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Contents of the Volume

A Two Step optimized Spatial Association Rule Mining Algorithm by Hybrid Evolutionary Algorithm and Cluster Segmentation

By J.Arunadevi, Dr.V.Rajamani

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A TWO STEP OPTIMIZED SPATIAL ASSOCIATION RULE MINING ALGORITHM BY HYBRID EVOLUTIONARY ALGORITHM AND CLUSTER SEGMENTATION

Strictly as per the compliance and regulations of:

A Two Step Optimized Spatial Association Rule Mining Algorithm by Hybrid Evolutionary Algorithm and Cluster Segmentation

J.Arunadevi[α], Dr.V.Rajamani[Ω]

Abstract - A novel two step approach by adopting hybrid evolutionary algorithm with cluster segmentation for Spatial Association Rule mining (SAR) is presented in this paper.Here first step concentrates on the optimization of SAR using the hybrid evolutionary algorithm which uses genetic algorithm and ant colony optimization (ACO). Multi objective genetic algorithm is used to provide the diversity of associations. ACO is performed to come out of local optima. In the second step, cluster the generated association rules used for the target group segmentation. Preferential based segmentation of the women of various groups belongs to the Madurai city, Tamilnadu, India. Here, number of rules generated by the first step of our SAR is minimized, also time generation for the rules are also minimized. Lift ratio increased for the generated rules.

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I. Introduction

An association rule is a general form of dependence where an element has some dependence with another element. Margaret H.Dunham and S.Sridhar [1] said Spatial Association Rule mining (SAR) is about generating association rules about spatial data objects. Either the antecedent or the consequent of the rule must contain some spatial predicates (such as near). Spatial association rules are implications of one set of data by another. Due to the relationships involved the spatial components; one entity can affect the behavior of other entity. Spatial data items are naturally linked to neighboring data elements (e.g., contiguous geographic positions), these data elements are not statistically independent. This makes the spatial data mining different from the normal transactional data mining.

Various activities involved in the SAR is computing the spatial relationships, generating the frequent sets and extracting the association rules. The existing approaches use quantitative reasoning, which computes distance relationships during the frequent set generation [3]-[4]. These approaches deal only with points, consider only quantitative relationships and do not consider non spatial attributes of geographic data,

which may be fundamental importance of knowledge discovery. Qualitative spatial reasoning [5]-[7] considers distance and topological relationships between a reference geographic object type and a set of relevant feature types represented by any geometric primitive (e.g. points, lines, and polygons). Bogorny.V [8] used qualitative spatial reasoning approach with prior knowledge and removes well known patterns completely by early pruning the input space and the frequent item sets. Salvatore Orlando [9] discussed about the various kinds of spatial predicates which can be involved in spatial association rules. In this paper, we are concentrating on the second and third step for the SAR.

A novel two step refinement algorithm based on Hybrid Evolutionary Algorithm (HEA) which uses genetic algorithm with ant colony optimization for generating the spatial association rules and clustering the generated rules for the required groups is developed and implemented. In the first step HEA algorithm is used to enhance the performance of Multi Objective Genetic Algorithm (MOGA) by incorporating local search with Ant colony optimization (ACO), for multi objective association rule mining. In the proposed HEA algorithm, MOGA is conducted to provide the diversity of associations thereafter; ant colony optimization is performed to come out of local optima. From the simulation results, it is shown that the proposed HEA algorithm has superior performance when compared to other existing algorithms. In the second step, we group the rules generated for finding the various target groups by clustering based on genetic algorithm. The proposed methodology is to use genetic algorithm over the existing rule cover algorithm for keeping nearest neighbors in common cluster and to be insensitive to data input order. Rules are grouped based on consequent information of the rules generated by step 1. Groups of rules are in the form $X_i -> Y$ for i=1,2,...,n. That is, different rule antecedents X_i's are collected into one group for a same rule consequent Y.

Moses santhakumar said [29] it is the second largest city in Tamilnadu state, having a very old history of about two thousand six hundred years and is often referred to as the Athens of East. Having different locations for residential, commercial, industrial,

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educational, public and semi-public habitats, we have chosen Madurai as the place of study and collected data from various parts of it.

Aditi pai and Deepika Khatri [30] said women are now a critical consumer segment for marketers to tap, not only for household and conventional women's products but also for services. Yet all women do not behave the same, their habits differ according to their status such as marital and working status. In our paper we have taken women in city Madurai for the target segmentation.

The paper is organized as follows: Section 2 deals with the background concepts of SAR, MOGA and the ACO applied for the optimization of the rule generation, method of clustering the rules. Section 3 deals first step of the algorithm developed, Section 4 explains the second step of the algorithm. Section 5 deals with approach followed in this paper and discuss the results obtained and Section 6 gives the conclusion of the paper.

II. Background Study

This section is divided into three parts. Section a.) discusses the need for considering SAR as a multi objective problem, section b.) discusses the use of genetic algorithm and the ACO for the optimizing SAR and section c.) says about the Clustering of association rules.

a) Multi objective view on SAR

Existing algorithms for the SAR try to measure the quality of generated rule by considering only one evaluation criterion. Due to the growing need of the knowledge from the spatial data, we can consider the problem as a multi objective one rather than the single objective. Multi-objective optimization deals with solving optimization problems which involve multiple objectives. Most real-world search and optimization problems involve multiple objectives (such as minimizing fabrication cost and maximize product reliability and others) and should be ideally formulated and solved as a multi-objective optimization problem.

b) Evolutionary algorithms for optimization

Over the past decade, population-based evolutionary algorithms (EAs) have been found to be quite useful in solving multi-objective optimization problems, simply because of their ability to find multiple optimal solutions in a single simulation run. Alex A. Freitas [10] explained the motivation for using genetic algorithms in the discovery of high-level prediction rules. GA perform a global search and cope better with attribute interaction than the greedy rule induction algorithms often used in data mining. According to Dehuri. S et al [12] genetic algorithms for rule discovery can be divided into two broad approaches, the

Michigan approach and the Pittsburgh approach. Peter P. Wakabi-Waiswa and Venansius Baryamureeba [13] said the biggest distinguishing feature between the two is that in the mapping of chromosome to the rule.

ACO is a paradigm for designing meta heuristic algorithms for combinatorial optimization problems. The ACO algorithm was first introduced by Colorni, Dorigo and Maniezzo [13]-[14] and the first Ant System (AS) was discussed by Dorigo [15] in his Ph.D. thesis. The ACO is a meta-heuristic algorithm, which utilizes the inspiration from real ant colonies behaviours to find a shortest path from a food source to the nest without using visual cues by exploiting pheromone information [16]-[18].

In order to reduce the total number of rules generated we used evolutionary algorithm. We tend to use the evolutionary algorithms since the solution space and the number of rules generated will be exponentially growing. We use the HEA, which inturn is using MOGA and ACO.

c) Clustering of the association rules

Clustering association rules is one of the meaningful ways of grouping association rules into different clusters. When the spatial association rules are generated in order to identify the group of targets we are using the clustering approach. Waler A.Kosters et al, [19] selected highly ranked (based on confidence) association rules one by one and formed cluster of objects covered by each rule until all the objects in the database are covered. Toivonen.H et al [20] formed cluster of rules of the form $X_i \rightarrow Y$, that is, rules with different antecedent but with same consequent Y and they extracted representative rules for each cluster as knowledge for the cluster. Pi Dechang and Qin Xiaolin [21] formed cluster of rules based on structure distance of antecedent. Alipio Jorge [22] formed hierarchical clustering of rules based on different distance methods used for rules. G. Li, and H.J.Hamilton [23] discussed different ways of pruning redundant rules including rule cover method. All Associative Classifier (AC) CBA, CMAR proposed by W. Li et. al[24]. RMR proposed by A. Thabtah, and P. I. Cowling [25] and MCAR proposed by Adriano Veloso et. al [26] generate cluster of rules called class-association rule (CAR) with class label as same consequent and they use database (rule) cover to select potential rules to build (AC) classifier model. In most of the association rule mining, confidence measure is used to rank association rules. Also, other measures such as chi-square, laplace-accuracy is used to select highly ranked rules.

III. Application of HEA for Spatial Association Rule Mining

SAR uses apriori algorithm for the generation of the rules. Here the rules generated by apriori using the hybrid

evolutionary algorithm.The MOGA is used to achieve the multi objective by with a Pareto based multiple-objective genetic algorithm. The possible rules are represented as chromosomes and a suitable encoding/decoding scheme has been defined, it also provides the diversity of associations among the rules generated by elitism.We follow the Michigan approach for the optimization. To increase the efficiency of the MOGA, we are using the ACO, which limits the algorithm from falling to the local optimal solution.

The procedures of HEA are as follows. First, MOGA searches the solution space and generates association lists to provide the initial population for ACO. Next, ACO is executed, when ACO terminates, the crossover and mutation operations of MOGA generate new population. ACO and GA search alternately and cooperatively in the solution space. Then the rules are clustered using the rule cover based on the consequent information.

a) String Representation

Chromosomes are encoded as real numbers the number of genes in each chromosome is equal to the number of item sets considered. Each gene will have 4 digits for vector index. A sample chromosome may look like as follows:

0001 0102 0204 0302 0401 0500 0601 0702 0802 0901 1002 1101 1201

Here, the first two numbers in each gene represents the attribute and the next two denotes the value , fourth gene has the value 0302 where 03 refers to the age group and 02 refers to the third age group ranges from 23 to 25. Like wise all the gene has been encoded, once the initial population is generated now we are ready to apply genetic operators.

b) Fitness

The fitness function is calculated as the arithmetic weighted average confidence, comprehensibility and J-Measure. The fitness function is given by

$$f(x) = \frac{(w1 * Comprehensibility) + (w2 * J\text{-}Measure) + (w3 * Confidence)}{w1+w2+w3}$$

where w1,w2,w3 are used defined weights.

c) Reproduction (Selection)

The selection process selects chromosomes from the mating pool directed by the survival of the fittest concept of natural genetic systems. In the proportional selection strategy adopted in this paper, a chromosome is assigned a number of copies, which is proportional to its fitness in the population, go into the mating pool for further genetic operations. Roulette wheel selection is used for the proportional selection strategy.

d) Crossover

Crossover is a probabilistic process that exchanges information between two parent chromosomes for generating two child chromosomes. In this paper, single point crossover with a fixed crossover probability of C is used. For chromosomes of length l, a random integer, called the crossover point, is generated in the range [1, l-1]. The portions of the chromosomes lying to the right of the crossover point are exchanged to produce two offspring.

e) Mutation

Each chromosome undergoes mutation with a fixed probability M. For binary representation of chromosomes, a bit position (or gene) is mutated by simply flipping its value. Since we are considering real numbers in this paper, a random position is chosen in the chromosome and replace by a random number between 0-9.

Step 1: Pseudo code for optimization of rule generation
1. while (t <= no_of_gen)
2. M_Selection(Population(t))
3. ACO_MetaHeuristic
  while(not_termination)
   generateSolutions()
   pheromoneUpdate()
   daemonActions()
end while
end ACO_MetaHeuristic
4. M_Recombination_and_Mutation(Population(t))
5. Evaluate Population(t) in each objective.
6. t = t+1
7. end while
8. Decode the individuals obtained from the population with high fitness function.

IV. CLUSTERING THE RULES

We are using the classifier model which uses the consequent information for grouping. The clusters will be formed who are having their consequent as similar pattern. We have first grouped based on the attributes; it may be homogeneous like urban core, suburbs, rural or hierarchical groups like metropolitan area, major cities, and neighborhoods. Further group based on the purpose like segmenting the population by consumer behavior. S.Kannan and R.Bhaskaran [27] proposed an algorithm for clustering the rules.

The key factors to be considered in the spatial clustering algorithm is keeping nearest neighbors in common cluster and the cluster to be insensitive to the data input order. In our novel approach we achieve this using the application of genetic algorithms to the rules before applying the rule cover algorithm. GA is used to rearrange the rules in various order based on the

fitness, this rectify the sensitiveness to the data input order. After applying the rule cover, GA is used to retain the nearest neighbors based on the metrics given by the user. Application of GA is to increase the quality of the clusters. The reason for this is clusters produced will not give 100% quality output. The distance between the clusters is expected to be large and the diameter of the clusters is expected to be small. Dunn uses [30] a validity index, measure of quality which indicates the dissimilarity and the dispersion of clusters. Large values of the index indicate the presence of compact and well-separated clusters. Using our approach we try to increase the Dunn's validity index

The clustering algorithm groups the rules in the form $X_i \rightarrow Y$ for i=1,2,…,n. That is, different rule antecedents X_i's are collected into one group for a same rule consequent Y. next step is to select small set of representative rules from each group. Representative rules are selected based on rule instance cover as follows.

Let $R_y = \{ X_i \rightarrow Y \mid i=1,2,…,n \}$ be a set of n rules for some item-set Y and $m(X_i\ Y)$ be rule cover, which is the set of tuples/records covered by the rule $X_i \rightarrow Y$ in the dataset D.

Let C_y be the cluster rule cover for a group or cluster of rules R_y. i.e.,

$$C_y = m(R_y) = U_{i=1,2,…n}\ m(X_i\ Y)$$

From cluster rule set R_y, find a small set of k rules r_y called representative rule set such that $m(r_y)$ is almost equal to $m(R_y)$. i.e.,

$m(r_y) \approx m(R_y)$, or $U_{i=1,2,…k}\ m(X_i\ Y) \approx U_{i=1,2,…n}\ m(X_i\ Y)$, where k<< n

Step 2 : Pseudo code for clustering the rules generated

Input : set of rules generated by the HEA $R_y = \{ X_i \rightarrow Y \mid i=1,2,…,n \}$ and the rule cover. Apply GA for rearranging the rules in various orders based on the fitness preferred by the user.

1. Generate the cluster rule cover
2. count = number of records in the cluster cover
3. while(no of records in the cluster cover > 2% of count)
   Sort all the rules in the R_y in the descending order of the rule cover.
   Take the first rule **r** with highest rule cover
   If the no of records in the rule cover is <= 2% of count
   Exit while loop
   End if.
4. $r_y = r_y\ U\ r$
5. Delete the highest rule cover from the cluster cover
6. End While

Output : the representative rule set.

Apply GA for retaining nearest neighbours in common cluster.The optimized representative rule set is used for the segmentation of the consequent.

GA is applied at the first stage for the arrangement of the rules based on the fitness; this is to help the clustering for not suffering from the order of the input. In the second.

V. Results and Discussions

We have used the synthesized dataset for our research. The general procedure of data mining is:

- Question raise
- Data preparation (including data selection, data pre treatment and data transformation)
- Data arrangement
- Model building/data mining
- Result evaluation and explanation.
  The specific procedure is as following.

(1) As done by Xinqi Zheng and Lu Zhao [28] we take advantage of "import wizard" in Matlab to accomplish the import of data file. Until now, the data fields and character fields are saved separately.
(2) Run algorithm step 1 to generate the rules.
(3) Run algorithm step 2 to generate the target group.

The environmental setup are Population size = 100, Mutation rate (M) = 0.5, Crossover rate (C)=0.8, Elitism = 0.5. The stopping criterion used is the non evolution of the archive during 100 generations, once the minimal number of generations has been over passed.

Keeping the fitness as 50% we have computed the results. In Fig 1 the comparison has been done for the number of rules generated to the support count given with the apriori algorithm, apriori algorithm optimized with the MOGA and the apriori algorithm optimized with HEA proposed in Step 1.
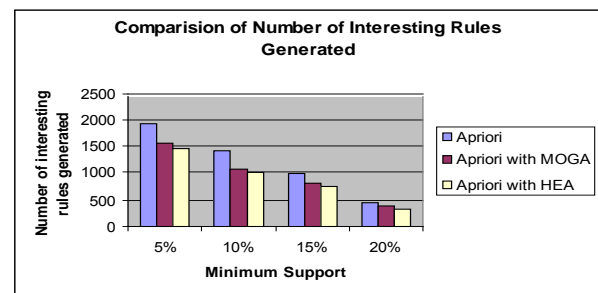
Fig 1 : Comparison of the three algorithms based on the number of rules generated

From Fig 1 we can have the following observations.
1. When the Support is increased the numbers of rules generated are decreasing and the use of HEA also performs a significant change in the number of rules

generated. The proposed HEA filters the rules generated based on the criteria given by the user

2. The application of the ACO reduces the number of needed rules generated. This is because of the ability of the ACO to come out of the local optima.

It is observed that the performance of HEA is better compared to the other two algorithms. HEA outperforms MOGA by an average of 8% for the four support levels (5%,10%,15% and 20%). It shows the good improvement in the 20% support level.

In Fig 2 the comparison has been done for the lift ratio for the top 500 rules generated to the support count given with the apriori algorithm, apriori algorithm optimized with the MOGA and the apriori algorithm optimized with HEA proposed in Step 1.
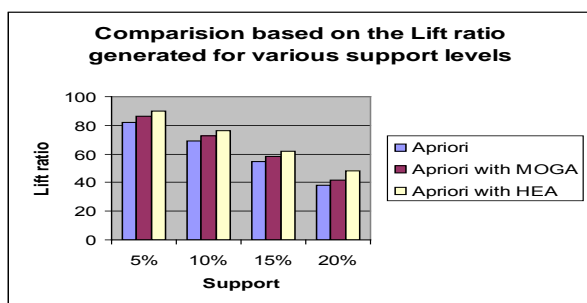
Fig 2 : Comparison of the three algorithms based on the lift ratio

Lift ratio says us how much better the rule is better as predicting the result than just assuming the result in the first place. It is defined as the ratio of the records that support the entire rule to the number that would be expected, assuming there was no relationship between the items. From Fig 2 we can have the following observation, Lift ratio for the HEA is better than the other two algorithms. This shows the efficiency of the HEA to identify the rules for predicting the result by improving the information about the increase in probability of the consequent to the given antecedent part.

In Fig 3 the comparison has been done for computational time for the support count given with the apriori algorithm, apriori algorithm optimized with the MOGA and the apriori algorithm optimized with HEA proposed in Step 1.
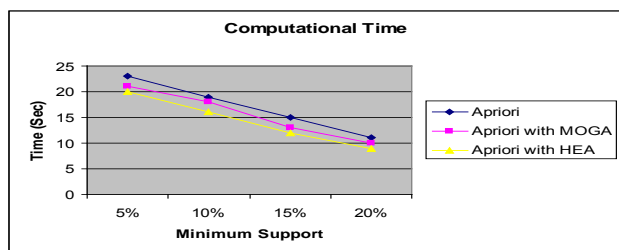
Fig 3 : Comparison of the three algorithms based on the computational time

By the refinement of the rules generated HEA algorithm in step 2 by the cluster concept is useful in narrowing the segmentation. From the synthetic dataset we have used the representative rules to find the preference based segmentation for the women based on 7 preferences and the distance they can maximum travel to get it. We have segmented the women into five segments and the representative rules have minimum support 20% fitness as 50% and the lift ratio as 38 %.

By the application of genetic algorithm for the keeping nearest neighbors in common cluster and to be insensitive to data input order, the time of generation of the clusters has been significantly reduced. This is depicted in Fig 4 and Fig 5
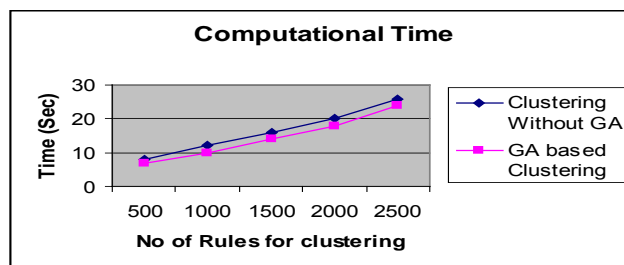
Fig 4 : Comparison of the two algorithms based on the computational time
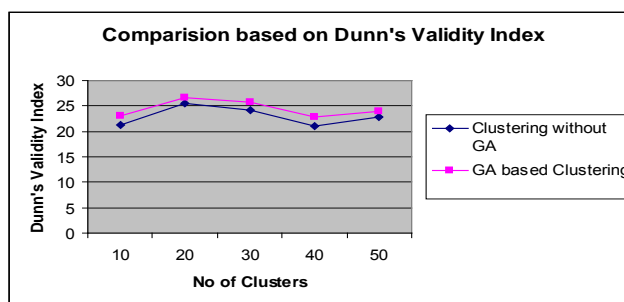
Fig 5 : Comparison of the two algorithms based on the Dunn's Validity Index

The observations from Fig 4 and Fig 5 shows the proposed algorithm outperforms the standard algorithms.

1. On an average 11 % decrease in the time of forming the clusters is performed by the proposed approach. This is due to the reason of applying GA for the rearrangement of rules before clustering.
2. The proposed approach works well when the number of rules applied for clustering is 1000 and the time reduction is about 16.6%
3. The average increase in the Dunn's Validity Index is 6.91%
4. The performance is good when the number of clusters formed is 40 and the increase is about 9.08%
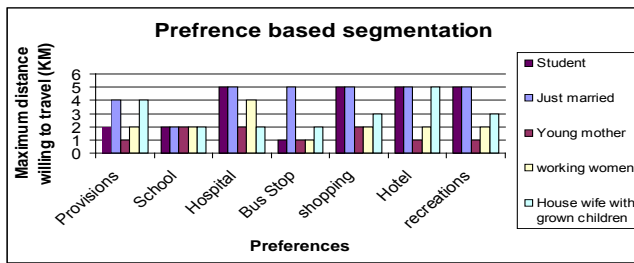
Fig 6 : Comparison of the preferences for various target groups

From Fig 6 some of the observations are

1. The students and the just married women are willing to relocate more for the preference.
2. Young mothers are limited to relocate
3. Most of the target group is willing to relocate less for the bus stop
4. The preference of the students and the just married women were alike.

We can generate number of observations and this can be used to the planning of the city based on the preferences, marketing and the logistics can be planned.

VI. CONCLUSION

This paper proposed a methodology for the optimization of SAR using the Hybrid Evolutionary Algorithm in the first phase and finding the target groups by the refinement of the rules by clustering. The results for the first phase is promising and the second phase also lay a opening for the identification of target groups which can be further extended to the preferential based mining. In this paper the case taken for the phase two is the women target groups with various categories and their preferences. The work can be extended to the classification of the rule generated and the phase two can be also optimized with the help of the evolutionary algorithms.

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Network Security Based on Quantum Cryptography & Multi-qubit Hadamard Matrices

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Abstracts - An approach is described for generating a secret key using polarized photons in quantum systems. A message is encoded and decoded by using code generated through the properties of Hadamard matrices. The algorithm uses the features of certain existing algorithms and makes the transmission of data through an insecure channel less vulnerable to various attacks. The algorithm uses the concept of bases: rectilinear and diagonal for the sender and the receiver respectively [1]. This is a deterministic algorithm in which the two communicating parties use the same orthogonal bases to measure each qubit in the transmitted message. The algorithm uses the concept described by Lester-Hill [2] in the intermediate steps of the cryptographic process. The key that is transmitted over the network is made less vulnerable to the man-in-the-middle attack using the Diffie-Hellman concept of key exchange [3].

Keywords : Network security, Quantum cryptography, photon polarization, deterministic one step quantum key distribution, polarization filter, Hadamard matrices, qubit, man-in-the-middle attack, sequency value.

GJCST Classification : C.2.0

NETWORK SECURITY BASED ON QUANTUM CRYPTOGRAPHY MULTI-QUBIT HADAMARD MATRICES

Strictly as per the compliance and regulations of:

Network Security Based on Quantum Cryptography & Multi-qubit Hadamard Matrices

Sandip Dutta[α], Anand Kumar[Ω], N.C.Mahanti[β]

Abstract - An approach is described for generating a secret key using polarized photons in quantum systems. A message is encoded and decoded by using code generated through the properties of Hadamard matrices. The algorithm uses the features of certain existing algorithms and makes the transmission of data through an insecure channel less vulnerable to various attacks. The algorithm uses the concept of bases: rectilinear and diagonal for the sender and the receiver respectively [1]. This is a deterministic algorithm in which the two communicating parties use the same orthogonal bases to measure each qubit in the transmitted message. The algorithm uses the concept described by Lester-Hill [2] in the intermediate steps of the cryptographic process. The key that is transmitted over the network is made less vulnerable to the man-in-the-middle attack using the Diffie-Hellman concept of key exchange [3].

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I. Introduction

Quantum cryptography is an emerging technology in which two parties can secure network communication by applying the phenomena of quantum physics. The concept of quantum cryptography was first given by Charles Bennett and Gills Brassard in 1984 (the first known quantum distribution scheme). Quantum cryptography takes its sources from quantum mechanics and is based on fact that light comes in little packets called photons, which have a property of getting aligned along some particular axes and this phenomena is known as Polarization. Photons can be polarized by being passed through a polarizing filter. A polarizing filter is a device or procedure that accepts any photons as input but produces only those photons having a certain kind of polarization particular to the polarizing filter as output. If a beam of light (i.e. a stream of photons) is passed through a polarizing filter, all the photons emerging from it will be aligned in the direction of filter's axis (e.g. vertical or horizontal). If a beam is now passed through a second polarizing filter, the intensity of light emerging from the second filter is proportional to the square of the cosine of the angle between the axes. This confirms to the Lambert's cosine law. If the two axes are perpendicular, no photons get through. Photons vibrate in all directions as they travel. Although photons can have any directional orientation ranging from 0˚ to 360˚, for purposes of quantum cryptography, we can assume here that there are only four directional orientations. We can denote these four orientations with four symbols

↔ ↕ ↗ and ↘

The quantum cryptography allows a bit string to be agreed between two communications parties without having two parties to meet face to face, and yet that two parties can be sure with a high confidence that the agreed bit string is shared exclusively between them thereby deferring the chances of eavesdropping, if there be any.

The polarized photons are used in BB84 to allow two communicating parties, conventionally "Alice" and "Bob", to establish a secret common key sequence. For this Alice needs two sets of polarizing filters. Set one consists of vertical filters and horizontal filters. This choice is called a rectilinear basis. A basis is just a coordinate system. Second set of filters is the same, except rotated 45˚. This choice is called the diagonal basis. Thus Alice has two bases, which she can rapidly insert into her beam at will. Alice does not have four separate filters but a crystal whose polarization can be switched electrically to any of the four allowed directions at great speeds. Bob has the same equipment as Alice.

To send a one-time pad of 1001110 with these bases, Alice's photon pattern is shown in the following figure [6]. Given the one time pad and the sequence of bases, the polarization to use for each bit is uniquely determined. Bits sent one photon at a time are called **qubits** .

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Bit No:	0	1	2	3	4	5	6
Data :	1	0	0	1	1	1	0

No	Yes	No	Yes	No	No	No
	0		1			
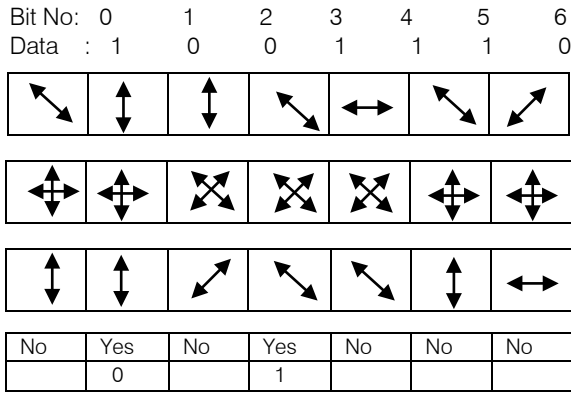
Fig. 1 : Bit transmission by quantum cryptography (Source: Tanenbaum, A. S., "Computer Networks,"p.733)

In the algorithm, if Bob picks the correct basis he gets the correct bit otherwise he gets a random bit.

Hadamard matrices [4] are a class of square matrices first described by James Sylvester in 1867. Hadamard matrices possess several curious and interesting properties [5] which are used in the proposed algorithm:

1. The matrices are symmetric which means the mth row is equal to m^{th} column.
2. A normalized H_n has $n(n-1)/2$ elements of -1 and $n(n+1)/2$ elements of +1.
3. For normalized Hadamard matrices of order 2 or greater, every row (except the first) or column (except the first) has n/2 elements of +1 and n/2 elements of -1.
4. Any two rows or any two columns are orthogonal.
5. Every pair of rows and every pair of columns differ in exactly n/2 places.
6. A Hadamard matrix may be transformed into an equivalent Hadamard matrix either by interchanging any two rows or any two columns or by multiplying any row or any column by -1.

Another interesting property is the sequence number of each row, which indicates the number of transitions from +1 to -1 and from -1 to +1. A rows sequence number is called its sequency because it measures number of zero crossings in a given interval. Each row has its own unique sequency value in the range [0, N-1].

Approach that we used to generate codes from Hadamard matrix is to generate Hadamard matrix of desired order, change all -1 entries to 0 and arrange the matrix in the increasing order of their sequency and then fetch desired number of rows from the matrix and XOR these rows to generate Hadamard codes as shown in figure below.

Now from the below shown Hadamard matrix of order 8 we can generate Hadamard codes as g0=[1 1 1 1 1 1 1 1], g1=[1 1 1 1 0 0 0 0], g2=[1 1 0 0 0 0 1 1], g3=[1 1 0 0 1 1 0 0] and so on, g0 $\oplus$ g1=[0 0 0 0 1 1 1 1], g0 $\oplus$ g1 $\oplus$ g2=[1 1 0 0 1 1 0 0]. In similar way we can generate Hadamard matrix of any desired order and generate any number of codes from it.

$$
\begin{bmatrix}
1 & 1 & 1 & 1 \\
1 & 1 & 0 & 0 \\
1 & 0 & 0 & 1 \\
1 & 0 & 1 & 0
\end{bmatrix}
\begin{matrix}
=0 \\ =1 \\ =2 \\ =3
\end{matrix}
$$
Order =4

$$
\begin{array}{l}
g0 = \\ g1 = \\ g2 = \\ g3 = \\ g4 = \\ g5 = \\ g6 = \\ g7 =
\end{array}
\begin{bmatrix}
1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 \\
1 & 1 & 1 & 1 & 0 & 0 & 0 & 0 \\
1 & 1 & 0 & 0 & 0 & 0 & 1 & 1 \\
1 & 1 & 0 & 0 & 1 & 1 & 0 & 0 \\
1 & 0 & 0 & 1 & 1 & 0 & 0 & 1 \\
1 & 0 & 0 & 1 & 0 & 1 & 1 & 0 \\
1 & 0 & 1 & 0 & 0 & 1 & 0 & 1 \\
1 & 0 & 1 & 0 & 1 & 0 & 1 & 0
\end{bmatrix}
\begin{matrix}
=0 \\ =1 \\ =2 \\ =3 \\ =4 \\ =5 \\ =6 \\ =7
\end{matrix}
$$
Order =8

Fig. 2 : Hadamard matrices in increasing order of sequency value

II. Previous Work

The principle of cryptography using quanta is based on physics, not mathematics, and is an emerging technology. Not much has been done very significantly in this field and the works are not too efficient and the area is still open to a wide domain of experiments.

III. Proposed Algorithm

In the algorithm that we propose, we perform sanitation on the existing features of certain algorithms to enhance the efficiency of our algorithm. We have assumed the communicating parties to be the conventional **Alice** and **Bob** and the intruder as **Trudy.**

Here goes the description of the algorithm. The algorithm uses the term qubit. This represents a binary digit in the form of a photon transmitted at a time.

Alice computes word length from the plain text and performs modulus 2 operation if she wants to encrypt plaintext with 2×2 matrix in accordance with the Lester-Hill algorithm, if the result is 0 she sends word length to Bob else she appends a dummy letter to make the length even, increments word length by 1 and then sends to Bob. Both Alice and Bob compute seven times the word length and generate the Hadamard matrix of desired order depending on the result for e.g. if the word length is 3 then 3*7 = 21. They thus generate Hadamard matrix of order 24 since 24 is the smallest number greater than 21.

Now, both Alice and Bob change all -1 entries of the matrix to 0 and arrange the entire matrix in the increasing order of its sequence value.

Having done with the Hadamard matrix, Alice and Bob use the authenticated Diffie-Hellman key exchange algorithm (Diffie-Hellman key exchange algorithm [7] using the concept of digital signature for authentication of the two communicating parties **and** eliminating the man-in-the-middle attack, thus the name Authenticated). Suppose they exchange a secret key as 160. Then, both parties perform operation $g1 \oplus g6 \oplus g0 \oplus g16 \oplus g10 \oplus g60 \oplus g160$, ignoring the generator values that does not exist in the generated matrix. The g's represent the corresponding row numbers to be selected for the key creation. After the above operation both parties have generated the same bit sequence of 1's and 0's. Alice then informs Bob by sending a plaintext message thereby indicating her choices like 1 as rectilinear and 0 as diagonal and so on

1 ✛ Rectilinear   0 ✖ Diagonal

and encodes the plaintext message using Hill cipher (say by a 2×2 matrix). Each character of the plaintext is converted into a bit string by taking the 7-bit ASCII value representation. A new one time pad is generated again by Alice and this depends entirely on her choice. This one time pad (or the key) is generated from the Hadamard matrix and this serves as the symmetric key for the cryptographic process. e.g. $g1 \oplus g18 \oplus g10 \oplus g15 \oplus g55$

Finally, she performs XOR operation between the bits of the encoded message and those of the generated one time pad to produce the cipher text.

Now, in order to transmit the one-time pad to Bob, both parties set their basis according to previously generated bit sequence and the agreed pattern of the representation of the bits, the bits are transmitted securely to Bob. This process is called deterministic one step quantum-key distribution. The one time pad is used by Bob as well to decrypt the message that was encrypted and the phenomenon to be used is the same Hill cipher.

The key for the Hill cipher is again transmitted by Alice in a similar manner by converting key into binary bit string and again setting up similar basis on both ends and then the bits are transmitted across the insecure channel securely. At the receiver's end, Bob receives the key, computes the inverse of key and recovers the plaintext message in the original form. The following is the diagrammatic representation of the proposed algorithm:

Plain text

Alice encrypts using Hill cipher

Alice converts each encrypted character of plain text into its equivalent 7-bit ASCII representation

Alice computes one time pad (key) using Hadamard matrices

Alice performs XOR of 7-bit ASCII of encrypted plaintext with the generated one time pad

Both Alice and Bob exchange a session key using authenticated D-H key exchange algorithm

Both again generate a similar bit pattern based on exchanged keys and Hadamard matrices and set up the same basis for transmission

The key is transmitted. After this the cipher text is also transmitted

Bob now performs the XOR operation on the received cipher text

Bob again receives the key for Hill cipher in the similar manner and decrypts using Hill cipher to recover the plain text

Plain text

Fig. 3 : Flow Sequence of Proposed Algorithm

IV. Evaluation

The proposed scheme is a deterministic one step quantum key distribution. The argument in favour of this statement is that both Alice and Bob use the same basis for the data transmission by agreeing on a common basis before they start the message transmission. This is an enhancement to the feature of the Bennet and Brassard algorithm in which a lot of the qubits get distorted in the transmission process due to the difference in the selection of the basis.

Since we have used the authenticated version of the Diffie-Hellman key exchange algorithm, the man-in-the-middle attack possibility is eliminated.

The algorithm uses random sequence generation of binary bits. Since the occurrence of all the plaintexts that are possible is equally likely, the message that is transmitted possesses no information and thus the message to be transmitted can be said to be safe from all types of attacks irrespective of the computational capability present with the cryptanalyst.

V. Conclusion

The ongoing enhancements in the internet technology continue to be ever increasing and the advent of modern computers to support more and more remote computation will lead to an ever increasing in the requirement of the network data transmission. This will tempt attackers to gain illegitimate access to information for various reasons. Thus the algorithm we propose here is going to serve the needs of the people in the times to come. With the passage of time, the algorithm will become more and more powerful with improvements by those who use it.

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Microinnovations among the paradigms of innovation research - what are the common ground issues

By Pertti Saariluoma, Antti Hautamäki, Seppo Väyrynen, Minna Pärttö, Esa Kannisto

Abstracts - If we consider innovations as human action, this research has been dominated on one hand by social and policy making processes and, on the other, by organizational management thinking. In this study, we shall introduce a third perspective to innovation as action, namely, innovation as a human way of thinking. We claim that innovations are always made by thinking people, and therefore we should also look innovations in concepts of scientific research to human thought processes. Since societal and organizational paradigms concern innovations as relatively large wholes, we term the research on these paradigms as macroinnovation research.Here, we study the relations of microinnovations research to major paradigms of innovation research and in this way define its role within the field. We shall define the common ground points between microinnovation research and such established paradigms as organizational innovation research, innovation processes, systems and especially ecosystems of innovations research, flow of information, diffusion of innovations and finally the research on innovation policies.

GJCST Classification : K.6.m, K.6

MICROINNOVATIONS AMONG THE PARADIGMS OF INNOVATION RESEARCH —WHAT ARE THE COMMON GROUND ISSUES

Strictly as per the compliance and regulations of:

Microinnovations among the paradigms of innovation research - what are the common ground issues

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Abstract - If we consider innovations as human action, this research has been dominated on one hand by social and policy making processes and, on the other, by organizational management thinking. In this study, we shall introduce a third perspective to innovation as action, namely, innovation as a human way of thinking. We claim that innovations are always made by thinking people, and therefore we should also look innovations in concepts of scientific research to human thought processes. Since societal and organizational paradigms concern innovations as relatively large wholes, we term the research on these paradigms as macroinnovation research.

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I. Introduction

The word innovation can be found in the 13th century French and three decades later in English. It thus has Latin roots (Innovare). In both cases, innovation refers to renewal (Zingerle 1976). Although this etymology is not significant for our arguments – the use of the word and the contents of the concept having recently become much more specified – it still expresses something essential about the nature of innovation. This is that innovation leads to something new which has not existed earlier (Damanpour & Wishnevsky 2006, Freeman & Perez 1988, Schumpeter 1939, p. 85). In human terms, the new in life is always created by human thinking, and our species has earned its position among all other species by its capacity to think (Johnson-Laird 2008, Newell and Simon 1972). This is why it is natural to consider innovation as renewal and thinking as the human ability to create new thoughts and, consequently, new objects or social systems.

The word *innovation* can be found in the 13th century French and three decades later in English. It thus has Latin roots (*Innovare*). In both cases, innovation refers to *renewal* (Zingerle 1976). Although this etymology is not significant for our arguments – the use of the word and the contents of the concept having recently become much more specified – it still expresses something essential about the nature of innovation. This is that innovation leads to something new which has not existed earlier (Damanpour & Wishnevsky 2006, Freeman & Perez 1988, Schumpeter 1939, p. 85). In human terms, the new in life is always created by human thinking, and our species has earned its position among all other species by its capacity to think (Johnson-Laird 2008, Newell and Simon 1972). This is why it is natural to consider innovation as renewal and thinking as the human ability to create new thoughts and, consequently, new objects or social systems.

The central social role of innovations is an undeniable fact today, and there has been a lot of effort to investigate them. If one looks at the Fortune 500 list, it is possible to see that from 1970 to 1995 around 60% of the companies disappeared from the list (Tidd et al. 1997). This means that even the most prosperous and best companies can lose their position in the markets if they do not take care of their innovation processes. Companies which have been able to carry out successfully their technical innovation processes have prospered and gained markets (Adams, Bessant and Phelps 2006, Chesbrough 2003, Nonaka and Takeuchi 1995, Tidd, 2001, Tidd et al. 1997). The Japanese car industry is a good example. Another good example is Apple, which has recently very successfully marketed its products all over the world and created a networked system. During technological revolutions, such as the recent emergence of mobile ICT, companies which have been able to manage effectively their product innovation management have survived and taken the main part of the markets, while the less successful competitors have abandoned the business.

Competition makes it understandable why innovation and taking care of innovation processes is not a free choice for a company but a simple necessity. If a company or a society is lazy in this point, others will take it over. However, before it is possible to get working innovation systems within countries and companies, we must have a clear understanding of this

elusive and versatile phenomenon. This means that research in innovations is just as necessary as development of innovation systems.

Finally, the question is not only that of technological development and business processes but innovations are also important in the way communities, societies, organizations and collaborative networks organize their activities (Freeman and Soete 1997, Hautamäki 2010). Innovations may also concern systems such as national education, research organization and industrial networks. The new ways of organizing and acting may be important preconditions for the actual innovation processes in industries and in societies.

Innovations are studied using many different conceptual systems from political and organization sciences to economics (Fagerberg, Mowrey and Nelson 2005, Tidd et al. 1997). This is not odd or exceptional in science. The phenomena of evolution, for example, are studied simultaneously with the help of molecular, cell biological and zoological concepts (Mayr 2001). It simply makes good sense to ask questions about innovation using concepts, methods and theories from many different fields of research, as in this way it is possible to get a comprehensive picture of this lifeline of modern society.

One can classify innovation research into many types, one major line of demarcation being between different types of innovation as human action, on one hand, and innovation as social transformation, on the other. The former type of innovation research uses some concepts of human action. This means normally either policy making or organizational management (Brown and Eisenhart 1995). Good examples of the latter are innovation systems, diffusion of innovations and financing.

Innovation research has so far considered innovation as human actions from two different perspectives. These two research paradigms are innovation policies and organizational innovation processes (Brown and Eisenhardt 1995). The policy-related research opens up questions on how the USA, European union or Japan should organize their actions to effectively foster innovations in their particular areas of competence (Diederen, Stoneman, Toivanen and Wolters 1999, Beise and Stahl 1999, Etzkowitz and Leydesdorff 2000, Freeman and Soete 1999). The organizational type research concentrates on organizational and management innovation processes (Birkinshaw, Hamel, and Mol, 2008, Dodgson 2000, Drucker 2006). However, these two broad categories do not give us all the information that we need about innovation as human action.

Here, we suggest one new perspective to innovation as human action, i.e. innovation as human thinking (Saariluoma, Kannisto 2008, Saariluoma,

Kannisto and Kujala 2008). In our work, this means that we shall consider innovation processes in terms of the cognitive scientific research on human thinking. Since thinking is the only means to generate innovations, it is equally important to consider innovations as policy making or management. Without our human thinking ability we would have no more innovations than chimpanzees have. This is why it makes sense to ask what the innovative thought processes are when studied in terms of the research in human thinking (Simon 1969). Because national and organizational paradigms of innovation research analyze relatively large issues, we can term this third perspective as microinnovation research (Saariluoma, Kannisto 2008, Saariluoma, Kannisto and Kujala 2008).

In this paper, we are interested in defining the position of microinnovations research among the main paradigms of innovation research. A way of doing this is to look at how the questions of microinnovations, i.e. the research to innovative thinking, are related to the main paradigms of innovation research. This deals with what microinnovation research might add to the analysis of innovation policies and systems, organizational and innovation management, innovation processes and diffusion of innovations. We systematically ask what the function and role of human thinking in these major innovation discussions are, and in this way we can clarify the position of microinnovation issues among other paradigms of innovation research. Our discussion raises two basic questions. Firstly, is thinking really essential in analyzing some known aspect of innovation? Secondly, what kinds of research issues are opened up by concepts of human thinking?

II. INNOVATION PROCESSES

Innovation is a process in which innovators find new things (Christensen 2002). We do not know how we will do things until after the innovation process has reached its goal. The goal itself is either a small or a large change in technology, but it is also a change in the quality of human life (Saariluoma and Leikas 2010). Flash memories and memory sticks, for example, changed the way people store information in their computers and in many other devices. This innovation, originated by Sony in 1998, has spread very fast over the whole field of computing. Apple invented a number of devices, which eventually lead to a revolution in mobile services.

Design is the key in the innovation process and also forms the core of innovative thinking. However, not all design processes lead to innovations. Thus not all that is required in innovation can be seen in terms of design, either. Fifth generation computers require a large-scale design process, but we still do not have computers which some suppose should think like human beings. Of course, this undertaking lead to many important improvements in our knowledge of

important for creativity in organization. They form the computing, but still it never became an innovation as such, because human thinking is more complex than the information processing that can be realized by the computers of today.

Companies have to conduct a variety of activities to build up their production volume. Product design is the process of devising and laying down plans that are needed for the manufacture of a product (Pahl and Beitz 1988, Roozenburg and Eekels 1995). The traditional way in companies has been to associate the design activity with research, sales and production. Designing requires a special form of problem solving: the phase models of product design indicate what kinds of problems the designer has to solve and what is the best sequence therein (Pahl and Beitz 1988, Roozenburg and Eekels1995).

From the microinnovation perspective, the main problem area in design is design thinking, which is assumed to signify a process of organized thoughts aiming to a clear goal. Design begins with concepts and broad solutions. A concept (or sometimes scheme) comprises a "broad" solution which is normally documented as diagrams or sketches (Roozenburg and Eekels1995). The term *principal solution* is quite near to the "broad" solution (Pahl and Beitz 1988, Roozenburg and Eekels1995). Ulrich and Eppinger (2004) describe the field of concept selection as an iterative process of generation, screening, scoring and testing of concepts.

Besides satisfying the functional and working interrelationships of a product, a solution must also satisfy certain general or task-specific constraints. Hubka and Eder (1996) separate the properties affected by the constraints into categories based variously on industrial, ergonomic, aesthetic, distribution, delivery, planning, design, production and economic factors. Today we have to add factors such as safety, environmental and legal considerations, transport, maintenance, recycling and disposal (Pahl et al. 2007).

Nowadays, product design is embedded in a more comprehensive process, which is called product development, and further, e.g., according to Roozenburg and Eekels (1995), product development is part of industrial innovation process. The above mentioned problems become concrete tasks after the problems that designers have to solve to create new technical products (artifacts) are clarified and defined (Pahl et al. 2007). This happens in individual work as well as in teams in order to realize interdisciplinary product development (Ulrich and Eppinger 2004).

In addition to emphasizing systematic procedures, Pahl et al. (2007) mention clearly the importance of experience, intuition, and creativity as far as an effective design methodology as a "practical tool" is concerned. It is a concrete course of actions that derives its knowledge from design science (Pahl et al.

2007, Hevner et al. 2004, Järvinen 2004) and cognitive psychology (Pahl et al. 2007). The aim of design science, in brief, is to develop rules for development (Pahl et al. 2007) or to build innovations and evaluate them (Hevner et al. 2004, Järvinen 2004).

The process of growing something to a commercial product does not form a straight line from invention to innovation but presupposes a huge number of small and larger inventions. The construction of DX-200 was not a simple elegant process as it entailed a large number of great inventions. It presupposed, like most modern commercialized ICT-innovations, a long development work (Bruun and Wallen 1999). One of the best inventions was the way this development process was kept alive so that it had a theoretical possibility to become the basic innovation for mobile ICT.

This means that innovations in general do not result from one single invention, but, rather, they are processes that are often also goal directed. Thus we might talk about a mass of new ideas organized in a clever manner for a single problem solving process. A logical question now to ask is: what kinds of thought processes could there be and how are they organized to get a real innovation?

In a study by Saariluoma, Nevala and Karvinen (2006) a long-range development process is analyzed. The target was an extended nip in a paper machine, which was developed during 1986-2000 and which made the Metso corporation the world technology leader in paper machines. At the same time Belotti, the best known company in the industry, ended its activities. Therefore, this very difficult engineering process can be thought of as a genuine industrial innovation process.

We found four different modes of engineering design thinking. Firstly, when people came across a problem, they made a coherent mental representation of possible solutions. Secondly, they tested it and restructured the representation when the outcome of testing was not satisfactory. Thirdly, there where thought processes in which people tried to solve which one of a number of plausible solutions would be optimal. Finally, they integrated the accepted solution to the whole. Respectively, we discuss here apperceptive, restructuring, reflecting and constructive modes. This empirical investigation illustrates that innovation entails different types of thought processes.

Invention and innovation have thus specific relations. Innovation process organizes numerous invention processes into one whole. These processes have specific contents. A part of the contents may be technical, some of it has to do with human actions, some is process information and, finally, much of it belongs to marketing. The differences in this background information show already how innovation arises from numerous inventions, and thus it is

essentially a process which organizes inventions into a whole. Therefore, it is too simplifying to consider innovation as inventions which have merely passed through a business process.

In each state of innovation, problems emerge and must be solved. If a group or network of innovators fails, innovation cannot become true. Failures in apparently small problem solving processes may have fatal consequences. Many supertankers blew up in the Sixties as a consequence of one design error in their tanks (Perrow 1999). One failed problem-solving and design process thus destroyed the ships which were otherwise well designed. This example illustrates how important it is to study the flow of thoughts and problem-solving processes in innovation research – and not only problem-solving processes but also the preconditions for problem solving.

III.   What is Innovative Thinking?

We all know what is thinking. It is something we do to get new ideas and new ways to look at our life and work. Thinking is thus intuitively very essential for renewal, which is typical to innovation. For this reason, it makes sense to study what kinds of questions can be asked and answered by using concepts and theories of human thinking. Though this is very clear, our intuition does not yet give us much, because scientific theories of human thinking are as far from everyday intuitions as the concept of mass in mechanics compared to the everyday concept of mass (Holyoak and Morrison 2005). This is why we first have to consider, from the viewpoint of science, what we mean by thinking.

Thinking has interested philosophers and psychologists for thousands of years, but it has also been topical in modern psychology (Evans and Over 2004, Holyoak and Morrison 2005, Manktelow and Over 1990, Sonnentag, Niessen and Volmer 2006). The difference between these two disciplines in looking at the issue is roughly the following: philosophers are interested in what is the objectively right way of thinking, while psychologists work with problems of how people really think. Therefore, it is good to combine the two perspectives when working within the frame of cognitive science.

Intuitively thinking is manipulation of ideas, images, memories, percepts or simply mental representations (Holyoak and Morrison 2005). In principle, we can simulate the manipulation of representations with computers (Anderson 1983, Dunbar and Fugelsang 2005, Newell and Simon 1972, Sun 2006). This kind of manipulation causes shifts in the contents of our thoughts. In one moment of time we might not be able to represent something, even though a little later this may be clear for us (Duncker 1945, Köhler 1925, Wertheimer 1945). Innovation researchers also speak about changes in perception (Drucker 1977).

Another character of human thinking is that it emerges when we have a goal but are not able to reach it by the means currently available for us. It is thinking that creates those means for us (Johnson-Laird 2008, Newell and Simon 1972). Of course, innovation processes are very goal-oriented. The goal is to create and market products that can provide new value to users and change the ways they live (Cockton 2006, Saariluoma and Leikas 2010). Thinking is the way that final goal can be reached.

Thinking presupposes motivation. People must set goals and pursue these goals. If people had no goals, they would have no problems either, nor any need for creative thinking. They must be motivated to have thoughts which are relevant in innovation processes. Motivation and goal-setting is one of the core characteristics of humans (Dwegg and Lewgget 1988). Therefore, it is essential in microinnovation research to work with the problem of motivated thinking. The importance of motivation has been known for quite a long time among traditional innovation researchers, though it has not been connected to the scientific study of human thinking.

We can see the influences of innovation by considering the effects of dismotivation on our daily work life. A study by Hidalgo and Albors (2008) demonstrates that such dismotivating phenomena as bureaucratic complexity, unwillingness to share knowledge, low awareness of innovation technology and difficulty to accept failure harm innovation activities (Hidalgo & Albors 2008). The literature on organizational motivation and creativity is in this work central (Amabile 1999).

When considering microinnovation problems, perhaps the main attention should be put on intrinsic motivation for which there is a wide and elaborated literature. Thinking has always an important intrinsic component (Ryan and Deci 2000, Oudeyer and Kaplan 2008). People must have their own needs to pursue their goals. This is something that organizations all too often unintentionally miss. Closed minds, unnecessary and unskilled evaluations, and absence of real feedback are typical phenomena spoiling human motivation (Amabile 1999).

Negative organizational practices are in contradiction with one important principle of human motivation. This is the self-determination theory (Ryan and Deci 2000). In this theory, intrinsic motivation, self-regulation and well-being are central determinants of human action. In intrinsic motivation, the important things are interest, enjoyment and inherent satisfaction. This means that people must be genuinely committed to the ideas they foster in innovation processes. Of course, closed organizational practices are destructive for human self-determination. We can also see that factors in work atmosphere and in life outside work are

important for creativity in organization. They form the basis of motivation. They create the conditions for intrinsic motivation, which is a critical element in microinnovation processes.

This introduction illustrates that we have important reasons for thinking that motivation is among the important factors in microinnovation research. Motivation explains a part of what happens when innovating people think about various issues. It is especially important when we consider the relations of organization, management and innovative thinking. This is why it is necessary to include problems of motivation and thinking to the spectrum of microinnovation processes.

Nevertheless, thinking does not only depend on the thinking person, but also on information and social contexts. Much of human thinking is social, i.e. it must be considered either in social, psychological, sociological or social scientific terms (Wegner 1998). This means that the final outcome of thinking is a product of several people and their collaboration. One invents something, and the next piece is invented by someone else. Finally, all knowledge is brought together into a complex idea. Much of design and innovation must be seen from this social perspective. This is why it is essential to consider the role of social psychology, sociology and cultural research in thinking that takes place within microinnovation processes.

Language and dialogue are the most important tools of social thinking. In dialogue, people learn about content and processes. They learn to know each other, they get new skills and finally, they can see much more than they would alone (Isaacs 1993). Thus dialogue enables people to share knowledge and become conscious of many tacit aspects in their thinking. It is also an essential tool in management and leadership (Fairholm 2009, Isaacs 1993). In this way, the nature of dialogue is a vital problem in the research into microinnovation processes.

The same dialogue can have a number of discourses. It seems that a heterogeneous group needs a common ground discourse. The formation of common ground needs common patterns, mutually agreed-formed rules, policies and practices. Argumentation and debate by an expert network to resolve problems, rather than being a direct source of information seem to orient expertise and experts in data exploration.

Thought progresses through a dialogue between people in the form of argumentation. Arguments are clauses with truth value (Hamblin1998, Parsons 1996, van Ermereen, Grootendorst & Snoeck Henkemans 1996). These clauses or propositions claim something about the world. Their role in dialogue is to show how things are and in this way to make a stand in relation to knowledge. In organizational discussions, arguments may be correct but they may also entail numerous fallacies. In any case, organizational thinking proceeds through argument.

It is crucial to ensure that argumentation works on solid grounds (van Ermereen, Grootendorst & Snoeck Henkemans 1996). This means that the discourse must remain justified. If we have a record of that, it will be possible to consider what the true grounds are, or whether the circumstances have changed so that something which was impossible earlier can now be done. The nature, truth and systems of argumentative discourse in innovation systems are important topics in microinnovation research.

There are also non-argumentative discourse practices in organizations. Typically, ideas may be met through irrelevant points of silence. These kinds of practices are destructive for organizational thinking. Therefore, it is essential that argumentations in organizations are considered from the microinnovation point of view. This addresses the questions of how thinking in argumentative discourses is organized, what we mean by strong practices and what kinds of practices are dysfunctional.

The points made here illustrate how microinnovations have their social and psychological aspects also. We need to investigate how thoughts get their forms in innovative discourses. The question then is not how the discourse proceeds but how thoughts get their forms. Discourses are important only because they can lead to incomplete or incorrect final solutions while preventing the best ideas from coming to the fore.

IV. SOCIETAL INNOVATIONS AND INNOVATION POLICIES

Governments have a number of important tools for fostering innovations in their regions when creating good preconditions for innovative processes. The size of a region or district is not central when we think about fostering innovations. Regional, national and international administrative organizations, from local communities to the European Union, can find and create instruments to improve the conditions for innovative organizations and innovative people. These instruments we call innovation policies.

Regulations, directing flows of resources such as money and knowledge, as well as creating advantageous organizational structures are typical policy means to create innovations (Tidd et al. 1997). Since the governmental resources are often quite large, the issues of innovation policies and societal innovations are vital. One cannot think about innovations without having a clear idea of what governments have done, how these operations have succeeded and what they could and should do.

Of the many governmental instruments to create innovations, the closest to the present topic is knowledge flow. Of course, there can be policy mistakes which may be costly to the societal innovation

17

processes, and in the end of the day these mistakes are nothing but thought errors. The reasons for such thought errors are typical in microinnovation research.

Nevertheless, flow of knowledge is the most important governmental tool for improving microinnovation processes. Science and R&D-processes can be supported by many different means. It is possible to create physical infrastructures, such as fast communication lines, for people who are innovative and creative so that they can transfer knowledge to right places at right times.

Another large-scale view to innovation processes is the study of the development of systemic innovations and innovation ecosystems (Geels 2004, Geels, Boelie and Green 2004, Hautamäki 2010). Systemic innovations are related to transitions of socio-technical systems. We have systemic innovations incorporated in many of the challenges that a modern society faces: in energy issues, transportation systems, health care systems, reforms in agriculture, waste systems etc. Systems could be developed by optimizing certain factors or by system innovations leading to new systems. As a result, systemic innovations are often described by jumps or transitions. Transitions could be large like a transition from a rural to an industrial society or more restricted like a transition from telegraph to telephone.

In our studies, our starting point is the thesis that innovation is thinking. So the issue is how the external and internal preconditions of innovation are related. One way to try to solve this problem is to make a distinction between invention and innovation. Thinking is, first of all, the creative base for inventions – that is to say, novelties. The framework of thinking is a niche or an innovation ecosystem. The pathway of novelties to markets is dependent on regime and landscape. They create the context of innovation (demand factor, users, norms, regulations). The context also has influence on this niche, creating pressures for an invention.

Undoubtedly, one of the main issues here arises from related argumentation and decision-making theories (Hamblin1998, Hastie 2010, van Eemeren, Grootendorst & Snoeck Henkemans 1996, Tversky and Kahneman 1974). There are numerous decisions taken and discourses going on at different levels of governmental institutions, from parliaments to local governments. They follow rational procedures in the world where we know that irrational practices are common (Giegerenzer and Selten 2001). Obviously, we have to study these issues in detail when dealing with microinnovation research.

V. Systems of Innovations

It is well-known that experimental thinking, which underlies modern innovation systems, was developed by Galileo. He studied how the variation of the length of a pendulum changes its movements. He presented a procedure which has been used since in academic research as well as in industry. Much less well-known is the fact that he copied his procedure from the Pythagoreans, who hundreds of years before had manipulated the length of a string to study the changes in the height of a tone. Indeed, Galileo directly cites the Pythagoreans' experiment.

Why did the idea of Galileo lead to a dramatic change and to the birth of a new industrial and economical culture when the outcome of the Pythagoreans' experiment was very modest in its time (Galilei 1954, p.p. 95- 103)? The natural answer is that Pythagoreans had no preconditions for an innovation system, which indeed was already present in late renaissance Italy. Similarly, Leonardo, despite his great ideas, did not yet have any innovation system, and thus his ideas were left unobserved.

The examples illustrate that thought without an innovation system does not flesh out to innovations. On the other hand, it is equally clear that without new thoughts and ideas, there will be no innovations. This is why it is essential to consider both innovation systems and innovative ideas. Without these systems innovation does not materialize, and without ideas systems are bound to remain empty. However, there are many different ways to conceptualize systems in innovations research.[10]

On one hand, systemic innovation means a cluster of innovations where many innovations are related and dependent on each other. In this sense also a technical device like a mobile phone presupposes a cluster of technical innovations (signal processing, batteries, displays, antenna etc.). Sometimes the phrase "parallel innovations" is used in the same sense. On the other hand, systemic innovations refer to changes or transformation in large operating systems, such as an energy production system or a railway system (see Elzen, Geels & Green 2004). New technologies incorporate ideas, and the process of systemic innovation is a process of combining ideas. These naturally involve thought processes, and in this way microinnovations are connected to systemic innovations.

However, there is another conception of system in innovations research. This is the idea of innovation system or innovation network and, especially, innovation ecosystem (Hautamäki 2010, Tuomi 2002). Innovation ecosystem is a local environment for innovation processes. It consists of different actors working together and communicating with each other. It provides a flow of ideas between individuals and institutions like universities, service providers, financers and large and smaller companies collaborating in an ecosystem. For our purpose here, innovation ecosystem is the context and enabler of innovative thinking. A larger, regional or national, concept of innovation ecosystem is an innovation system.

Innovation systems, when understood in a traditional manner as static institutions, are seldom relevant in microinnovations research. By system we refer here to a cluster of companies and to the associated parts of the system of firms. Typically, these can be research organizations, legal bodies, local trade and business associations and government agencies. As a whole, such elements can form effective networks and ecosystems for innovations. However, they have only marginal relevance to the contents of innovative thoughts and for their creation. Therefore, we cannot assume that there would be much common ground between these concepts and microinnovations.

However, the concept of innovation system can also refer to a flow of ideas between institutions (Saariluoma, Kannisto and Kujala 2008). Especially the flow of knowledge and knowledge creation between actively collaborating organizations or collaborative networks and teams can open up many important common ground points between microinnovation research and systemic innovation studies. In such cases, the social construction of knowledge easily rises to the fore (Berger and Luckman 1966).

System innovations are defined as large-scale transformations in the way societal functions such as transportation, communication, housing and feeding, are carried out. A system innovation can be understood as a change from one socio-technical system to another (Geels 2004). One aspect of a system innovation is technological substitution, which comprises three sub-processes: a) emergence of new technologies, b) diffusion of new technologies, c) replacement of old by a new technology. The second aspect is coevolution: system innovations not only involve technological substitutions, but also changes in elements such as user practices, regulation, industrial networks, infrastructure, and cultural meaning (Chesbrough 2003, v. Hippel 2005). The third aspect is the emergence of new functionalities: when radical innovations have particular technical properties, this may enable the articulation of new functional characteristics. (Geels 2004)

A typical example could be the flow of ideas and knowledge in open innovation systems (Chesbrough 2003). Linux community created vast operating systems by means of collaborative co-operation with no direct financial goals. Later on, of course, numerous important business ideas grew from this ecosystem of ideas. From microinnovation points of view, it is essential to study how the idea grew and what are the motivating forces behind. In open innovation, the innovation process is decentralized and distributed (Chesbrough 2003, Hautamäki 2010). It is interesting to study how microinnovation process takes place in a distributed mode of innovation. At least, we have to understand the flow of knowledge between "thinkers".

Thus, communication is a central mode in microinnovation.

The general conclusion concerning the relations of innovation systems and systemic innovations to microinnovations originates from the fact that systems are in a constant change information wise. This information entails thoughts which are combined with each other by active human thinking. This means that systems actually emerge from thinking, to support thinking in innovation processes. Therefore, we have to investigate the nature of discourse and thinking in relation to the flow of information between the systems.

VI. Organizational Innovation Management

The importance of thinking in innovation management has indirectly been known for a long time. Nonaka and Takeuchi (1995) already argued that Japanese companies had got to their position because they were more able to create knowledge than their Western rivals. Here we must keep in mind that creating knowledge is nothing but thinking. Thinking is the psychological process which creates all new knowledge we have. This is why understanding thinking is so vital in managing innovations.

Another close idea is creativity. Von Stamm (2008), for example, writes: "Creativity is the beginning of innovation". She uses the word creative here in everyday sense, but equally well one could write: "Thinking is the enigma of innovation". This means that innovation essentially refers to creating new, often unexpected, mental representations and respectively turning these new thoughts, ideas or plans into real products. Even from this point of view, thinking is an important but barely researched ground for innovation research.

The relations of the two important psychological concepts "creativity" and "thinking" are problematic and there is a lot of confusion about how to use them intuitively. The main point of this difficulty is historical. Creativity is an external sign or measure for thinking, but it does not really refer to the mental process of thinking. The notion of creativity became important and popular in the Fifties, which was the period of behaviorism. In that period, psychologists did not pay much attention to internal, mental or cognitive processes. Therefore, creativity was used synonymously with thinking, but this is fatal error, as it easily omits the internal research process. This means that we do not consider what happens in the minds of thinking people: what the preconditions for good thinking, such as skill and expertise, are, and what the laws of the contents of thoughts are.

The connection of new and thinking is evident and its relations to creating knowledge and creativity obvious, but still it is surprising how little work in

innovation management research has been done to investigate innovation as a thought process. There are important studies connecting thinking and design (Gero 2003, Saariluoma 2003, Saariluoma, Nevala and Karvinen 2006), but one can hardly find research on innovation and thinking. This is why it is essential to call attention to the microinnovation processes.

In practice, microinnovation processes within an organization are vital as they enable innovation managers to reach more concrete ideas about how to direct the flow of innovative thought processes. Innovation management needs not only concern products; it can also work on organizational thought processes (Amabile, Hadley and Kramer 2003). Understanding microinnovation processes is one of the first steps towards a more comprehensive innovation management.

VII. Microinnovations Research – new Ways of Looking Innovations

We have outlined here some of the main features of new ways to look at innovations. This is based on the idea that innovations always depend on how individuals think. Even the most complicated ideas are nothing but organized collections of ideas individuals have thought one at the time. Thought is thus the "atomic" or" molecular" structure of big innovations. For this reason alone, it is essential to consider innovations as human thinking and not only as social or organizational processes. Addressing only those higher levels simply ignores human thinking and its preconditions.

Innovations are systems of thoughts. This means that there are information contents, which have integrated into each other into sense making systems. We do not always fully understand why some ideas work and what we should do to get them to work. The task of microinnovation research is to consider how these ideas are integrated into wholes, what the preconditions of such processes are, and how we could improve the thinking conditions for innovating people.

Microinnovation research is not independent of the research on the higher societal and management levels. On the contrary, microinnovation research should be able to explain why some interventions on these higher levels make sense or why they are not rational. However, it would be a mistake to think that social or organizational innovation phenomena could exhaustively explain what happens in the minds of innovating people.

Human thinking depends on many external factors such as obtaining knowledge or building social relations. These factors can be influenced by organizational means, but the external conditions do not explain all of human thinking. It is also essential to investigate internal conditions of human thinking. These concern such issues as emotional states, skills, motivation and exhaustion. These factors must be thought in their individual terms mostly, and this is why we have to consider innovations also from the microinnovation point of view.

When we look at innovation as thinking, we can also ask, in a meaningful manner, what its preconditions are. We know quite a lot about human thinking, and we can learn more about the nature of innovations. In particular, we can learn about the internally significant preconditions, which is not open for externalist innovation research as it closes out innovation as a mental process and thinking.

To think, we first need information. Thinking is organizing innovation. It has, of course, its emotional and motivational aspects, but we leave them out here to concentrate on the main thing. Thinking creates new information. People get information and they process it in their thoughts to bring about new information. Before Pasteur, we had no idea about the connection between microbes and some illnesses, but after his work the situation changed. Nevertheless, it was possible for him to do his life work, Leeuwenhoek having done his so that Pasteur could get the information he needed.

Information is often important for innovations, but problems in getting information may have serious consequences. The problems with information in innovative thinking may be due to the absence of information, poor relations between people in the organization, poor communication, low competences or simply lack of information services in organization. 13

Innovations may be affected also by many dangerous and illusory ways of thinking. Illusions due to vividness or illusory thought models may act as an induction bias. Vivid information tends to look more probable than it actually is and act as an induction bias in generalizing from the past to the future (Tversky and Kahnemann 1974). From the fact that Napoleon so far had beaten all the enemy armies did not follow that he could also do the same with the Russian army. The circumstances can always change for some reason and then the old truths will be far from realistic.

The spread of innovative thinking may also be too hasty or follow too strict time tables, which leads to most routine thinking and errors (Saariluoma 2002). Haste may get people to forget something and apply a tunnel vision to the problems to solve. It may also lead to problems in checking all the necessary things. Innovative thinking may also be disturbed by poor social climate at work (Amabile 1999). It may be that people do not like to work together or they cannot find common important goals. The formation of inner and outer circles and other possible things which can lead to a bad work climate may be problematic for the innovation process. It has its consequences for the vital information flow as well as for emotional enthusiasm.

There can be even much simpler reasons for failures. Lee Iacocca (198x) tells in his famous autobiography how a worker used a lot of time for an invention which did not work. The invention would not work because it was impossible to construct it. The ultimate reason behind all this was that no-one had asked the mechanics whether it would be possible to realize this idea as departments did not really communicate with each other. Communication is the lifeline of innovation.

The examples show that there are numerous preconditions for innovative thinking. It would be unrealistic to think people as capable for successful innovative thinking unless they analyzed carefully the preconditions for it. The analysis of preconditions is one important issue in our research to innovations. This is why microinnovations are important (Saariluoma and Kannisto 2008).

To investigate closer the position of microinnovations in innovative processes, it is reasonable to consider in detail two important aspects of innovation processes and their connections to microinnovations. These two aspects are product development and systemic innovations. The first one represents the major management process and the latter the social dimension of innovations. The key problem to consider is how human thought processes are involved in these innovation processes.

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Maintenance Modification Algorithms and its Implementation on object oriented data warehouse

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Abstracts - A data warehouse (DW) is a database used for reporting Paper describes Modification Algorithm and implementation on Object Oriented Data Warehousing. A Data Warehouse collects information and data from source data bases to support analytical processing of decision support functions and acts as an information provider. In initial research data warehouses focused on relational data model. In this paper concept of object oriented data warehouse is introduced modification maintenance algorithms and its implementation to maintained consistency between data warehouse and source data base.

Keywords : Data warehousing, object oriented database, instance, maintenance .

GJCST Classification : H.2.7, H.2.8

MAINTENANCE MODIFICATION ALGORITHMS AND ITS IMPLEMENTATION ON OBJECT ORIENTED DATA WAREHOUSE

Strictly as per the compliance and regulations of:

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Dr. Mrs Pushpa Suri[α] , Mrs. Meenakshi Sharma[Ω]

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I. INTRODUCTION

The concept of data warehousing was first proposed by Inmon (Inmon and Kelley,1993). A data warehouse is a repository of subjectively selected and adapted operational data which can successfully answer any ad hoc, statistical, complex or analytical queries. Data warehousing technology is becoming essential for effective business intelligence, business strategy formulation and implementation in a globally competitive environment where in larger and larger amounts of data are required to be processed faster and faster for comprehension of its real meaning and impact. The term Data Warehouse was coined by Bill Inmon in 1990, which he defined in the following way: "A warehouse is a subject-oriented, integrated, time-variant and non-volatile collection of data in support of management's decision making process". Data that gives information about a particular subject instead of about a company's ongoing operations. It is integrated as data that is gathered into the data warehouse from a variety of sources and merged into a coherent whole.

Data warehouse system is time variant as all data in the data warehouse is identified with a particular time period. Data is stable in a data warehouse. More data is added but data is never removed. This enables management to gain a consistent picture of the business. (Source: "What is a Data Warehouse?" W.H. Inmon, Prism, Volume 1, Number 1, 1995). A single-subject data warehouse is typically referred to as a data mart, while data warehouses are generally enterprise in scope. Also, data warehouses can be volatile. Due to the large amount of storage required for a data warehouse, (multi-terabyte data warehouses are not uncommon), only a certain number of periods of history are kept in the warehouse. For instance, if three years of data are decided on and loaded into the warehouse, every month the oldest month will be "rolled off" the database, and the newest month added. Data warehouse contains information that is being collected from different sources and integrated into a common repository for efficient query and analysis. When the data sources are disturbed over a different location then a DW has the responsibility to collect the necessary data and save it in appropriate form. In this paper some research topics are mentioned as Maintenance [11] [12] [13] [15] [17][20] [21], consistency[6],[26],[27].

In this paper is organized as follows. The concept of object oriented data warehousing. Formal definition of class instance and object oriented data warehousing. Maintenance modification algorithms for consistency between the object oriented data warehouse. Examples are also given there to illustrate the proposed algorithms and its implementation in oracle 10g.

II. OBJECT ORIENTED DATA WAREHOUSING

In an object oriented database, each employee or class is associated with unique identifier, a set of attributes and a set of procedures. There could be no. of data types such as atomic or any other class. Object Oriented Data warehousing, like other areas of Information Technology, is a field in the midst of change. The current systems integration approach is associated with the objective of creating a centralized operational data store and Decision Support System read-only server-based application [3]. To meet this objective, it is necessary to extract, transform, and transport data from

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25

isolated islands of information to such centralized repositories, and then to retrieve information efficiently and effectively through query and reporting tools. To perform multidimensional analysis, and to meet performance criteria, special methods and tools associated with On-Line Analytical Processing are employed. Multidimensional client, multidimensional server (Multidimensional Online Analytical Processing or Multidimensional Data Online Analytical Processing), Relational Online Analytical servers, and most recently, Vertical Technology servers, are used to help performance in the query and reporting process. Object Oriented Data Warehouse approaches are better at specifying user requirements than Systems Integration ones. In particular, systems integration approaches seem to move from process identification to data modeling without specifying the details of the identified processes. They do not employ Use Case specification and analysis to get at requirements, while this is a central aspect of Object Oriented Data Warehouse .The fourth class of specific reasons for an Object Oriented Data Warehouse approach to data warehousing is conceptual consistency with the various components of a data warehousing solution. The tools used to arrive at these solutions are increasingly object-oriented. For example, data extraction, transformation and transportation (ETT), tools from Sagent, Informatica, Carleton, ETI, VMARK and others strongly reflect the conceptual outlook of object technology. In the object oriented Data warehousing we used the classes and instances. An object type is a description of a set of object sharing the same attributes operations and relationships. Classes are implementation of types in software. So, objects are instances of classes as well as one of the types.

III.   Notation And Definition

In an object oriented data base system, we have defined certain definitions for various employees or classes. The classes can be organized according to their hierarchy. Let ID be a set of identities, A be set of attribute names be a set of data types allowed for A,TW be a set of atomic data types be a set of values and M be a set of processing methods. A set of employees in an object oriented database can be defines as follows:

a) Definition (Class)

A class is used to create new instances (objects) by instantiating the class. A class usually represents a noun, such as a person, place or (possibly quite abstract) thing - it is a model of a concept within a computer program. Fundamentally, it encapsulates the state and behavior of the concept it represents. It encapsulates state through data placeholders called attributes (or member variables or instance variables); it encapsulates behavior through reusable sections of code called methods.[**source : Molina G H (1995)**].

A class c is a quadruple {cid, ca, ct, cm} where cid ε ID, ca = < ca1, …… can> with cai ∈ A   and i= 1 to n, ct = < ct1, …… ctn > with ctj ε T and j=1 to n, and cm ⊆ M.

ID: Collection of identifies (Name) of classes
A: Collection of attributes of classes of collection ID
T: Collection of type of attributes of collection A
M: Collection of methods of classes of collection ID

Example 1 : In this example four classes, **EMPLOYEE, NAME, OFFICE**, and **DEPT** are taken. The class **EMPLOYEE** has four attributes, **EmployeeID, EmployeeName, EmployeeDept, EmployeeTitle** and one method **Counter().** In this example attribute EmployeeID is a character type, the attribute **EmployeeName, EmployeeDept** and **EmployeeTitle** is a character type. In the graph shown in figure 2 circles with shadow represents classes and circle represent in instance.

1. Class **NAME** {
First char(20), Middle char(20), Last char(20)}
2. Class **OFFICE** {
State char(20), City char(20))}
3. Class **DEPT**{
DeptId char(3), DeptName char(40), DeptOffice Office , counter() int}
4. Class **EMPLOYEE** {

EmployeeID char(20), EmployeeName Name, EmployeeDept   Dept, EmployeeTitle   char(10), Counter()int}

For the class Employee in this example, cid= Employee, ca= {EmployeeID, EmployeeName, EmployeeDept, EmployeeTitle }, ct= {char, Name, Deptart), and cm= {Counter()}, Let C be the set of classes defined in source database. C= { c1,c2,…….cn} where c_i is a class, $1 \le i \le n$.

Figure 1 : An example 1 of classes
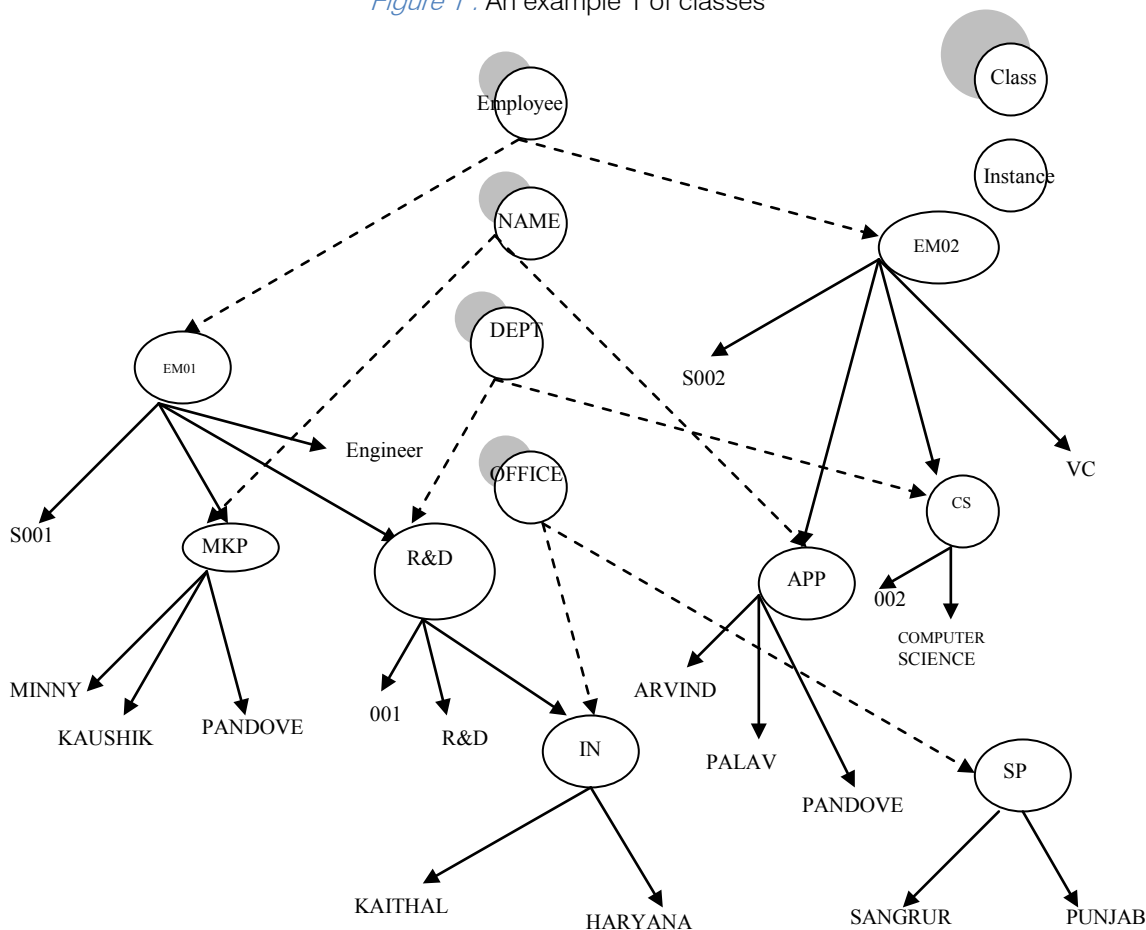
Figure 2 : Graphical representation of Classes

b) Definition (Instance)

An instance t ={tid, ta, tv,tm}is created and inherits from a certain class cid={cid, ca, ct, cm} such that tid $\in$ ID, ta= ca tv= <tv$_{1,}$ tv$_{2,........}$ tv$_{n}$> with tv$_i \in$ U and tv$_i$ being of type ct$_i$ for i=1 to n, and tm= cm.

Example 2 : For the example in Figure 2, assume that two instances are created by and referring to class *Dept.* One is called *R&D* with attribute values (001, R&D) the other is called *CS with* attribute values (002, Computer Science). Similarly, assume that two instances, *A1* and *B1* respectively, with attribute values (001, R&D) and (002, CS) are created by referring to the class Dept. Assume that two instances, *MKP* and *APP* respectively, with attribute values (MINNY, KAUSHIK, PANDOVE) and (ARVIND, PALAV, PANDOVE) are created by referring to the class *Name.* Also assume that two instances, *EM01* and *EM02* respectively, with attribute values (S001, MKP, AI) and (S002, APP, BI) are created by referring to the class *Employee.*

c) Definition (Data warehouse)

An object-oriented data warehouse W is a triple {V, VC, I}, where V is the set of view definitions, VC is a set of classes and I is the set of instances generated from the source database according to VC and V. Below, modification maintenance algorithms are proposed to maintain the consistency between an object-oriented data warehouse and its underlying source databases. They are instance insertion, instance modification alters, and instance modification update.

IV. INSTANCE INSERTION

We have a source database, a new instance Iid is inserted into a source database. A new Msg known as transaction Msg is formed and sent from the data collector to the data warehouse for the view maintance. The proposed syntax of the transaction Msg for instance insertion as follow : MID, insert, Iid, Cid

In this Msg identifier of this transaction which is formatted automatically by data collector. Insert is denote type of Msg. Iid identifier the new instance which is inserted in a database and Cid class identifier form which this instance is inherits.

The algorithm of maintenance for instance insertion

Input : - A Data Warehouse W(V,VC, I) and an instance

lid of the class Cid is inserted into the source database.

Output : - A modified Data warehouse W' (V, VC, I')

Step1 : A source receives an instance insertion truncation Message, which is formed and sent from the data collector to the data warehouse.

Step2 : Make the view definition to find the definition which refers to the class Cid in the From Part. View found is denoted by V$_A$.

Step3 : If A is empty, set W'= W and exit the algo otherwise go to the next step.

Step4 : After application of select, where operations deduce all the attributes from the view named V$_A$ and denotes it by V$_B$.

Step5 : Request the data collector to collect the contents of V$_B$ and instance lid or alternatively from its subsequent descending instances.

Step6 : Acknowledge the contents of V$_B$ from the data collector.

Step7 : If contents of V$_B$ received and satisfy the conditions of view v in A. Create a new instance according to the class of the view otherwise do nothing.

Step8 : After step 7, new necessary instances are created and inserted into the Data warehouse. Data warehouse now modified by. **W' (V, VC, I')**

V.   Instance Modification Alter

When the attribute values of an instance tid in the source database are changed, a transaction Message is sent from the data collector to the data warehouse for view maintenance. In algorithm W is warehouse, V is View, C is the Class and I is Instance. The format of a transaction message for modifying an instance is proposed as follows:

MsgID, Alter, tid, cid,
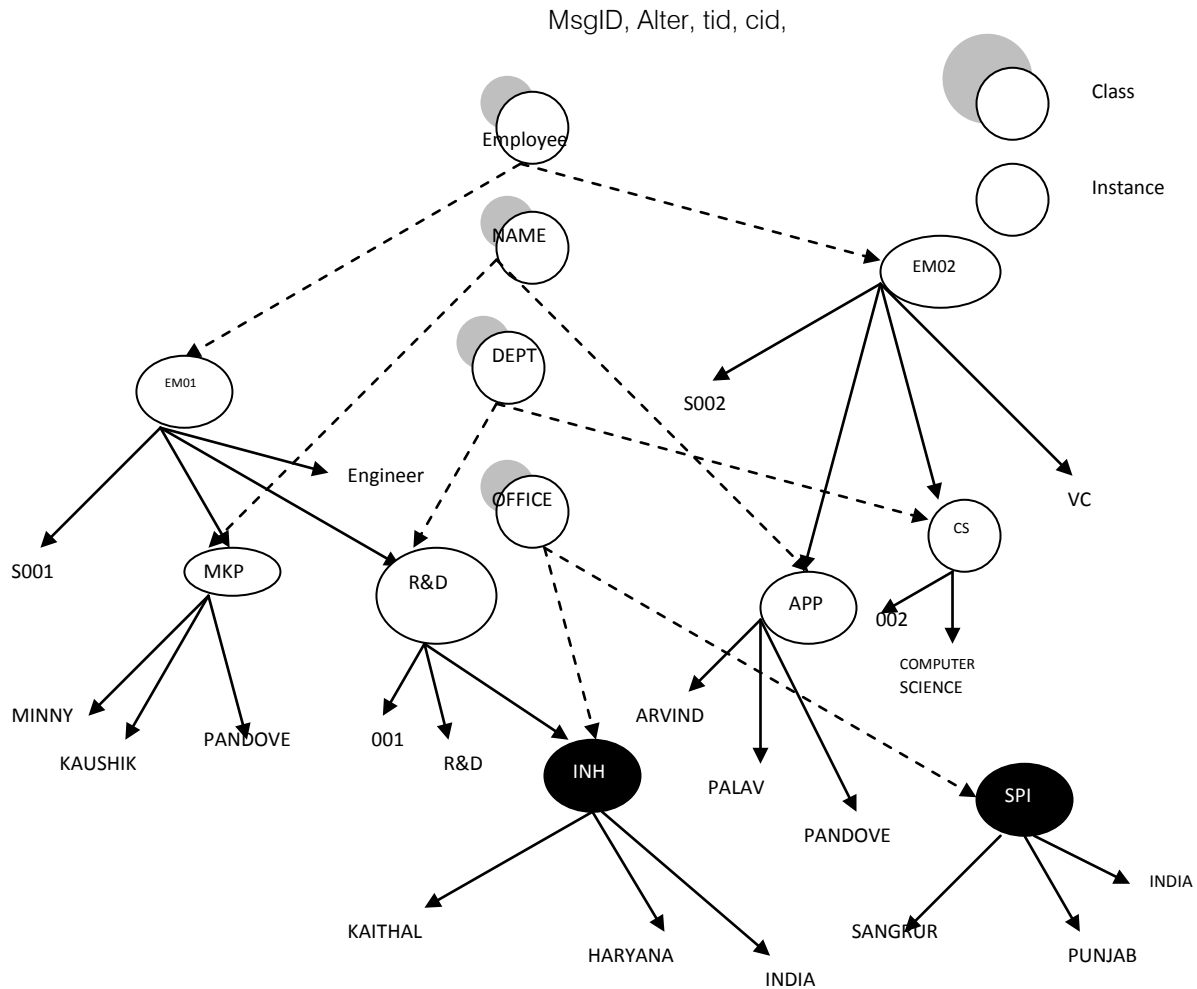
Figure 3 : The Graphical Representation of Instance Modification Alter for example 3

(From Figure 2 to Figure 3)

Where ui denotes the i-th attribute add to be alter and vi denotes the new attribute. Example3, assume that the attribute office in instance IN is alter from IN to INH. The data collector will detect it and send a transaction message (001, alter, office, R&D, {(office country)}) to the warehouse. The maintenance algorithm for processing the above instance modification alters is proposed as follows:

The maintenance algorithm for instance modification

Alter:

Input: Data warehouse W(C, V, I) and modified alter instance tid of class cid.

Output: A revised data warehouse W' (C, V, I')

Step1: An Instance of modified alter message is received from the data collector.

Step2: Search the data warehouse W for instance tid: If instance tid exits in W exist algorithm otherwise Go to the step No.3 and set W'=W

Step3: For the instance tid in warehouse alter its attribute according to the transaction message.

Step4: If the instance tid satisfies the condition of at least one view which refer to class cid, then keep the instance tid in I of the warehouse W otherwise remove tid from I in the warehouse W

The attribute of instance tid have been modified alter add in the data warehouse after the Step no.4.

Example 3 : Assume that the attribute of an instance have been added in the source database and the transaction Msg is formed as Alter type office add attribute (country char(20))cascade. This message is processed by the instance modified alter algorithm as follow:

Step1: Receive the transaction message alter type office add attribute (country char(20)) cascade from the data collector.

Step2: Since the instance A1 exists in the warehouse W then stop.

Step3: Alter the attribute country of the class office.

Step4: If A1 satisfies the condition of view country office it is kept in W.

VI. INSTANCE MODIFICATION UPDATE

When the attribute values of an instance tid in the source database are changed, a transaction message is sent from the data collector to the data warehouse for view maintenance. The format of a transaction message for modifying an instance is proposed as follows:
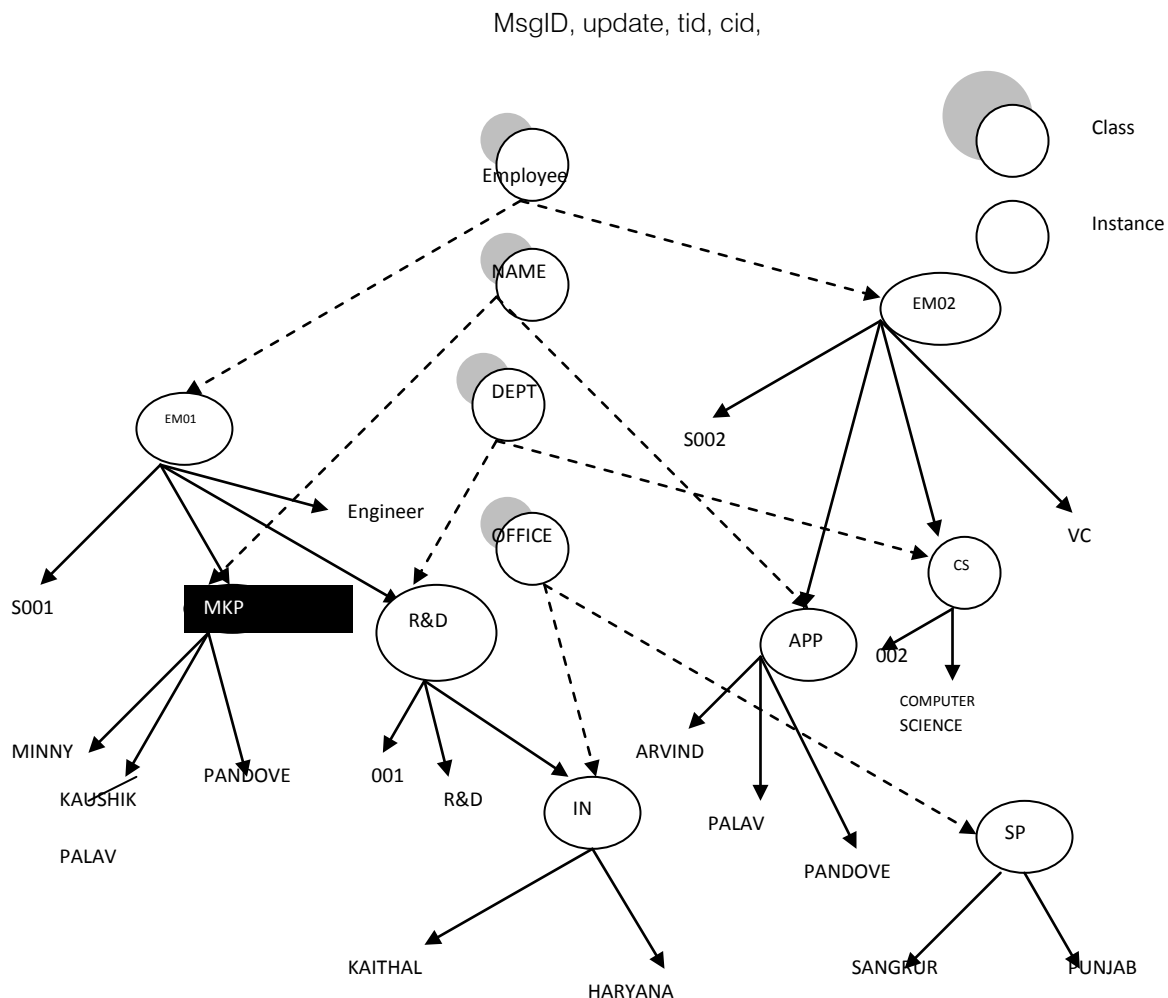
MsgID, update, tid, cid,

Figure 4 : The Graphical Representation of Instance Modification update for Example 4
(From 2 to Figure4)

where ui denotes the i-th attribute name to be updated and vi denotes the new value of ui. For example, assume that the value of attribute name in instance MKP is changed from KAUSHIK to PALAV. The data collector will detect it and send a transaction message (S001, update, NAME, MKP, {(MKP PALAV)}) to the warehouse. The view -maintenance algorithm for processing the above instance-modification transaction message is proposed as follows.

The maintenance algorithm for instance modification update:

Input : data warehouse W (C, V, I) and a modified instance tid of class cid.

Output : A revised data warehouse W' (C, V, I').

Step1. Receive an instance-modification transaction message which is formed from the data collector.

Step2. Search the data warehouse W for instances tid; If instance tid exists in W, do the next step; Otherwise, set W' = W and exit the algorithm.

Step3. For the instance tid in the warehouse, change its attribute values according to the transaction message.

Step4. Check whether the instance tid satisfies the conditions of the views V which refer to the class cid; If the instance satisfies the condition of at least one view, keep instance tid in I of the warehouse W; Otherwise, remove tid from I in the warehouse W. After Step 4, the attribute values of instance tid have been modified in the data warehouse. An example is given below to demonstrate the instance -modification algorithm.

Example4, Continuing Example 3, assume that the attribute values of an instance have been modified in the source database, and the transaction message is formed as (S001, update, Name, MKP, {(NAME PALAV)}). This message is processed by the instance -modification algorithm as follows.

Step1. Receive the transaction message (S001, update, NAME, MKP, {(NAME PALAV)}) from the data collector.

Step 2. Since the instance A1 exists in the warehouse W, the algorithm executes Step 3.

Step 3. Change the value of attribute NAME of the instance MKP from KAUSHIK to PALAV.

Step 4. Since A1 satisfies the condition of the view MKP Employee, it is kept in W.

The graphical representation of the warehouse after the attribute value of instance A1 has been changed is shown in Figure 4.

VII.   Implementation

Oracle has Object oriented capabilities. This example demonstrates how to
- create a type
- derive a new type from it

- and how to store instance of this type in a table

SQL> Create type name as object (
first char(20),
middle char(20),
last char(20)
);
/
SQL> Create type office as object (
State char(30),
city char(30)
);
/
SQL> Create type dept as object (
deptid char(30),
deptname char(40),
deptoffice office,
counter int
);
/
SQL> Create type employee as object (
EmpID char(20),
EmpName name,
Empdept dept,
Emptitle char(10),
counter int
);
SQL> Create table emp of employee;
SQL>insert into emp values (employee ('EM01', name('minny, 'kaushik', 'pandove'),
dept ('s001', 'R&D','kaithal',' Haryana', 'Engineering'));
SQL> Alter type office add attribute (country char(20)) cascade
SQL> Update type name set middle ='palav' where employeeid='EM01'

VIII.   Conclusion

The research of object oriented data warehousing is current topic so, there are many important issues which are yet to be explored. For online processing modification maintenance in object oriented data warehousing is very important. Modification maintenance of the data warehouse is very important to accuracy of the on-line analytical processing. In this paper, we have discussed the concept of object oriented data warehouse and modification maintenance algorithms to maintain the consistency between the data warehousing and the source databases. They are instance insertion, instance modification alters and instance modification update. Although the proposed algorithms can be used to make object oriented data warehousing practical.

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32

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Image Fusion Algorithm for Impulse Noise Reduction in Digital Images

By M.Jaya Manmadha Rao, Dr.K.V.V.S.Reddy

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Abstracts - This paper introduces the concept of image fusion technique for impulse noise reduction in digital images. Image fusion is the process of combining two or more images into a single image while retaining the important features of each image. Multiple image fusion is an important technique used in military, remote sensing and medical applications. The images captured by different sensors undergo filtering using pixel restoration median filter and the filtered images are fused into a single image, which combines the uncorrupted pixels from each one of the filtered image The fusion algorithm is based on selecting the sharper regions from the individual de-noised images. The performance evaluation of the fusion algorithm is evaluated using structural similarity index (SSIM) between original and fused image. Experimental results show that this fusion algorithm produce a high quality image compared to individually de-noised images.

Keywords : Image Fusion, Image Restoration, Image Processing, Impulse Noise.

GJCST Classification : I.4.3

IMAGE FUSION ALGORITHM FOR IMPULSE NOISE REDUCTION IN DIGITAL IMAGES

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Image Fusion Algorithm for Impulse Noise Reduction in Digital Images

M. Jaya Manmadha Rao[α], Dr.K.V.V.S.Reddy[Ω]

Abstract- This paper introduces the concept of image fusion technique for impulse noise reduction in digital images. Image fusion is the process of combining two or more images into a single image while retaining the important features of each image. Multiple image fusion is an important technique used in military, remote sensing and medical applications. The images captured by different sensors undergo filtering using pixel restoration median filter and the filtered images are fused into a single image, which combines the uncorrupted pixels from each one of the filtered image The fusion algorithm is based on selecting the sharper regions from the individual de-noised images. The performance evaluation of the fusion algorithm is evaluated using structural similarity index (SSIM) between original and fused image. Experimental results show that this fusion algorithm produce a high quality image compared to individually de-noised images.

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I. Introduction

Digital images are often corrupted during acquisition, transmission or due to faulty memory locations in hardware [1]. The impulse noise can be caused by a camera due to the faulty nature of the sensor or during transmission of coded images in a noisy communication channel [2]. Consequently, some pixel intensities are altered while others remain noise free. The noise density (severity of the noise) varies depending on various factors namely reflective surfaces, atmospheric variations, noisy communication channels and so on.

In most image processing applications the images captured by different sensors are combined into a single image, which retains the important features of the images from the individual sensors, this process is known as image fusion[3][4]. In this paper, the images captured by multiple sensors are differently noised depending on the proximity to the object, environmental disturbances and sensor features. These noise images are filtered using pixel restoration median filter and the filtered images are fused into a single image based on the sharpness of the regions from the de-noised images, thus producing a high quality image. The entire process of our technique is shown in figure 1. The performance evaluation of the image fusion is evaluated using SSIM [7] index between the original and fused image.

This paper is organized as follows: Section II present the impulse noise in images, Section III present the method for noise density calculation in an image, Section IV present the pixel restoration median filter Section V present the image fusion algorithm, Section VI present experimental results and finally Section VII reports conclusion.
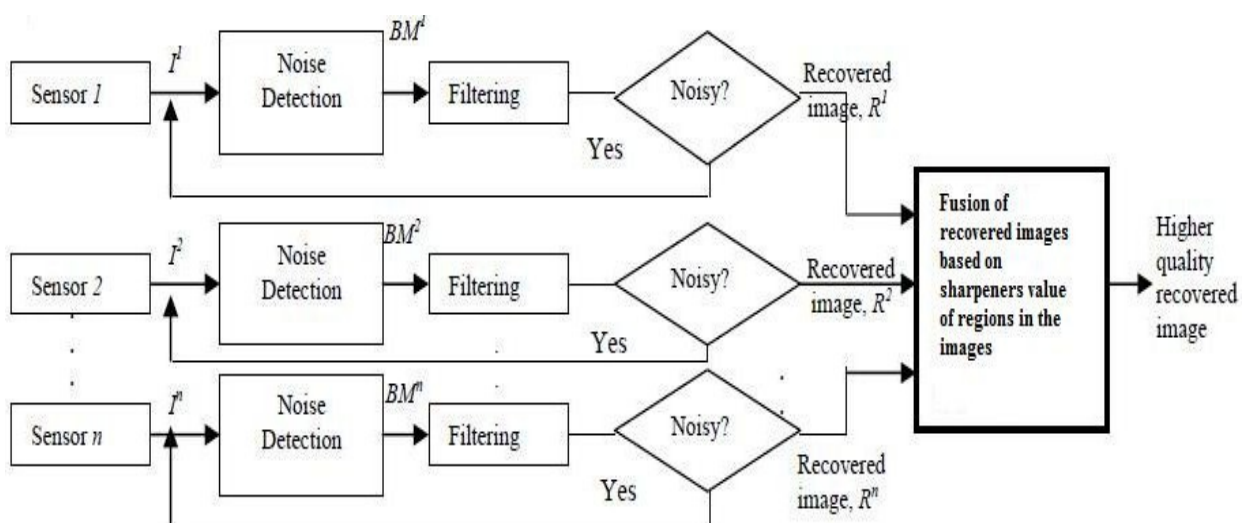

Figure 1: Image Fusion Technique

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II. IMPULSE NOISE IN IMAGES

Impulse noise [5] corruption is very common in digital images. Impulse noise is always independent and uncorrelated to the image pixels and is randomly distributed over the image. Hence unlike Gaussian noise, for an impulse noise corrupted image all the image pixels are not noisy, a number of image pixels will be noisy and the rest of pixels will be noise free. There are different types of impulse noise namely *salt and pepper* type of noise and random valued impulse noise.

In *salt and pepper* type of noise the noisy pixels takes either salt value (gray level -225) or pepper value (gray level -0) and it appears as black and white spots on the images. If p is the total noise density then salt noise and pepper noise will have a noise density of $p/2$. This can be mathematically represented by (1)

$$y_{ij} = \begin{cases} \text{zero or 255 with probability } p \\ x_{ij} \text{ with probability } 1-p \end{cases} \qquad (1)$$

Where y_{ij} represents the noisy image pixel, p is the total noise density of impulse noise and x_{ij} is the uncorrupted image pixel. At times the *salt noise and pepper* noise may have different noise densities p_1 and p_2 and the total noise density will be $p = p_1 + p_2$.

In case of random valued impulse noise, noise can take any gray level value from zero to 225. In this case also noise is randomly distributed over the entire image and probability of occurrence of any gray level value as noise will be same. We can mathematically represent random valued impulse noise as in (2).

$$y_{ij} = \begin{cases} n_{ij} \text{ with probability } p \\ x_{ij} \text{ with probability } 1-p \end{cases} \qquad (2)$$

where n_{ij} is the gray level value of the noisy pixel.

III. NOISE DENSITY CALCULATION

Algorithm:

1. Let I be the noisy image of size *NXN* of an object or scene captured by sensor.
2. The noise boundaries of noisy image I are computed by spike detection technique [6]. Let L_1 and L_2 be the lower and upper noise boundaries for the noisy image.
3. The binary map (*BM*) of the noisy image is developed using the noise boundaries L_1 and L_2. If the image pixel 'y' lies within the noise boundaries, then it is uncorrupted and represented by a '0' in the binary map. The corrupted pixel is represented by a '1' in binary map.

$$BM = \begin{cases} \text{`0' if } L_1 < y < L_2 \\ \text{`1' if } y < L_1 \text{ or } y > L_2 \end{cases} \qquad (3)$$

4. Compute the noise density ND of the noisy image.

$$ND = \frac{\text{sum of '1's in BM}}{N*N} \qquad (4)$$

The value of *ND* ranges from 0 to 1.

IV. PIXEL RESTORATION MEDIAN FILTER

Image X and Binary Map of the image *BM* are inputs to the PRMF algorithm[6].

[1] Let pixel x_{ij} and corresponding b_{ij} are selected from image X and binary map *BM* respectively, where $i=2……(n-1)$ and $j=2…..(n-1)$ for an image of size *nxn*. If $b_{ij} = $ '0', then pixel x_{ij} is 'uncorrupted'. Hence go to step [5].

[2] Select a *3x3* window W_x in X and W_b in *BM* centered around $(i,j)^{th}$ pixel x_{ij} in X and b_{ij} in *BM* respectively.

[3] Check for '0's (uncorrupted pixels) in W_b and store corresponding elements of W_x in vector A.

[4] If A is a null vector go to step V. Else replace x_{ij} with median of vector A.
$x_{ij} = median(A)$.   (5)

[5] Increment i, j and consider next x_{ij}, b_{ij} and go to step [2].

By using this algorithm iteratively along with updated binary map of the recovered image, noise fades from the noisy image.

V. IMAGE FUSION ALGORITHM

[1] Let $I^1, I^2, ..., I^n$ be the noisy images of an object or scene captured by sensors $S^1, S^2, ..., S^n$ respectively. Let I be of size *NXN* where $i = 1,2,…,n$. Iteration index $k^i = 1$.

[2] Compute the noise densities of the images I^i. Noise densities are computed for the iteration count $k^i = 1$. If $K^i = 1$ compute ND^i

[3] Filter the noisy images using pixel restoration median filter. The filtered images are denoted as R^i shown in figure 1.

[4] Check for the noise in the processed images. If the images are still noisy, then increment the iteration index k^i, $k^i = k^i + 1$ and goto step [2].

[5] The recovered images R^i for $i=1,2,..,n$ are divided into non-overlapping rectangular blocks (or regions) with size of *mxn (10x10 blocks)*. The jth image blocks of R^i are referred by R^i_j

[6] Variance (*VAR*) of R^i_j is calculated for determining the sharpness values of the corresponding blocks and the results of R^i_j are denoted by VAR^i_j. VAR is defined as:

$$VAR = \frac{1}{m \times n} \sum_x \sum_y (f(x,y) - \overline{f}) \qquad (6)$$

Where $\overline{f}$ is the average grey level over the image.

$$\overline{f} = \frac{1}{m \times n} \sum_x \sum_y f(x,y) \qquad (7)$$

In order to determine the sharper image block, the variances of image blocks from n recovered images are sorted in descending order and the same ordering is associated with image blocks. The block with the maximum variance is kept in the fused image. The fusion mechanism is represented as follows:

If $VAR_{(k)}$ is the variance of block R_j, where k denotes the rank, the ordering of variances is given by

$$VAR_{(1)} > VAR_{(2)} > \ldots\ldots > VAR_{(n-1)} > VAR_{(n)} \qquad (8)$$

and this implies the same ordering to the corresponding blocks

$$R_{(1)} > R_{(2)} > \ldots > R_{(n\_1)} > R_{(n)} \qquad (9)$$

Where the subscripts are the ranks of the image blocks. Since the block with the largest variance is in the fused image, it will correspond to rank 1 of the ordered blocks ie;

$$Fused\ Block = R_{(1)} \qquad (10)$$

VI. EXPERIMENTAL RESULTS

The proposed method of image fusion for impulse noise reduction in images was tested on the true color parrot image with 290x290 pixels. The impulse noise is added into the image with noise density 0.45, 0.5, 0.6. The noisy images are processed using pixel restoration median filter individually. The filtered images are fused into a single image using the Image fusion method. The experimental results are shown in Figure 2. Table (1) shows the SSIM value of fused image with different noise densities of input images with respect to original image.

a) Original Image

b) Image with ND =0.45

c) Image with ND=0.5

d) Image with ND=0.6

e) Fused image , ND reduced to 0.12
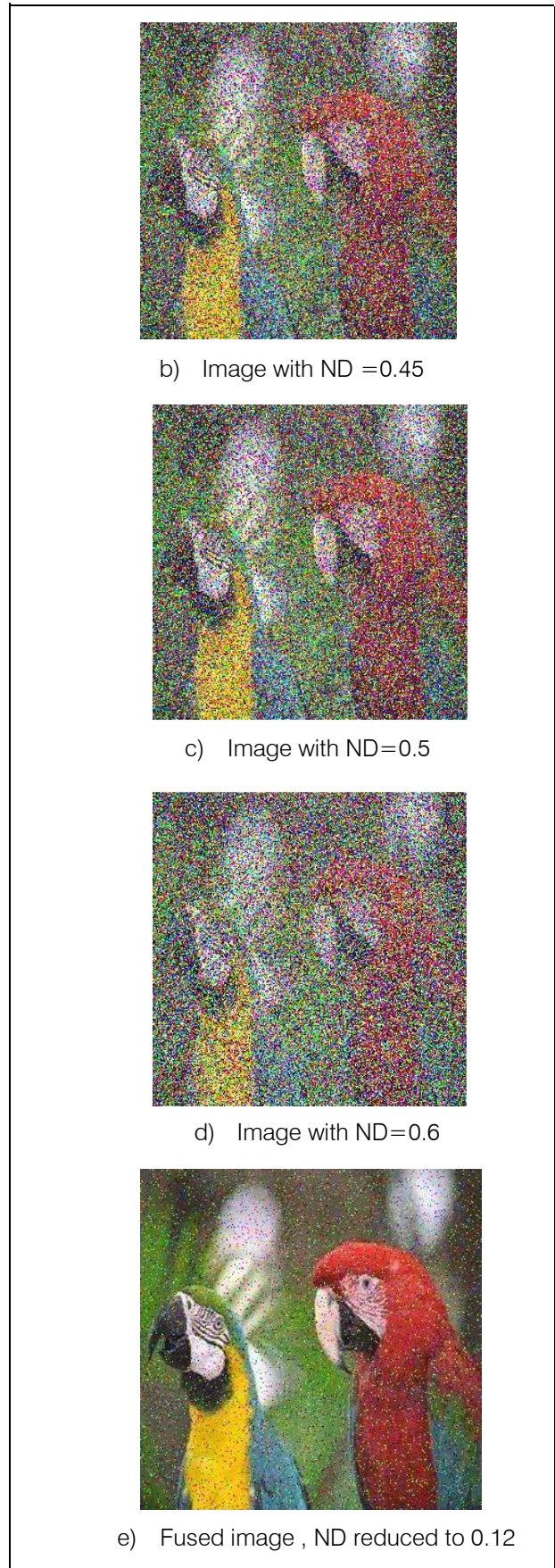
Figure 2 : Illustration of Proposed Technique

Table 1: Performance evaluation of Image Fusion using SSIM index with different ND's

Noise densities of 3 input images			SSIM value of fused image with respect to original image
0.2	0.35	0.4	0.8436
0.3	0.4	0.5	0.7342
0.5	0.6	0.7	0.5743
0.6	0.7	0.8	0.4468

VII. Conclusion

In this paper, an image fusion technique for impulse noise reduction in digital images is presented. The proposed technique helps to attain high quality images. Images of an object or scene, captured by multiple sensors undergo filtering using pixel restoration median filter individually and these de-noised images are fused by the proposed technique. The proposed method is simple and can be used for real-time imaging applications.

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Cloud Computing in Digital and University Libraries

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Abstracts -   Libraries may soon be building and managing their own data centers. This model would let libraries maintain more control over the applications and data stores that contain sensitive, private information about patrons. Provisioning and maintenance of infrastructure for Web based digital library present several challenges. In this paper we discuss problems faced with digital library and development efforts to overcome that problem. Infrastructure virtualization and cloud computing are particularly attractive choices which is challenged by both growth in the size of the indexed document collection, new features and most prominently usage. With the purpose of applying Cloud Computing to university library, the paper describes the current status of user service models in university libraries. Then it proposed to improve current user service model with Cloud Computing. This paper explores some of the security issues surrounding data location, mobility and availability.

GJCST Classification : *C.1.4, C.2.1*

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Cloud Computing in Digital and University Libraries

Rupesh Sanchati[α] , Gaurav Kulkarni[Ω]

Abstract - Libraries may soon be building and managing their own data centers. This model would let libraries maintain more control over the applications and data stores that contain sensitive, private information about patrons. Provisioning and maintenance of infrastructure for Web based digital library present several challenges. In this paper we discuss problems faced with digital library and development efforts to overcome that problem. Infrastructure virtualization and cloud computing are particularly attractive choices which is challenged by both growth in the size of the indexed document collection, new features and most prominently usage. With the purpose of applying Cloud Computing to university library, the paper describes the current status of user service models in university libraries. Then it proposed to improve current user service model with Cloud Computing. This paper explores some of the security issues surrounding data location, mobility and availability.

I. Introduction

Cloud Computing is a completely new IT technology and it is known as the third revolution after PC and Internet in IT. To be more specific, Cloud Computing is the improvement of Distributed Computing, Parallel Computing, Grid Computing and Distributed Databases. And the basic principle of Cloud Computing is making tasks distributed in large numbers of distributed computers but not in local computers or remote servers. In other words, by collecting large quantities of information and resources stored in personal computers, mobile phones and other equipment, Cloud Computing is capable of integrating them and putting them on the public cloud for serving users.

Digital library is a development-oriented hardware and software integration platform, through to technical and the product integration, each kind of carrier digitization, carries on the effective deposit and the organization, provides the network the effective service. After Digital library technology popularization, provided the high grade information service but simultaneously also to expose all sorts of questions unceasingly, because the zones of different the current economic condition limit presented the development

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not balanced phenomenon, the regional resources shared with difficulty, form each one information isolated island or the resources are redundant, create the resources the waste, satisfied the aggregate demand with difficulty, the cloud computing possibly provides a good plan day by day for this kind of phenomenon.

II. Problems Of Digital Library

Digital library for our study provides a convenient, along with the increasing knowledge level, the requirement of digital library and growing. But because of uneven economic development in different regions causes the digital library's resources to be relatively short, to university digital library as an example. Various colleges and universities while are raising the respective teaching level unceasingly, have established a digital library to purchase its own database resources, but because of the teaching focus and economic conditions, library resources between university's has the differences, meanwhile looked from the whole that the Digital library has certain flaw. Data resources between various universities are relatively independent, building redundant projects possibility was high, has created the manpower, the financial resource and the resources waste, or some colleges and universities to use only part of database resources, inadequate use of resources, cannot play resources maximum utilization.

Digital library representative one kind of new infrastructure and the environment, through the cloud computing, it may use resources more effective , and can solve the defects of digital library.

a) Cloud computing realization

Based on cloud computing in the cost calculation, performance, team cooperation and the advantages of the geographic location, because simultaneously the different application procedure has used the different mutually independent platform, each application procedure completes on own server. Using cloud computing can share the server in many application procedures, realizes the resource sharing, thus also reduced server's quantity, achieves the effect of reducing the cost, therefore utilizes cloud computing in the Digital library, will give our work, the life and the study inevitably obtains a greater efficiency, see figure1.
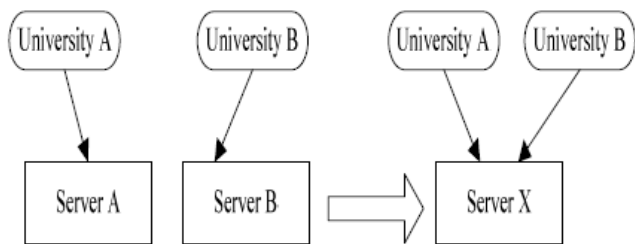
Figure 1. Server share plan

Every cloud computation's server may be the computation server, saves the server or the wide band resources and so on, in figure 2 every cloud represents any university Digital library database resources, every two clouds or more clouds may compose a bigger cloud, may divide the cloud or the composition cloud by the different regions either the different rank university. Saas, Software as a Service, through the browser to the form of services provided to the applications, to users and suppliers to reduce costs. Paas, Platform as a service, defined by the form of services provided to the developers application development and deployment platform, so that they can use this platform to develop, deploy and manage SaaS applications. This platform typically includes a database, middleware and development tools, all are in the form of services through the Internet. IaaS infrastructure as a service, defined by the form of services to provide servers, storage and networking hardware. SDK Software Development Kit, refers to supporting development of a certain type of software, documentation, samples, and a collection of tools. In general, SDK that the development of applications under the Windows platform.

b) *Permissions realization*

In Figure 2 cloud superintendent should is composed by university representative, government representative and service provider representative , its responsibility should be the management daily operation, provides the high grade service and the high security, the formulation agreement, the coordinated all quarters' benefit and carries on sanction on the illegal user and the contrary operation.
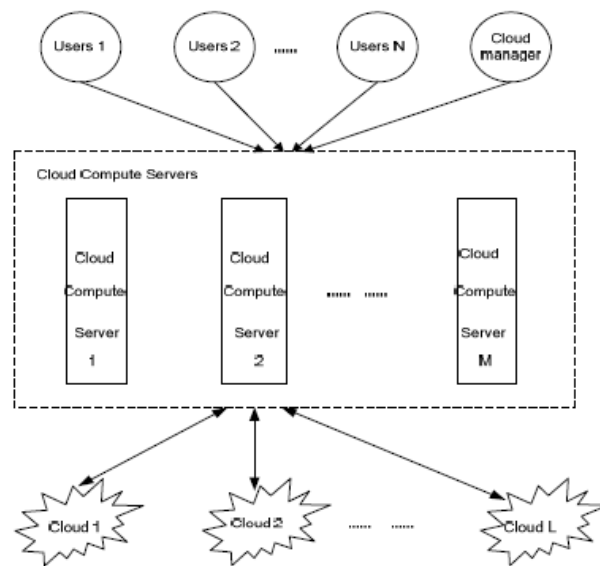
Figure 2. cloud computing implementation diagram

First, user requested to the Internet transmission, and between cloud platform and Internet continuous revision key, in order to protect the platform. Simultaneously the cloud platform defines an access rule to its user, the user transmits own status to the platform, the platform basis rule production user permissions statement.

III. ANALYSIS OF CURRENT USER SERVICE MODEL IN UNIVERSITY LIBRARY

University library, as a most important academic and scientific research base, charges for providing information services for its users. In the past, most libraries insisted that their service is based on their own library resources. So librarians scarcely considered users' demands. But today, modern libraries have changed this viewpoint. And librarians usually need to collect as more information as they can according to users' requirements. Then they will analyze the information and sort out them. Finally, they will provide them for users in some certain technical methods. However, services in modern libraries will increasingly focus on users' demanding in future. And the ultimate goal of modern library is to offer appropriate, comprehensive and multi-level services for its users. At current user service models are mainly WWW service model, FTP service model, BBS and E-mail service model, etc [5].

a) *WWW Service Model*

WWW (World Wide Web) is based on client-server model. It presents all kinds of information browsing systems with the bases of HTML language and HTTP protocol. The specific division is: WWW Servers are in charge of linking web pages by hypertext links and WWW clients are responsible for displaying information and sending requests to servers. And the

most significant feature of WWW service is its high degree of integration. In other words, it can connect all kinds of information and services seamlessly and provide users with vivid graphical user interface finally. In general, WWW provides new means of searching and sharing information for people around the world. Meanwhile, it gradually becomes the best means of dynamic multimedia interactive for people.

b) FTP Service Model

FTP (File Transfer Protocol) is a widely used communication protocol. And it is comprised of various rules that support file transfer on the Internet. As such rules can permit online users copy files from one host to another, it brings great convenience and benefits to users. Just as other Internet services, FTP is also based on client-sever model. Meanwhile, it's easy to learn to use FTP service. First, you only need to start the FTP client program to connect with remote host, then you should issue file transfer command to remote host and after remote host received the command, it will give respond and implement the correct operation. Launching FTP service in university library network system is a good type which brings great convenience for users and library as well. By using FTP service in university library, users can make their own password, such as using their Email address, and this can let librarians obtain users visiting records easily. Furthermore, according to users' visiting records, librarians can offer corresponding services for them and improved users' satisfaction

c) BBS and E-mail Service Model

BBS (Bulletin Board Service) is a kind of electronic information service system on the Internet. It is just like a public blank board on the Internet, all users can write their thoughts or release information on this board. And E-mail is just another kind of information service on the Internet. In a word, E-mail provides a very quick, simple and economical way of communication for the Internet users in the whole world.

Through BBS system, library users can ask and consult librarians at any time. Usually they can get their response in a very short period of time. Meanwhile, librarians can communicate with more users at a time through BBS. What's more, university libraries can open lectures, release announcements and provide online help for users by BBS system. And through E-mail system, users can obtain their needed information and knowledge resources more quickly and economically as they don't need to visit libraries personally. In the new information environment, various IT technologies updated timely. So current user service models are already out of date at some extent. Although they brought convenient services for users and saved their time indeed, they cannot keep up with the development

of libraries. Facing the problems of shortage of funds, manpower and other material resources, current user service models cannot deal well with them effectively. What's worse, they may cause waste of resources and affect the quality of library services. BBSes were generally text-based, rather than GUI-based, and early BBSes conversed using the simple ASCII character set. However, some home computer manufacturers extended the ASCII character set to take advantage of the advanced color and graphics capabilities of their systems.

IV. IMPROVEMENT OF USER SERVICE MODEL IN UNIVERSITY LIBRARIES

With the rapid development of various IT technologies, users' information requirements are increasingly personalized. And now more and more libraries advocated user-centered services. So librarians should mine and study users' information requirements frequently. And only in this way, they can master the basic demands of their users. And furthermore, library can develop itself according to such information and improve users' satisfaction. University library, as we all know, is famous for its academic and teaching influences. And IT technology has been the driving force of library development. What's more, librarians can keep using new technology to develop library and optimize library service. With the expansion of Cloud Computing application, this paper proposed to apply Cloud Computing in libraries. By establishing a pubic cloud among many university libraries, it not only can conserve library resources but also can improve its user satisfaction. And it can be illustrated in figure 3.

Figure 3 : Application of Cloud Computing in University Library

a) Unified Search Service Model

Although there are OP AC(Online Public Access Catalog)and ILL(Inter-library loan) services already,

library users still cannot access to the shared resources through an uniform access platform. However, with the adoption of Cloud Computing in university library, the integrated library resources support distributed uniform access interface [61]. At the same time, the uniform access platform can promote library resources, guide and answer users' questions by using high-quality navigation. As a result, users can grip more information retrieval methods and make better use of library resources.

b) Integrated Consulting Services Model

Today almost every university library can provide its users with network reference by BBS or E-mail. But with the constant improvement of users' demanding, integrated digital reference service came into being. And driven by Cloud Computing, CDRS (Cooperative digital reference service) can realize the sharing of technology, resources, experts and services of university libraries. Furthermore, it will develop QI A smart joint service system, and this will bring great conveniences for library users [71].

c) Real-time Access Services Model

In the era of digital libraries, library users paid more attention to electronic journals, electronic databases and so on. This is really a big challenge for university libraries. But by introducing Cloud Computing, university libraries can establish a shared public cloud jointly [81. As shared cloud can have infinite storage capacity and computing power theoretically. It can bring obvious benefits to libraries. On one hand, allied libraries no longer consider the hardware cost; on the other hand, it can help reduce the purchase of electronic database resources repeatedly among allied libraries. Meanwhile, users can visit the shared resources by any terminal equipment, such as PC, 30 mobile phone or PDA only if you can access to the Internet.

d) Knowledge Service Model

In the context of the knowledge economy, knowledge resource has become the main resource affecting productivity development. And university libraries are the main departments of storing, processing and spreading knowledge. So how to provide users with efficient transmission of information and knowledge services became urgent task for librarians today T91. However, the Emergence of Cloud Computing accelerated library's development. And the establishment of shared public cloud can save manpower and material resources greatly among university libraries. Therefore, with the aid of Cloud Computing, librarians won't have to maintain their own equipments or deal with consultations personally. And librarians will have more time and energy to offer users with their needed knowledge-based services but not only information.

e) All-oriented Service Model

Comparing with foreign university libraries, we can find that foreign libraries are intended to provide services for all the people. Besides the professors, teachers or students, all the people of that country can access to the library resources. In addition, they also permit users access to many libraries' resources by handling related certificate of that library. And fortunately, domestic libraries can also do this in the cloud environment. Anybody who can through the legal network identity authentication has the right to visit the joint resources of university libraries on the Internet [101]. In other words, university libraries will offer services for all the people with the help of Cloud Computing.

V. CONCLUSION

We know that library is not only a knowledge ocean, its ultimate aim is to provide satisfactory services for all the people. So in the new era, library should improve itself constantly by adopting many new IT technologies. And in this paper, we attempted to improve current user service model in university library by using Cloud Computing. Although study of Cloud Computing is still in the initial stage now, impacts brought by Cloud Computing are obvious. With the introduction of Cloud Computing to university library, services of libraries will have a new leap in the near future. Services provided by libraries will become more user-centric, more professional and more effective, etc. And we all believe that libraries will create more knowledge benefits for our country with the help of Cloud Computing. Cloud environment is a highly developed network environment; it appears to the users of high-quality service and high security. The Cloud computing techniques and methods applied to digital libraries, not only can improve the utilization rate of resources to address the imbalance in development between regions, but also can make more extensive use of cloud computing to our work life.

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42

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Interactive Neuro-Fuzzy Expert System for Diagnosis of Leukemia

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Abstracts - Leukemia is closely linked with the blood or bone marrow. Leukemia is regard as cancer of the blood cells (usually white blood cells). The abnormal white blood cells formed in leukemia also accumulate in the organs of the body such as the spleen, liver, lymph nodes, testes, and brain, and interfere with normal functioning of the organ. Leukemia is of four common type; Acute lymphocytic leukemia, acute myelogenous leukemia, chronic lymphocytic leukemia and chronic myelogenous leukemia. Leukemia symptoms are predominantly paleness, fatigue, bone pain, asthemia, palpitation, frequent infection, nose bleeding and thrombocytopenia. Neuro-Fuzzy Logic explores approximation techniques from neural networks to finds the parameter of a fuzzy system. In this paper, the traditional procedure for the medical diagnosis of leukemia employed by physician is analyzed using neuro-fuzzy inference procedure. From the system designed if the patient is having five or more of the enlisted symptoms, the patient is experiencing "severe Leukemia" and should go for treatment urgently. If it is approximately four of the symptoms the patient is experiencing, the patient "might be suffering from Leukemia" and hence should see a physician right away, but if it is three or less of the enlisted symptoms, the patient is not "suffering from Leukemia". The system which demonstrates the practical application of Information and Communication Technology (ICT) in the health sector is interactive and tells the patient his current condition as regards Leukemia.

Keywords : Neural Network, Fuzzy logic, Neuro Fuzzy System, Expert System, Leukemia.

GJCST Classification : I.5.1

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Interactive Neuro-Fuzzy Expert System for Diagnosis of Leukemia

Obi J.C.[α], Imianvan A.A.[Ω]

Abstract - Leukemia is closely linked with the blood or bone marrow. Leukemia is regard as cancer of the blood cells (usually white blood cells). The abnormal white blood cells formed in leukemia also accumulate in the organs of the body such as the spleen, liver, lymph nodes, testes, and brain, and interfere with normal functioning of the organ. Leukemia is of four common type; Acute lymphocytic leukemia, acute myelogenous leukemia, chronic lymphocytic leukemia and chronic myelogenous leukemia. Leukemia symptoms are predominantly paleness, fatigue, bone pain, asthemia, palpitation, frequent infection, nose bleeding and thrombocytopenia. Neuro-Fuzzy Logic explores approximation techniques from neural networks to finds the parameter of a fuzzy system. In this paper, the traditional procedure for the medical diagnosis of leukemia employed by physician is analyzed using neuro-fuzzy inference procedure. From the system designed if the patient is having five or more of the enlisted symptoms, the patient is experiencing "severe Leukemia" and should go for treatment urgently. If it is approximately four of the symptoms the patient is experiencing, the patient "might be suffering from Leukemia" and hence should see a physician right away, but if it is three or less of the enlisted symptoms, the patient is not "suffering from Leukemia". The system which demonstrates the practical application of Information and Communication Technology (ICT) in the health sector is interactive and tells the patient his current condition as regards Leukemia.

Keywords : *Neural Network, Fuzzy logic, Neuro Fuzzy System, Expert System, Leukemia.*

I. INTRODUCTION

Knowledge-based expert systems, or simply expert systems, use human knowledge to solve problems that normally would require human intelligence. These expert systems represent the expertise knowledge as data or rules within the computer. These rules and data can be called upon when needed to solve problems. Books and manuals have a tremendous amount of knowledge but a human has to read and interpret the knowledge for it to be used. Most expert systems are developed via specialized software tools called shells. These shells come equipped with an inference mechanism (backward chaining, forward chaining, or both), and require knowledge to be entered according to a specified format (PCAI, 2000).

Leukemia (Cancer of the blood cells, usually white blood cells) is a type of cancer that occurs in the blood or bone marrow. Leukemia causes an uncontrolled growth of abnormal white blood cells, the infection fighting cells in the blood. Leukemia is one of the most common types of cancer and one of the top ten killers' cancers (Healthline, 2011 and Wrong Diagnosis, 2011)

Leukemia is a general term for four types of malignant disease of the blood and bone marrow (MedicineNet, 2011 and WrongDiagnosis, 2011). These include acute lymphocytic leukemia and acute myelogenous leukemia, which progress rapidly. The other forms of leukemia, chronic lymphocytic leukemia and chronic myelogenous leukemia, progress more slowly .

Leukemia is most treatable and curable if caught in the earliest stages of the disease. Untreated and/or advanced leukemia results in a proliferation of abnormal white blood cells that spread throughout the blood stream. These abnormal cells crowd out normal white blood cells. The abnormal white blood cells are not able to fight infections as effectively as the normal white blood cells. This results in increased infection (Wrong Diagnosis, 2011).

The abnormal white blood cells of leukemia also crowd out red blood cells, resulting in anemia, a low number of red blood cells. Leukemia also results in lower numbers of platelet cells in the blood, which are needed for normal clotting. This results in impaired clotting. The abnormal white blood cells formed in leukemia also accumulate in the organs of the body, such as the spleen, liver, spleen, lymph nodes, testes, and brain, and interfere with normal organ functioning (Best medicine, 2011).

Neural-Fuzzy is a fusion of neural network and fuzzy logic. Neuro-fuzzy system combines the advantages of both whilst eliminating their disadvantages. Using neuro-fuzzy logic the diagnosis of Leukemia will provide a self-learning intelligent system that is capable of handling uncertainties in the diagnosis process.

II. LITERATURE REVIEW

The cause of many cases of leukemia is unknown, but in some cases, leukemia is caused by abnormalities in the chromosomes. People at risk for developing leukemia include those who have been exposed to high doses of radiation, certain types of

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chemotherapy, or chemicals, such as benzene. Having Down syndrome or Fanconi's syndrome increases the risk as well. Additionally, certain viruses, such as Epstein-Barr virus, are associated with the development of leukemia. Smoking also increases the risk of leukemia (Wrong Diagnosis,2011 and Medicine Net, 2011).

Diagnosing leukemia begins with taking a thorough personal and family medical history, including symptoms and risk factors for leukemia. Diagnosis also includes completing a physical examination. Diagnostic testing includes a blood test called a complete blood count (CBC). A complete blood count will reveal the presence of high or low numbers of white blood cells, red blood cells and platelets. Other blood tests are also done to diagnose the specific type of leukemia. A bone marrow test is also done to diagnose leukemia. A bone marrow test involves using a needle to withdrawal a sample of cells from the bone marrow, where blood cells are formed. The sample is examined under a microscope for the presence of the abnormal leukemia cells. A diagnosis of leukemia can be missed or delayed because some symptoms of leukemia are similar to those of other conditions. In addition, some people may not have symptoms in early stages of some forms of leukemia. The prognosis for people with leukemia varies depending on the type of leukemia and other factors. However, many types of leukemia can be effectively treated and some can be cured. Survival rates for leukemia have risen dramatically in the last four decades due to improvements in treatment. Treatment of leukemia varies, depending on the specific type of leukemia, the patient's age, health history, overall health status, and other factors. Treatment may include chemotherapy, bone marrow transplant and enrollment in clinical trials (Bestmedicine, 2011; Healthline, 2011; MedicineNet, 2011 and Wrong Diagnosis, 2011).

Neural network (NN) consists of an interconnected group of neurons (Ponniyin, 2009). Artificial Neural Network (ANN) is made up of interconnecting artificial neurons (Programming constructs that mimic the properties of biological neurons). A Neural Network is an analog and parallel computing system. A neural network is made up of a number of very simple processing elements that communicate through a rich set of interconnections with variable weights or strength. ANN (subsequently referred to as NN) is used in solving artificial intelligence problems without creating a model of a real biological system. NN processes information using connectionist approach to computation. It changes it structures based on internal or external information that flows through the network during the learning phase. NN can be used to model complex relationship between input and output or find patterns in data. The term network in

the term "Artificial Neural Network" arises because the function f(x) is defined as a composition of other function gi(x) which can further be defined as a composition of the other functions (Gary and George, 2002).

Figure 1 present a simple NN which comprises of three layers (Input, Hidden and Output layers).
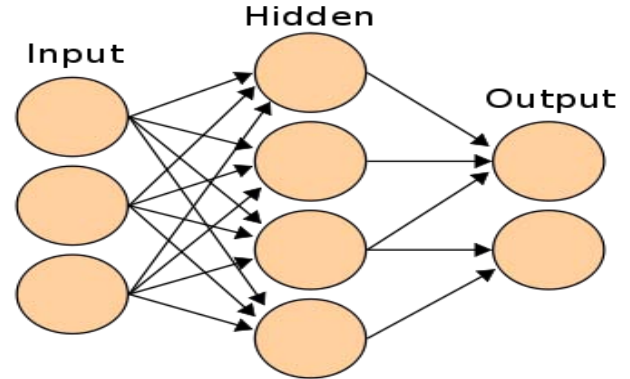
Figure 1: A simple Neural Network

The NN presented in Figure 1, comprises of a layer of "input" connected to a layer of "hidden" units, which is in turn connected to a layer of "output" units. The activity of the input unit represents the raw information that is fed into the network; the activity of the hidden units is determined by the activity of the input unit and the weights between the hidden and output units. The hidden units are free to construct their own representation of the input; the weights between the input and hidden units determine when each hidden unit is active, and so by modifying these weights, a hidden unit can choose what it represents (Christos and Dimitros, 2008).

NN employs learning paradigm that includes supervised, unsupervised and reinforcement learning (Wikipedia, 2010) NN has been applied in stock market prediction, credit assignment, monitoring the condition of machinery and medical diagnosis (Alesander and Morton, 1995; Bishop, 1995; Poa, 1989; Valid and Gholam, 2009 and Wikipedia, 2010). Application of NN in medical diagnosis includes electronic noses and diagonal of cardiovascular systems (Eklund and Fuller, 1993 and Wikipedia, 2010). NN are ideal in recognizing diseases using scans. They learn by example, hence details of how to recognize the disease is not needed. What is needed is set of examples that are representatives of all the variation of the disease. However, NN cannot handle linguistic information and also cannot manage imprecise or vague information (Akinyokun, 2002).

Fuzzy Logic (FL) is a branch of machine intelligence (Artificial Intelligence) that helps computers paint vivid pictures of the uncertain world. Fuzzy sets were introduced by Zadeh (1965) as a means of representing and manipulating data that are not

precise, but rather fuzzy. Fuzzy logic provides an inference morphology that helps appropriate human reasoning capabilities to be applied to knowledge-based systems. The theory of fuzzy logic provides a mathematical strength to capture the uncertainties associated with human cognitive processes, such as thinking and reasoning. A fuzzy set is called triangular fuzzy number (Figure 2) with peak (center) a, left width α>0 and right width β>0 if its membership function has the form:

$$A(t) = \begin{cases} 1\text{-a} -t/\alpha & \text{if } \alpha - \alpha \le t \le \alpha \\ 1 - (t - a)/\beta & \text{if } \alpha \le t \le a + \beta \\ 0 & \text{otherwise} \end{cases}$$

and we use the notation A = (a, α, β). It can easily be shown that

$$[A]^y = [a-(1-y)\,\alpha,\ a + (1-y)\,\beta],\ \forall\, y \in \{0, 1\}.$$

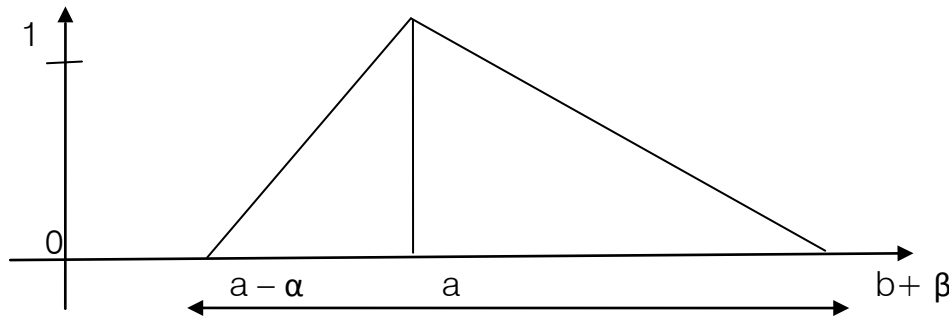The support of A is (a − α, b + β).

Figure 2 : Triangular Fuzzy Membership Number

Fuzzy systems often learn their rules from experts. When no expert gives the rules, adaptive fuzzy systems learns by observing how people regulate real systems (Leondes, 2010) The difference between classical and fuzzy logic is something called "the law of excluded middle" (Bart and Satoru, 1993). In standard set theory, an object does or does not belong to a set. There is no middle ground. In such bivalent systems, an object cannot belong to both its set and its compliment set or to neither of them. This principle preserves the structure of the logic and avoids the contradiction of object that both is and is not a thing at the same time Zadeh (1965). However, fuzzy logic is highly abstract and employs heuristic (experiment) requiring human experts to discover rules about data relationship.

Fuzzy Neural Network or Neuro-Fuzzy system is a learning machine that finds the parameters of a fuzzy system (i.e., fuzzy sets, fuzzy rules) by exploiting approximation techniques from neural networks (Statsoft Incorporated, 2008). Neuro-fuzzy refers to the combination of artificial neural network and fuzzy logic. It eliminates the individual weaknesses of neural network and fuzzy logic while making use of their best advantages. Fusion of neural network and fuzzy logic (that is Neuro-fuzzy) is interesting (Eklund and Fuller, 1993; Johnson, 1993; Kosaka, 1991; Nauck, 1996; Stathacopoulou et al., 2004 and Wong et al., 2002)

Neuro-fuzzy system for the diagnosis of Leukemia disease will provide a self-learning and adaptive system that is able to handle uncertain and imprecise data.

III. METHODOLOGY

The process for the medical diagnosis of Leukemia starts when an individual consults a physician (doctor) and presents a set of complaints (symptoms). The physician then requests further information from the patient or from others close to him who knows about the patient's symptoms in severe cases. Data collected include patient's previous state of health, living condition and other medical conditions. A physical examination of the patient condition is conducted and in most cases, a medical observation along with medical test(s) is carried out on the patient prior to medical treatment.

From the symptoms presented by the patient, the physician narrows down the possibilities of the illness that corresponds to the apparent symptoms and make a list of the conditions that could account for what is wrong with the patient. These are usually ranked in the order (Low, Moderate and high). The physician then conducts a physical examination of the patient, studies his or her medical records and ask further questions, as he goes in an effort to rule out as many of the potential

conditions as possible. When the list has been narrowed down to a single condition, it is called differential diagnosis and provides the basis for a hypothesis of what is ailing the patient. Until the physician is certain of the condition present; further medical test are performed or schedule such as medical imaging, scan, X-rays in part to conform or disprove the diagnosis or to update the patient medical history. Other Physicians, specialist and expert in the field may be consulted (sought) for further advices.

Despite all these complexities, most patient consultations are relatively brief because many diseases are obvious or the physician's experience may enable him to recognize the condition quickly. Upon the completion of the diagnosis by the physician, a treatment plan is proposed, which includes therapy and follow-up (further meeting and test to monitor the ailment and progress of the treatment if needed). Review of diagnosis may be conducted again if there is failure of the patient to respond to treatment that would normally work. The procedure of diagnosing a patient suffering from Leukemia is synonymous to the general approach to medical diagnosis. The physician may carry out a precise diagnosis, which requires a complete physical evaluation to determine whether the patient have Leukemia. The examining physician accounts for possibilities of having Leukemia through an interview, physical examination and laboratory test. Many primary health care physicians may require tools for Leukemia evaluation.

Neuro-fuzzy inference procedure is applied to the diagnosis of Leukemia using the model prescribed in Figure 3. The Expert system using the neuro-fuzzy model is developed in an environment characterized by Microsoft Window XP Professional operating system, Microsoft Access Database Management system, Visual Basic Application Language and Microsoft Excel. Neuro-Solution and Crystal Report were used for Neural Networks analysis and graphical representation respectively.

IV.   RESULT AND DISCUSSION

To design our neuro-fuzzy system for diagnosis of Leukemia, we designed a system which consists of a set of symptoms needed for the diagnosis (here, we are using fourteen basic and major symptoms):

(a).   Paleness. (b). Shortness of breath.   (c). Nose bleeding. (d). Frequent Infection.
(e).   Anaemia. (f). Epistaxis.   (g). Bone pain.   (h). Thrombocytopenia.
(l). Granulocytopenia.   (j). Asthemia.   (k). Palpitations.
(l.) Digestive bleeding.
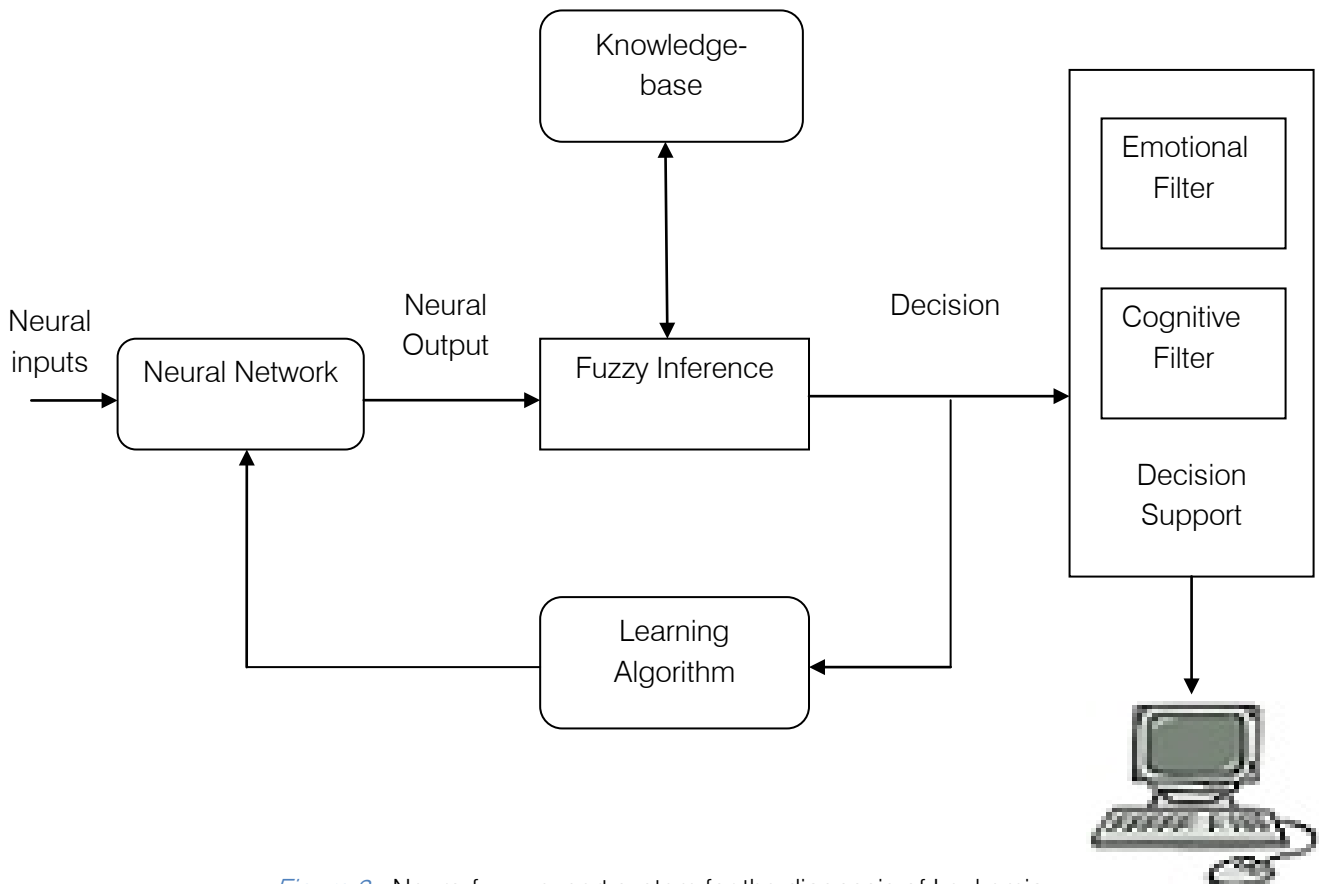(m). Enlarge Spleen. (n.) Fatigue.

Figure 3 : Neuro-fuzzy expert system for the diagnosis of Leukemia.

The knowledge base consists of the database, which consist of fourteen basic parameters mentioned earlier. The values of the parameters are often vague (fuzzy) and imprecise hence the adoption of fuzzy logic in the model as means of analyzing these data. These parameters therefore constitute the fuzzy parameter of the knowledge base. The fuzzy set of parameters is represented by 'P', which is defined as

P= {P_1, P_2…, P_n} where P_i represents the jth parameter and n is the number of parameter (in this case n=14). The set of linguistic values which is modeled as a linker scale denoted by 'L' is given as L= {Low, Moderate and High}.

Neural networks provide the structure for the parameters, which serves as a platform for the inference engine. The inference engine consists of reasoning algorithm driven by production rules. These production rules are evaluated by using the forward chaining approach of reasoning (Nauck, 1996). The inference mechanism is fuzzy logic driven. The cognitive filter of the decision support engine takes as input the output report of the inference engine and applies the objective rules to rank the individual on the presence or absence of Leukemia disease. The emotional filter takes as input the output report of the cognitive filter and applies the subjective rules in the domain of studies in order to rank individuals on the extent of the Leukemia disease.

A universal set of symptoms of Leukemia disease is set up for diagnosis where the patient is expected to choose or pick from the set of symptoms fed into the system. We used a simple binary encoding scheme wherein the presence of a symptom is represented by 1 in the input vector and 0 otherwise (we call this the symptom vector).

The operational procedure of the model is represented in Figure 4. The set of symptoms are fed into the network. The patient is expected to choose from the list of symptoms the one corresponding to what he/she is having
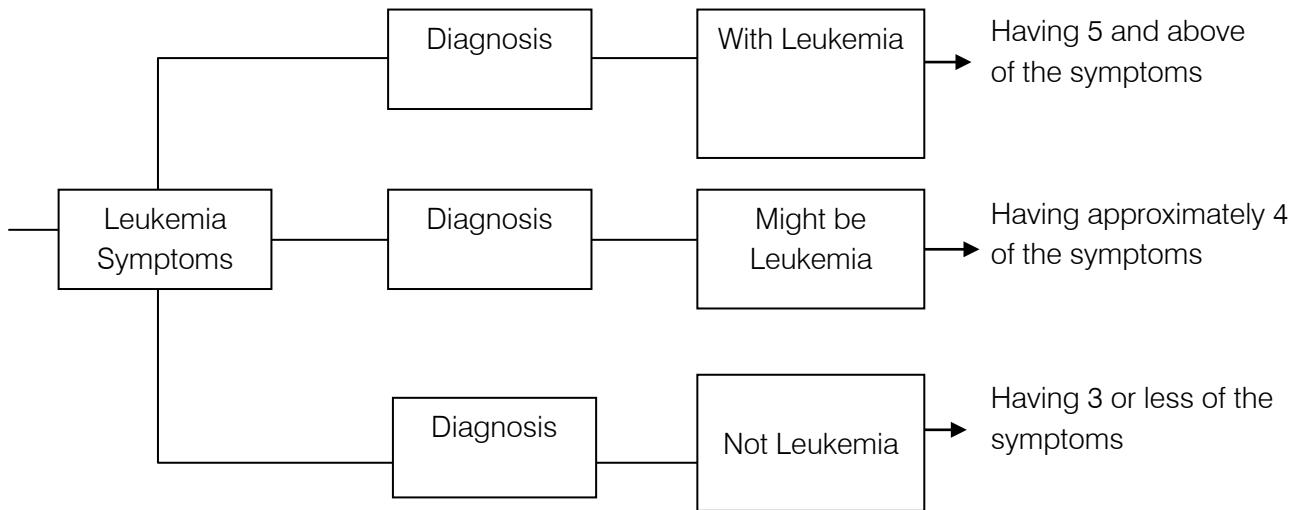
Figure 4 : *Operational procedure of the neuro-fuzzy system for the diagnosis of Leukemia*

If the patient is having five or more of the symptoms, he is having severe Leukemia and should go for treatment urgently. If it is approximately four of the symptoms he is having, he might be suffering from Leukemia and hence should see a physician right away, but if it is three or lesser of the symptoms, he may not be having Leukemia.

A typical data set that contains the fourteen symptoms is presented in Table 1. This shows the degree of intensity of the symptoms. As the value tends to 1.0, the more the chances that the patient is suffering from Leukemia

Table 1 : *Data Set showing the degree of intensity of Leukemia Symptoms Scale (0.00 – 1.00)*

SYMPTOMS	DEGREE OF INTENSITY		
Paleness	0.60	0.30	0.10
Shortness of Breath	0.30	0.55	0.15
Nose Bleeding	0.80	0.10	0.10
Frequent infection	0.68	0.15	0.17
Anaemia	0.32	0.60	0.08
Epistaxis	0.59	0.29	0.12
Bone pain	0.20	0.15	0.65
Thrombocytopenia	0.18	0.70	0.12
Granulocytopenia	0.50	0.50	0.00
Asthenia	0.60	0.20	0.20
Palpitation	0.55	0.25	0.20
Digestive Bleeding	0.77	0.13	0.10
Enlarge spleen	0.15	0.20	0.65
Fatigue	0.20	0.26	0.54
RESULT	With Leukemia	Might be Leukemia	Not Leukemia

Next, we create fuzzy logic membership functions that define the value of input/ output terms used in the rules. Membership functions are graphical function representation of the magnitude of the preparation of each input that is processed. Typical membership function is presented in Figure 5. Figure 6 shows that the height of the symptoms is 0.0, 0.5 or 1.0 and does not exceed 1.0. The fuzzy set however is zero, X/4 or one. From Figure 6, we say that when the fuzzy set is between zero and X/4, the person's condition is Low ("Not suffering from Leukemia"). When the fuzzy set is in-between zero and one, the condition is moderate ("might be suffering from Leukemia") and when it is between X/4 and one, the person's condition is high ("suffering from severe Leukemia").

48
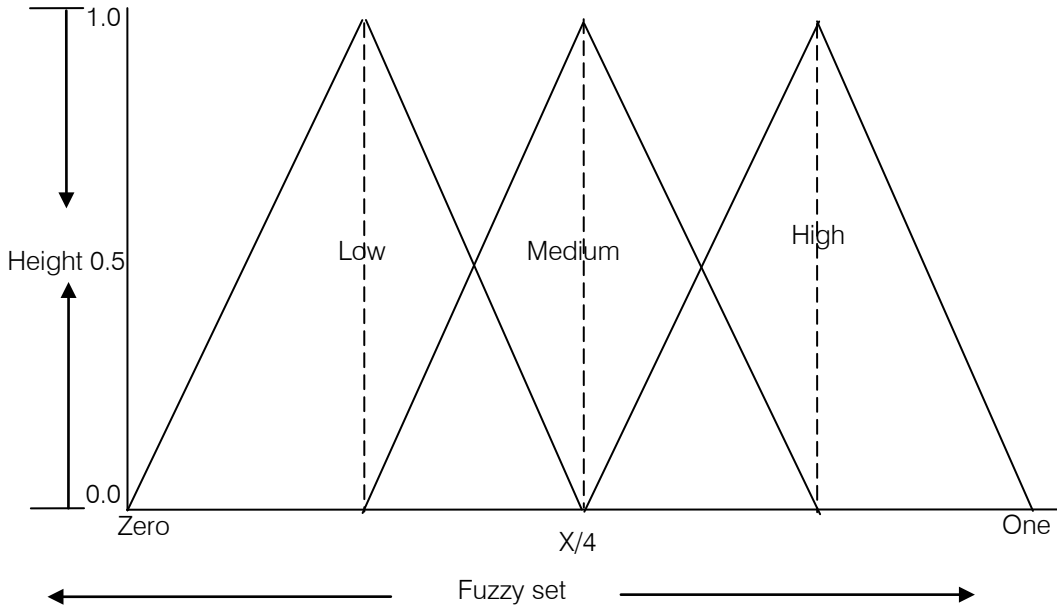
Figure 5 : Membership Function for Leukemia

Further, we create the necessary pre and post processing. As inputs are received by the system, the rule based is evaluated. The antecedent, which is the (IF X AND Y), block test the input and produces a conclusion. The consequent (THEN Z) are satisfied while the others may not be. The conclusion is combined to form logical sums. The degree of membership (D.O.M) of Leukemia is represented in Figure 6.
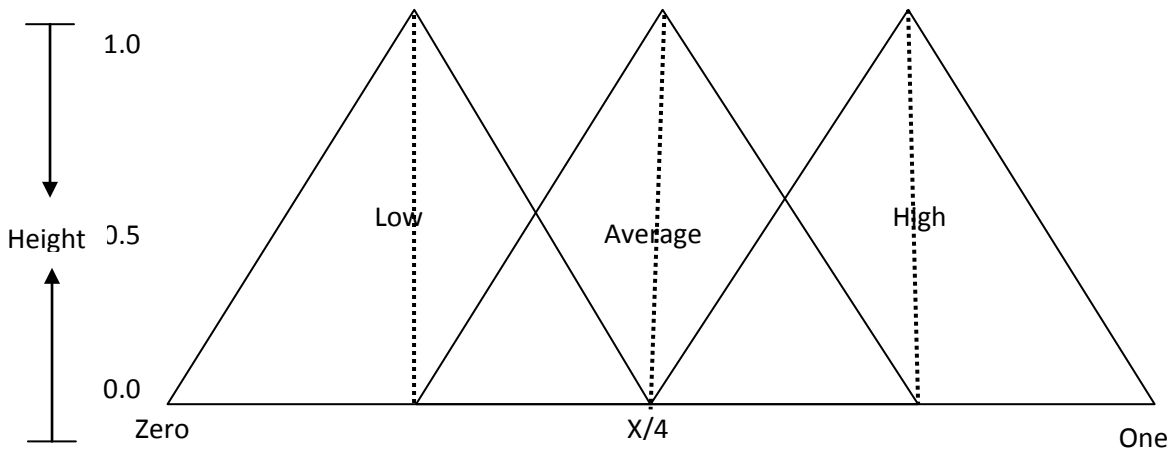
Figure 6 : Analysis of Leukemia Symptoms

Defuzzification coverts the rules base fuzzy output into non-fuzzy (numerical values). It reflects the interpretation of the logic of the different linguistic variable. The system can also be configured to handle not only Leukemia but, other kind of illness and diseases.

V. CONCLUSION

The need to design a system that would assist physician in medical diagnosis of Leukemia cannot be over emphasized. This paper which demonstrates the practical application of Information and Communication Technology (ICT) in the health sector, presented a hybrid Neuro–Fuzzy Expert System to help in diagnosis of Leukemia using a set of symptoms. This system which uses a set of fuzzified data set incorporated into neural network system is more precise than the traditional system. The system designed is an interactive system that tells the patient his current condition as regards Leukemia. It should however be noted that the system was not designed to give prescription of Leukemia drugs to patients but can also be expanded to do so in subsequent research. A system of this nature that has the ability to diagnose a person suffering from Leukemia should be introduced in health care delivery centers and hospitals to help ease the work of physicians.

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A Novel Real-Time Intelligent Tele Cardiology System Using Wireless Technology to Detect Cardiac Abnormalities

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Abstracts - This study presents a novel wireless, ambulatory,real-time, and auto alarm intelligent telecardiology system to improve healthcare for cardiovascular disease, which is one of the most prevalent and costly health problems in the world.This system consists of a lightweight and power-saving wireless ECG device equipped with a built-in automatic warning expert system. A temperature sensor is fixed to the user's body, which senses temperature in the body, and delivers it to the ECG device. This device is connected to a microcontroller and ubiquitous real-time display platform. The acquired ECG signals which are transmitted to the microcontroller is then, processed by the expert system in order to detect the abnormality. An alert signal is sent to the remote database server, which can be accessed by an Internet browser, once an abnormal ECG is detected. The current version of the expert system can identify five types of abnormal cardiac rhythms in real-time, including sinus tachycardia, sinus bradycardia, wide QRS complex, atrial fibrillation (AF), and cardiac asystole, which is very important for both the subjects who are being monitored and the healthcare personnel tracking cardiac-rhythm disorders. The proposed system also activates an emergency medical alarm system when problems occur. We believe that in the future a business-card-like ECG device, accompanied with a Personal Computer, can make universal cardiac protection service possible.

Index Terms : Atrial fibrillation (AF), ECG, Temperature Sensor, Expert Systems, Personal Computer, Wireless.

GJCST Classification : J.3

A NOVEL REAL-TIME INTELLIGENT TELE CARDIOLOGY SYSTEM USING WIRELESS TECHNOLOGY TO DETECT CARDIAC ABNORMALITIES

Strictly as per the compliance and regulations of:

A Novel Real-Time Intelligent Tele Cardiology System Using Wireless Technology to Detect Cardiac Abnormalities

S.Kohila$^{\alpha}$, K.Gowri$^{\Omega}$

Abstract - This study presents a novel wireless, ambulatory, real-time, and auto alarm intelligent telecardiology system to improve healthcare for cardiovascular disease, which is one of the most prevalent and costly health problems in the world. This system consists of a lightweight and power-saving wireless ECG device equipped with a built-in automatic warning expert system. A temperature sensor is fixed to the user's body, which senses temperature in the body, and delivers it to the ECG device. This device is connected to a microcontroller and ubiquitous real-time display platform. The acquired ECG signals which are transmitted to the microcontroller is then, processed by the expert system in order to detect the abnormality. An alert signal is sent to the remote database server, which can be accessed by an Internet browser, once an abnormal ECG is detected. The current version of the expert system can identify five types of abnormal cardiac rhythms in real-time, including sinus tachycardia, sinus bradycardia, wide QRS complex, atrial fibrillation (AF), and cardiac asystole, which is very important for both the subjects who are being monitored and the healthcare personnel tracking cardiac-rhythm disorders. The proposed system also activates an emergency medical alarm system when problems occur. We believe that in the future a business-card-like ECG device, accompanied with a Personal Computer, can make universal cardiac protection service possible.

Index Terms : Atrial fibrillation (AF), ECG, Temperature Sensor, Expert Systems, Personal Computer, Wireless.

I. INTRODUCTION

a) General Introduction

Cardio Vascular disease (CVD) is one of the most prevalent and serious health problems in the world. An Estimated 17.5 million people died from CVD in 2005, representing 30% of all deaths worldwide. Based on current trends, over 20 million people will die from CVD by 2015. In 2000, 56% of CVD deaths occurred before the age of 75. However, CVD is becoming more common in younger people, with most of the people affected now aged between 34 and 65 years [1]. In addition to the fatal cases, at least 20 million people experience nonfatal heart attacks and strokes every year; many requiring continuing costly medical care. Developed countries around the world continue to experience significant problems in providing healthcare services, which are as follows:

1) The increasing proportion of elderly, whose lifestyle changes are increasing the demand for chronic disease Healthcare services;
2) Demand for increased accessibility to hospitals and mobile healthcare services, as well as in-home care [2];
3) Financial constraints in efficiently improving personalized and quality-oriented healthcare though the current trend of centralizing specialized clinics can certainly reduce clinical costs, decentralized healthcare allow the alternatives of in-hospital and out-hospital care, and even further, home healthcare [3]. Rapid developments in information and communication technologies have made it possible to overcome the challenges mentioned earlier and to provide a changing society with an improved quality of life and medical services.

b) Sinus Tachycardia

Sinus tachycardia (also colloquially known as sinus tach or sinus tachy) is a heart rhythm with elevated rate of impulses originating from the sinoatrial node, defined as a rate greater than 100 beats/min in an average adult. The normal heart rate in the average adult ranges from 60–100 beats/min. Note that the normal heart rate varies with age, with infants having normal heart rate of 110–150 bpm to the elderly, who have slower normals. Tachycardia is often asymptomatic. If the heart rate is too high, cardiac output may fall due to the markedly reduced ventricular filling time. Rapid rates, though they may be compensating for ischemia elsewhere, increase myocardial oxygen demand and reduce coronary blood flow, thus precipitating an ischemia heart or valvular disease.

c) Sinus Bradycardia

Sinus bradycardia is a heart rhythm that originates from the sinus node and has a rate of under 60 beats per minute. The decreased heart rate can cause a decreased cardiac output resulting in symptoms such as lightheadedness, dizziness, hypotension, vertigo, and syncope. The slow heart rate may also lead to atrial, junctional, or ventricular ectopic rhythms. Sinus Bradycardia is not necessarily

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problematic. People who regularly practice sports may have sinus bradycardia, because their trained hearts can pump enough blood in each contraction to allow a low resting heart rate. Sinus Bradycardia can aid in the sport of Free diving, which includes any of various aquatic activities that share the practice of breath-hold underwater diving, Bradycardia aids in this process due to drop in blood rate pulse. These adaptations enable the human body to endure depth and lack of oxygen far beyond what would be possible without the mammalian diving reflex. Sinus bradycardia is a sinus rhythm of less than 60 bpm. It is a common condition found in both healthy individuals and those who are considered well conditioned athletes. Studies have found that 50 - 85 percent of conditioned athletes have benign sinus bradycardia, as compared to 23 percent of the general population studied. Trained athletes or young healthy individuals may also have a slow resting heart rate.

d) Wide QRS Complex

A widened QRS ($\geq$120 msec) occurs when ventricular activation is abnormally slow, either because the arrhythmia originates outside of the normal conduction system (e.g., ventricular tachycardia), or because of abnormalities within the His-Purkinje system (e.g., supraventricular tachycardia with aberrancy).

e) Atrial Fibrillation

Atrial fibrillation (AF) is the most common cardiac arrhythmia, affecting nearly 1% of the population. Its prevalence increases with age; although relatively infrequent in those under 40 years old, it occurs in up to 5% of those over 80. Most people with a normal sinus rhythm have a resting heart rate of between 60 and 100 beats per minute. In AF patients, the atria contract rapidly and irregularly at rates between 400 to 800 beat per minute. Fortunately, the atrioventricular node compensates for this activity; only about one or two out of three atrial beats pass to the ventricles [4]. A typical ECG in AF shows a rapid irregular tachycardia in which recognizable P waves are sometimes absent [5]. The ventricular rate in patients with untreated AF is generally 110 to 180 beats per minute. However, slower ventricular rates may occur in elderly patients with untreated AF. Data from the Framingham study demonstrates that chronic heart failure is associated with a 4.5-fold increase in risk of AF in men and a 5.9-fold increase in women. Apart from the epidemiological data, most evidence on the prevalence of AF in heart failure patients stems from analysis of a number of clinical trials conducted within the last 10–15 years on populations with heart failure. AF might have no detectable CVD. Hemodynamic impairment and thromboembolic events related to AF patients included in these trials were selected for different purposes, which are reflected in the varying prevalence of AF. In addition, AF, often associated with structural heart disease, causes significant morbidity, mortality, and healthcare cost in a substantial proportion of patients, thus making it a major global healthcare challenge. In this study, we attempted to develop an intelligent expert system with a built-in abnormal ECG-detection mechanism in the telecardiology healthcare service to facilitate diagnosis and management of patients with AF and other rhythm disorders [6]. Simplicity, reliability, and universality are the main concepts behind this service. Therefore, this study constructs a ubiquitous and intelligent telecardiology healthcare network consisting of a miniature wireless ECG device embedded with an alert expert system for the early detection of cardiac disorders.

f) Cardiac Asystole

Asystole is a state of no cardiac electrical activity; hence no contractions of the myocardium and no cardiac output or blood flow. Asystole is one of the conditions required for a medical practitioner to certify death. While the heart is asystolic, there is no blood flow to the brain unless CPR or internal cardiac massage is performed, and even then it is a small amount. After many emergency treatments have been applied but the heart is still unresponsive, it is time to consider pronouncing the patient dead. Even in the rare case that a rhythm reappears, if asystole has persisted for fifteen minutes or more the brain will have been deprived of oxygen long enough to cause brain death.

II. Overall System

The system proposed in this study uses a Three-lead wireless ECG device, a microcontroller expert system, and a Web-based monitoring platform to meet these objectives. Fig. 1.Shows the flowchart of the proposed system. A small, three-lead ECG device is first set up using electrodes, affixed to areas on the user's body. A temperature sensor is fixed to the users body, which senses temperature in the body and deliver it to the ECG device. This lightweight ECG can be connected to portable devices, such as a notebook or mobile phone, using ZigBee Module. The programming application .
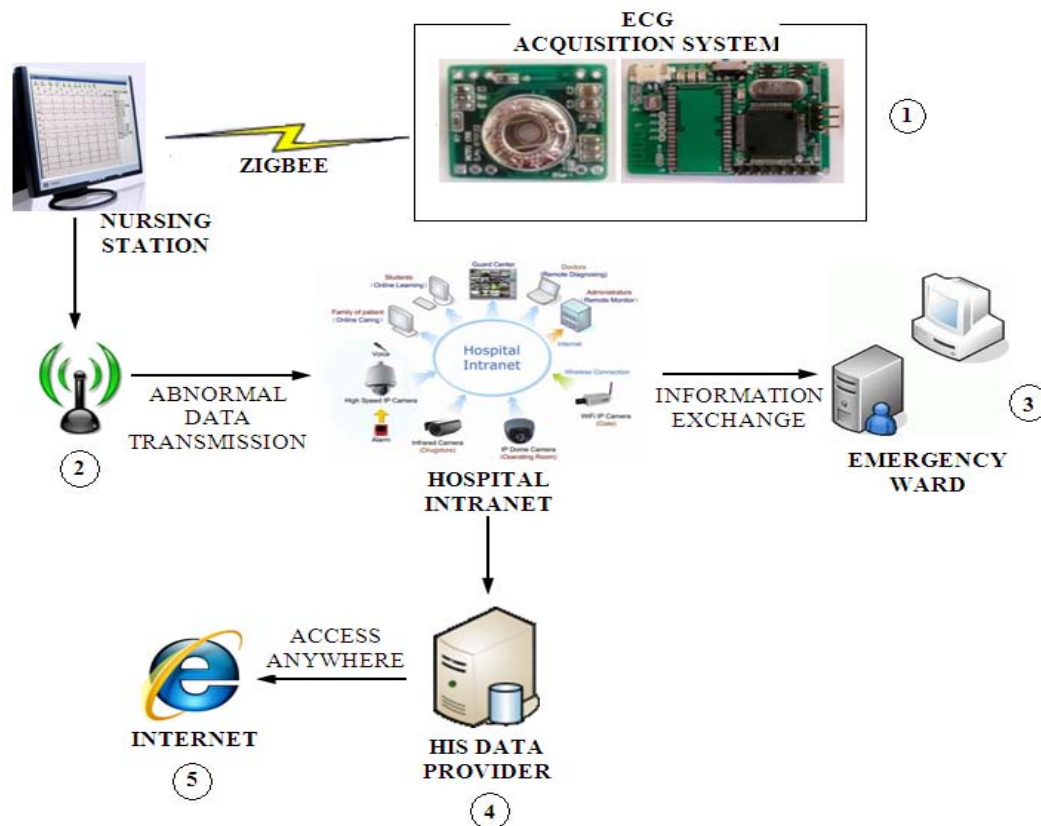
Fig.1 : Flowchart of proposed system.The System uses a 5 lead ECG acquisition device ,the Abnormality detection Algorithm in the device detect the abnormal ECG signal and a Web-based monitoring window allowing access to the data server and plot in real time by using an IE browser. Step①: The Signal are acquired by the ECG Electrodes Step②: The Abnormality in signal is detected and transferred to the hospital intranet, Step③:The information from intranet is moved to the emergency ward database, Step④: The information from the intranet is also moved to the hospital intranet server, Step⑤: The abnormality information can be accessed by anyone through web service.

Installed on a microcontroller in ECG Device can then initiate data recording and data transmission. Successive data are transmitted to a portable device and processed in a period of 6 s by an expert system. The lead signal, coordinated with the direction of cardiac conduction pathway is extracted for signal analysis. As long as an abnormal ECG signal was detected, the system automatically transmitted data over a Wi-Fi/3G/2G networks to a remote data server. At the same time, the system will send out an alert message to a nursing station in the cardiovascular ward for further examination. If necessary, the emergency ward or other departments can also access this data through an intranet. With the convenience of the world-wide Web protocol, anyone, including physicians, nurses, and family members, can access the data server and monitor real-time ECG plots using a Web browser, such as Internet Explorer (IE). For patients admitted to a cardiovascular ward or intensive care unit (ICU), the proposed cardio-healthcare system provides greater freedom of movement than products currently on the market [7]. Paring lightweight wireless ECG devices with mobile phones offers continuous and reliable patient monitoring. A warning system is also activated when unstable ECGs appear.

Whenever the person moves his body temperature rises due the work done, and the degree of increase is based on the amount of work done. Also if a person got any fever his heart beat may increase which may be misrecognized as an abnormal heart condition on an average the heart beat increase for an average of 7-8beats for every single degree increase in temperature. Here in the proposed work the constraint has been considered and the problem has been faced better. In the proposed system Zigbee module is used, which is fully secured and provide full duplex transmission. This will enhances the way of wireless communication used in the system. ZigBee targets the application domain of low power, low duty cycle and low data rate requirement devices.

III. ECG Device With Wireless Unit

The Hardware Circuit Designed Using all the Required parts (5 ECG electrode, Pre Amplifier, Band Pass Filter, Amplifier, PIC Microcontroller, ADC, Zigbee

ECG Device. The proposed three-lead ECG device contains two main parts: The Analog unit and The Digital unit.

a) Analog Unit

The DAQ unit integrates an analog preamplifier, filter, and an AD converter (ADC) into a small (20 × 18 mm2), lightweight, and battery-powered DAQ system. The ECG signal is sampled at 512 Hz with 12-bit resolution, amplified by 100 times, and band pass filtered between 1 to 150 Hz. To reduce the number of wires for high-density recordings, the power, clocks, and measured signals are daisy-chained from one node to another with bit-serial output. Therefore, adjacent nodes (electrodes) are connected together to 1) share the power, reference voltage, and ADC clocks and 2) daisy chain the digital signal outputs.

b) Digital Unit

The Digital unit consists of a wireless module and a microcontroller. This unit uses a Zigbee module to send the acquired ECG signals to a Zigbee Enabled PC, serving as a real-time signal processing unit. All modules included The QRS detection in the normal ECG waves is shown in Fig 3. The black curve means the normal ECG signal which contains three waves. The dotted line shows the first deviation of the normal ECG signal. Results show that full squares mark the R wave peaks, full circles mark the Q wave peaks, and full star mark the S wave peak. QRS onset is defined by the vertical line.
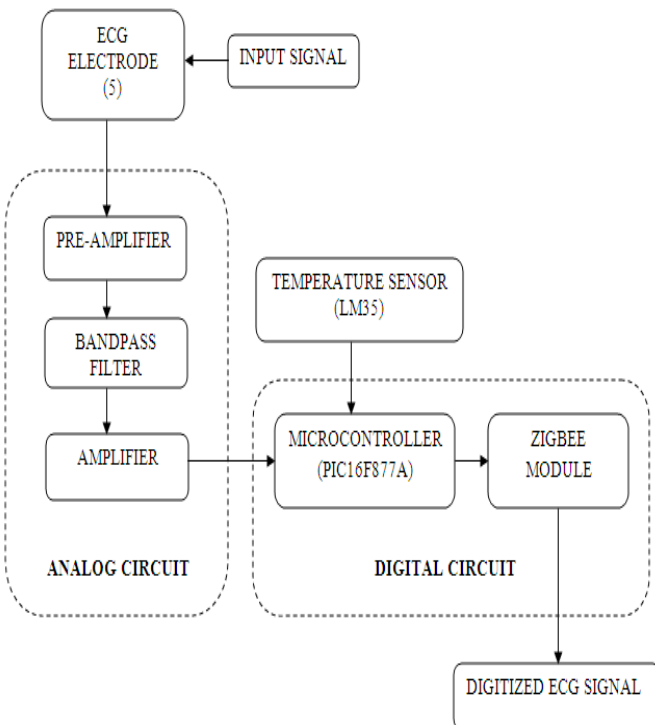
Fig.2 : Block Diagram of ECG Device

one wireless-transmission unit and three DAQs, the theoretical maximum running time is estimated at about 33 h when using an 1100 mA·h Li-ion battery with continuous acquisition and transmission of the physiological signal to the expert system[9].

IV. Abnormality Detection Algorithm In System

a) QRS Wave Detection Algorithm

The ECG signals are amplified and recorded with a sampling rate of 512 Hz and band pass filtered between 1 and 150 Hz. Artifacts were removed before R peak detection. A 50 Hz notch filter is used to eliminate the power line interference, producing high-frequency, noise-free, and smooth data. Two segments of the baseline signal are extracted to compute mean and standard deviation (SD). Besides, the QRS detector requires the first and second-order derivative of the preprocessed ECG signal. Fig. 3.Represents the QRS Detection of the normal ECG Wave.

The latter gives spikes at the fiducial points. There are also false spikes, but their relative magnitudes are lower than those of the spikes at the fiducial points. Accordingly, the R peak is clipped by higher magnitude negative peaks and high positive peaks in the first derivative plot. The procedure of defining the QRS complex onset is as follows: after 256 ms of flat segment in the ECG, the first sample, where the slope becomes steeper (high positive peaks) than the higher slope threshold, is defined as the QRS onset. The lower slope threshold is used to detect the higher magnitude negative peaks. Both thresholds are updated to search for missing beats.

After identifying the QRS onset, the R peak is labeled by searching for the maximal value of the ECG

Fig.3 : QRS Detection of the Normal ECG Waves

samples in the 36ms following the QRS onset. When R Peak is determined, the QRS detector searches forward and backward to identify the two most negative points on the ECG plot and labels them as the Q wave peak and the S wave peak, respectively.Fig.3.Represent the QRS Peak Detected Wave. The QRS complex duration is set from QRS onset time to 20 ms after the S wave peak [10].
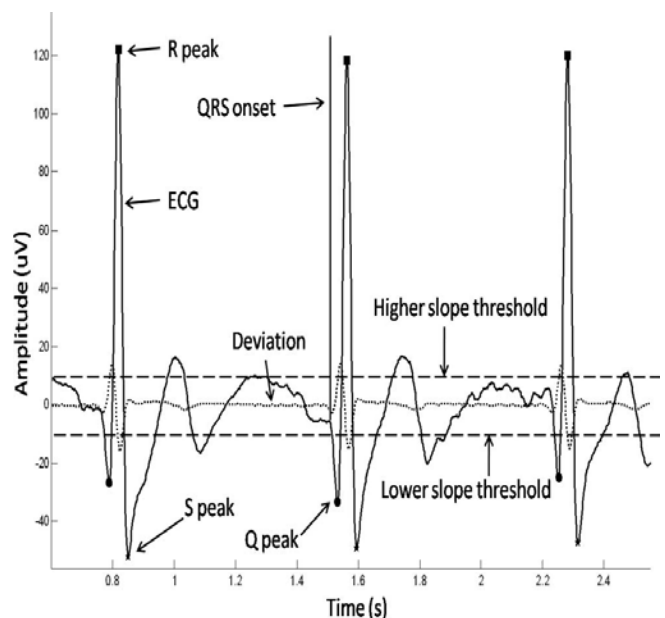
b) Abnormal ECG Detection

After defining the QRS complex and the Q, R, and S wave peak, we then sought to detect common and important rhythm disorders, including sinus tachycardia, sinus bradycardia, cardiac systole, AF, and wide QRS complex. Sinus tachycardia is detected by the condition of the heart rate >100 beats per minute.

An asystole indicates the situation of no heart rate. Wide QRS complex occurred as the duration of QRS complex was greater than or equal to 120 ms. C. AF Detection Since an irregular rhythm of the QRS complexes is the major feature of AF, the R–R interval (RRI), defined as the interval of neighboring QRS complexes, is an ideal parameter to identify AF. This study uses two different algorithms for AF detection.

1) Algorithm I for Abnormal ECG Detection:

Step 1 : Detection of R waves and marking of R peaks.
Step 2 : Calculation of RRI (the duration of adjoinedRpeaks).
Step 3 : Calculation of the variation of consecutive RRI (ΔRRI).
Step4 : Activation of the alarm system whenΔRRI >150 ms occurs twice within each 6 s of computation.

2) Algorithm II for Abnormal ECG Detection

Step 1 : Detection of *R* waves and marking of *R* peaks.
Step2 : Calculation of RRI (the duration of adjoined *R* peaks).
Step3 : Counting the number of peaks to calculate the number of beats in each 6s.
Step4 : Check whether temperature ranges between 33-37^{0}C continues the process, else goto   Step 8
Step5 : Calculation of the variation of consecutive RRI (ΔRRI).
Step6 : Calculation of the SD of RRI (RRIstd) in each 6-s recording.
Step7 : Activation of the alarm system when ΔRRI >150 ms occurs twice and RRIstd > 60 ms within 6 s of computation.
Step 8 : Measuring the heartbeat, up to 180bpm is considerable during very high fever.

Theoretically, Algorithm I is more accurate in detecting an irregular ventricular rhythm, though in detecting frequent pre mature beats during uncommon, it is difficult to differentiate the Atrial Fibrillation from Premature Beats. To overcome this problem, we formulated Algorithm II, which uses a cut-off value of RRIstd >60 ms for AF detection. This condition shows

that whenever the standard Deviation of RRI exceeds 60ms the system will produce an alert signal. The cut-off value of 60 ms was based on comparing 50 normal subjects' and 50 patients having cardiac abnormality' Also Algorithm II will produce an accurate detection considering the temperature of the patient Fig. 4 shows statistical results of the differences between normal and AF patients regarding ΔRRI and RRIstd. Accordingly, the threshold level of ΔRRI and RRIstd were given as 150 and 60 ms, respectively.

V.   Results And Discussions

In order to analyze the performance of the abnormality detection algorithm, the device is fixed to 10 patients who underwent treatment at General Hospital.

Analysis and Performance Calculation was performed according to the recommendations of the American National Standard for ambulatory ECG analyzers (ANSI/AAMI EC38–1994) [11]. A true positive (TP) shows that the algorithm successfully detected abnormality for abnormal subject during every 6 s of computation. On the other hand, a false negative (FN) shows a failed detection of abnormality for an abnormal patient. Finally, false positive (FP) represents a false detection of abnormality, whereas true negative (TN) means normal subjects have no abnormality detection. Accuracy, sensitivity and positive predictive values were used for further analysis. The recorded data were shown in Tables I and II for normal and abnormal patients under testing for different algorithms. Fig.5 shows the analysis of average performance between two algorithms.

The subjects tested for abnormalities were of age group greater than 50. Table I shows the abnormality detection in subjects using Algorithm I. Totally 10 subjects were tested and each were tested 20 times, hence there will be totally 200 tests undergone. Each test was recorded for duration of 6 sec. Hence the total duration for each subject will be 2 min. Similarly, Table II shows the abnormality detection in subjects using Algorithm II and Fig. 5.Represents the analysis of performance between two algorithms.

Table I : Abnormality Detection In Subjects Using Algorithm-I

Subject/Condition (N=10)	Positive Test	Negative Test	Total
Abnormal patients	187	8	195
Normal patients	5	0	5
Total no. of tests			200

Table II : abnormality Detection In Subjects Using Algorithm-Ii

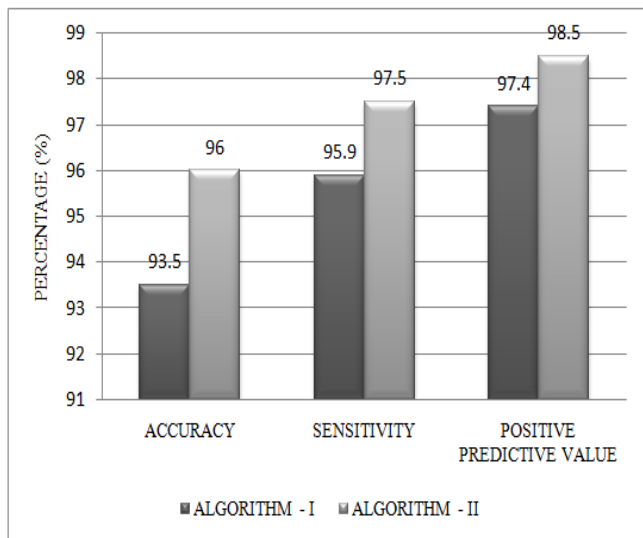| Subject/Condition (N=10)	Positive Test	Negative Test	Total
Abnormal patients	192	5	197
Normal patients	3	0	3
Total no. of tests			200

Fig 5 : Analysis of Average Performance between two Algorithms.

This algorithm shows 100% for normal subjects and with little difference in case of abnormal subjects. While considering Algorithm I the average accuracy was 93.5%, its sensitivity performance is 95.9%, and the positive predictive value is 97.4%. The same 10 patients were also tested using Algorithm II, in which abnormality is detected only when three conditions were met. i.e.,

(i) ΔRRI>150 ms occurs twice
(ii)   RRIstd > 60 ms within 6 s of computation and
(iii)   Body temperature<=104F, No, of Beats>150bpm.

The average accuracy, sensitivity, and positive predictive performance were 96%, 97.5%, and 98.5% respectively. Comparing the performance of both Algorithms I and II, the performance in Algorithm II was much better. These results showed that combining the three conditions as the detection criteria in Algorithm II, will improve the abnormality detection performance, especially in terms of accuracy and sensitivity performance. Among a total of 10 patients, Algorithm II displays the stable and high impact results across subjects. The results suggest that our system can provide a reliable abnormality detection function in telecardiology healthcare services.

VI. Conclusion

AF, the most common sustained cardiac arrhythmia, causes significant mortality and morbidity, and remains a major healthcare challenge [11]. Early detection is very important for providing appropriate therapeutic interventions and managing disease related complications, such as congestive heart failure and stroke. This study demonstrates that the proposed intelligent telecardiology system is capable of accurately detecting AF episodes and instantaneously alerting both the user and the healthcare personnel, facilitating early medical intervention. Furthermore, this intelligent telecardiology system is superior to conventional healthcare devices because it integrates all the key elements in one system. The following list describes the most important features of the proposed system

1) *Wireless* : Communications between devices are all wireless (Zigbee), reducing wire stock usage and allowing convenient operation.
2) *Ambulatory* : The miniature ECG device is very lightweight, can easily be applied to the body, and can operate for a considerable length of time. The system can be run anywhere with a notebook or mobile phone, eliminating the problems of limited power or restricted areas.
3) *Real time* : ECG signals can be transmitted to nearby mobile devices instantly and there is only a few seconds lag when the signals are transmitted to a remote database server, depending on network capacity.
4) *Self-alarm* : The built-in expert system automatically detects abnormal ECG signals and alerts both the user and healthcare personnel using a Internet, or by sending a message to a remote database server installed in the hospital computer system and the emergency service system.

This novel system cannot only be used for inpatients and outpatients, but also provides a long-lasting health monitor to normal people. Patients wearing the lightweight three-limb lead wireless ECG device can hardly feel its presence, but still enjoy a sense of protection.

However, there are several limitations for the expert system. First, Abnormality detection is based on the RRI variation, when the user has frequent atrial or ventricular premature beats, which can be misdiagnosed as AF. Second, in patients with Cardiac Abnormality and markedly impaired AV nodal conduction, RRI variations may become too small for the system to diagnose Abnormality accurately. Lastly, there is still considerable motion noise during the recording, which might impair diagnostic accuracy. In conclusion, this novel intelligent telecardiology system is capable of early Abnormality detection, and represents a

successful first step toward improving efficiency and quality of care in CVD. Further researches aimed at improving both hardware and software designs are necessary to enhance the efficiency and accuracy in future models of this system.

Acknowledgement

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Identifying and Separating Interaction Concerns from Distributed Feature Components

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Abstracts - Implementation of distributed applications over the internet needs the interaction among homogenous/ heterogeneous subcomponents to a great extent. This interaction among heterogeneous components can be implemented by considering the semantic issues of its related compositions. The coordination and cooperation between services at the two ends of application make the problem of interaction more significant. The term interaction can formerly be described in terms of features and services of the application or of the subcomponents & can be called the problem of "feature interaction". This paper proposes a less complex method that uses two concerns termed as signature and transformation. The signature describes the specification aspect of a feature i.e name, arguments etc. On the other hand the transformation describe the working aspect of the feature i.e the fundamental code which actually implements interactions and finally make the two features to work together.

Keywords : Aspect Oriented Programming, feature interaction (FI), FI resolution, feature based development, signature, transformation.

GJCST Classification : D.1.5, I.4.7

Strictly as per the compliance and regulations of:

Identifying and Separating Interaction Concerns from Distributed Feature Components

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Abstract - Implementation of distributed applications over the internet needs the interaction among homogenous/ heterogeneous subcomponents to a great extent. This interaction among heterogeneous components can be implemented by considering the semantic issues of its related compositions. The coordination and cooperation between services at the two ends of application make the problem of interaction more significant. The term interaction can formerly be described in terms of features and services of the application or of the subcomponents & can be called the problem of "feature interaction". This paper proposes a less complex method that uses two concerns termed as signature and transformation. The signature describes the specification aspect of a feature i.e name, arguments etc. On the other hand the transformation describe the working aspect of the feature i.e the fundamental code which actually implements interactions and finally make the two features to work together.

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I. Introduction

In the last few years the unavoidable interaction among the homogenous and heterogeneous applications has been increased to a great extent. The interaction among heterogeneous applications leads to the co-execution or co-operation of loosely coupled modules/queries of the software. Here the loosely coupled means the components of software which are designed and implemented independently from each other, have no or very less number of shared elements among them. This type of software components may be developed at same time but on different domains or may be developed by different providers/teams or may be developed by the same provider/team but at different times. Sometimes during the development of such components to maintain the quality of service it become necessary to bypass the semantic reliability among them. Adaptive capability must be provided to facilitate the smooth resolution of conflicts which ultimately leads to the co-ordination and co-operation between different feature components. Maintaining the co-operation and co-ordination in the distributed system is very cumbersome task. The feature interaction problems faced by the telecommunication industry are identified in [13]. The shifting of software solutions from stand alone computers to distributedsystems and taking steps towards the cloud computing makes this problem more significant and ubiquitous.

A desired capability or functionality of a particular query of component may be termed as feature. Within a telecommunication system a feature is expressed as "unit of functionality existing in a system and usually perceived as having a self contained functional role" [3]. It is very common tradition in telecommunication system to organize the development of projects, peoples and even marketing by features [14]. Same process is also followed apparently by the Microsoft for developing their software products [10]. Feature interaction problem involves an undesired interaction in which "the behavior of one feature is affected by the behavior of another feature or another instance of same feature" [7].

Though the FI problem is firstly identified in telecommunication industry, yet it is not limited to the domains of telephony industry. Another means of communication like e-mail, pager, messages etc also face the same problem. Feature interaction related aspects in traditional and telecommunication system are well documented in [6] & [7]. Problems of similar type are also identified in a number of miscellaneous examples like multimedia, mobile and internet services as discussed in [4] & [1]. Service composition problem can also be considered as feature interaction problem [5].

Small size features are used as building blocks of distributed systems. Because of presence of a number of features in the system, the interaction problem becomes inevitably complex. The solution suggested in this paper is based on separation of interaction related issues of the features; this separation is done in terms of signature and transformation. It allows the easy plug and unplugs of interaction resolution modules i.e. the feature interaction concern is raised up to the meta-level. The basic terminology of aspect oriented programming [8] is used to implement/describe this concept of meta-level. The method adds an enhancement to the previous work discussed in [9]. The resolution strategies discussed here are the step forward in the previous identification of concern based requirement engineering [2]. This approach can be best used by taking the concept discussed in the [13] as its plate-form.

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Importantly this paper takes the issues of resolving interaction problem further by considering two resolutions that themselves interact with each other. Operation precedence is also considered as one of the base to propose the solution of interaction problem. The query based communication system is used as a case study here. Any distributed relational data base system is a typical application of an internet based system, which has many interaction and communication related problems. This system has client and server based structure to store the data and support a number of queries to fulfill the user requests. Important consideration about this system is that it allows a relavar (table) to be stored both at server location (updated periodically) and at client location (updated frequently), to make the easy access of data at client locations. Only highly desired relavars are stored at two locations, to reduce the response time of queries. The feature components taken into consideration are FilterQuery, ForwardQuery and ResendQuery. All of these features are supposed to be implemented at client as well as server location, both for single-copied as well as multi-copied relavars and they help to illustrate interesting interaction properties. Here the same basic approach is used as used in distributed data base i.e. client raise a request for data, which may reside on same machine or on any other machine in distributed system. All the queries raised by one location are supposed to be passed through feature processing components unless it gets executed and result is returned. For simplicity routing issues are ignored.

Filterquery : This feature is used to filter the query based on the user's name and its location from where he/she raise it. To further check the query against the granted permissions in the DBMS, the queries are filtered by using the combination of relavar and user name. Rest all queries are passed to proceed further for execution on other parts of data base.

Forwardquery : This feature component is provisioned to forward a query to a new location based on address of current location to reduce the response time. The reason of forwarding of a query may be heavy load on current location or long distance of server from the client location.

Resendquery : This feature component is used for the timeout queries i.e. if the response of the query is not received within specified time period then it may be resend to the same or to any other target location to get the reply from there.

Based on the above feature components, two interactions among them can be identified as:

Case 1: Considering two locations L1 & L2 of distributed system, both of which keeps the copy of relavar R1. Now suppose a query raised by user U1 from location L1 is forwarded by ForwardQuery to location L2 because of heavy load or any other technical problem but if location L2 has different set of constraints for FilterQuery feature for user U1, then he may not be able to get the reply of his/her query. Here the FilterQuery subverts the ForwardQuery.

Case 2: The ResendQuery feature component become active, and resends the query if user U1 at location L1 does not receive the reply of his query. Here again FilterQuery subverts ResendQuery.

In above two cases it is difficult to resolve the FI conflicts which occur because of the following reasons:

1. Feature under consideration belong to and reside at two different locations. Both locations try to achieve their own goals and follow their own interest.
2. The conflict is acute, therefore difficult to reconcile. In favor of any one side might acutely harm another's side interest.

In above discussed Case 1 location L1 is forwarding the query to another location L2, so that result can be achieved with less response time, but in contrast to location L1, the administrator of location L2 may have different set of constraints applied on query raised by the user U1, to keep the data base secure at his location. This situation causes conflicts among the features and is termed as problem of feature interaction. In case 2 the user resends query because of time out response from location L1, it causes the same problem of feature interaction among the feature ResendQuery and FilterQuery.

This interaction can also be mapped to many other applications whose working depends upon the execution of query by the user. The resolution of this kind of conflicts is inevitably an important part of system if we want to yield better quality of services. However, most of the existing programming paradigms force the developers to program any query resolution code into the core functionality of a feature (referred as feature transformation). This type of entanglements of different functional roles can quickly complicate a system, making it harder to maintain and evolve. This type of deep seeking into the implementation architecture has led us to propose a two level architecture for complexity control.

One thing that must be pointed out here is that although the suggestion for resolution of each feature interaction is discussed in this paper, we have no intention to strictly validate them, because focus is on the separation techniques, rather than the feature interaction resolution issues themselves. As an aside, it is also believed that there is no definition of resolution in context of feature interaction, reason behind it is that the resolution on the same feature interaction problem may vary from developer to developer. The sentence like "resolution of an interaction" is very subjective and is very hard to implement. Sometimes it just meets the requirements of features of users other than a sound rationalization. In this paper it is assumed that any

resolution step that is able to implement any acute feature interactions constitute a resolution of that interaction. Therefore the simplest resolution is to disable one of the interacting features. However, real world applications might need a more deliberate resolution so as to improve the quality of service.

II. Separation Of Interaction Concerns

For the proposed framework, the work proceeds with an assumption that every feature has a clear specification of its functionality. It is confine that implementation of specification varies, even though it is generally easy to distinguish the pure feature code. This part of the feature is considered as "transformation" i.e the inevitable part for the implementation of specification (feature).

However in feature driven development, features must clearly be able to work with other features. Since transformation is acutely rigid business logic, it is unable to adapt itself to different execution contexts (different interactions among features). Hence the corresponding signatures are required to make the interaction easier and make it flexible enough to adopt with other interacting features. Therefore a feature signature is responsible for gluing features together and taking actions to smooth among incompatibilities.

It is not possible for a developer/designer to foresee the feature that will interact with his/her developed feature, hence signature must be able to adjust with transformation at any stage latter on i.e complementing the situations which causes problem with interaction resolution issues when transformation is designed. To make this kind of implementation possible, it is ideally raised up to the meta-level so as to provide a separation among signature and transformation and facilitate reuse and maintenance/ evolution.

Actually it is signature that is thought to be ideally suited to aspect oriented software development techniques. Fig 1 shows the FilterQuery's transformation part.

```
class filter implements Qrt
{
string qryid;
public filter()
 {
    // set statements for filter box
 }
public void receive(Query qry)
{
  filter_feature(qry);
}
private void filter_feature(Query qry)
{
  string sender=qry.location.user();
   if(! Isfilteredlist(sender))
      process(qry)
   else
       discard(qry);
}
public boolean isfilteredlist(string sender)
{
  string      list=sender.substring(sender.indexof("table name")+1);
return boolean(list);
}
public void process(Query qry)
{
  //execute the query;
}
public void discard(Query qry)
{
   //discard the query;
}
}
```

Fig 1. FilterQuery's transformation, implements only what specification specifies.

The transformation logic takes care of filtering the incoming query against a filter check list. In order to do this, for an incoming query, it will get the sender's address and check it against the filter list, then decide to either process it or discard it depending upon check list's entry. The Qrt interface, which contains two methods, *receive* and *process* must be implemented for the connection of feature boxes. It can be seen that transformation of a feature is simple, cohesive and highly consistent with its original specification. Typically features have two basic parts:

1.   Some data (structure) such as list of filter permissions, list of filter users etc.
2.   Some method to operate on data and provide necessary feature logic to implement a service feature.
The signature of the feature is expressed by considering the two features together.

a) Filterquery Vs Forwardquery

The signature of the feature can help in an easy way to come out of the problem faced during the interaction among the FilterQuery and ForwardQuery. One might use a form to ask a feature owner to specify options/preferences/policies for dealing with interaction so as to collect the basic data for negotiation, while another way might just design a default resolution policy. A simple resolution based on a default policy is discussed here. As ForwardQuery behave passively for this interaction, the policy requires a decision by the FilterQuery. A reasonable default policy of FilterQuery might be "to apply a check on the received query from user U1 whether this query has an entry in the filter list at location L1 if so then location L2 must follow the same check list for processing of query at its location, but if there is no entry in the filter list at location L1 against user U1 then location L2 is free to use its own

62

filter list for query raised by user U1." Thus the users as well as locations are free to process the query in their own way, though both locations have their own list to filter the queries. Formally this resolution can be described as:

Every time FilterQuery is about to process a query, it should additionally check if the query is from the ForwardQuery, if so, it must demand and follow the same filter list as obtained from the ForwardQuery's location, otherwise, it is free to process the query as per its own filter list. For this implementation ForwardQuery must add a <forward> tag in the content with original sender's location that allows FilterQuery to check against the filtering list.

Fig. 2 shows the implementation of above resolution in aspect oriented language.

```
aspect ForwardQuery()
{
    flist=filterlist.currentloaction();
      void prc(Query qry, boolean fwd)
      {
        If(fwd)
          {
              flist=getfilterlist.prevlocation();
              process(qry,flist);
          }
        else
            process(qry,flist);
      }
}
```

Fig.2 Resolve FI between FilterQuery and ForwardQuery

b) Filterquery Vs Resendquery

The goal of filtering must be clear at the time of resolution among the features. The features FilterQuery and ResendQuery interact in a number of ways to each other. In some cases the FilterQuery is implemented in context of ResendQuery only to avoid the re-execution of already executed query. If this is the case then problem of interaction can be resolved only by keeping record of acknowledgments to the users/locations. Based on this insight, a resolution can be suggested as follows:

Every time FilterQuery is about to execute a query it checks whether the query is received first time or it is received from the ResendQuery, if it is first arrival then execute it otherwise the FilterQuery will first check the list of acknowledgements for already executed queries, if it found an entry it simply discard the execution. To let the FilterQuery know that the query is a resend query, ResendQuery must add a <resend> tag in the sent query.

Fig. 3 shows the resolution for FilterQuery and ResendQuery

```
aspect stop ReExe()
```

```
{
    void filter(Query qry)
    {
      boolean resend;
      resend=qry.location.ack;
      if(resend)
       discard(qry);
      else
          process(qry);
    }
}
```

Fig. 3 Resolve FI between FilterQuery and ResendQuery

III. PROBLEM FACED DURING COMPOSITION

Last section clearly shows that by using the basic terminology of aspect oriented programming for representation of feature interaction resolution is an effective way of feature composition. It is also flexible with respect to further evolution of the system. However, FI problems are complicated issues, and a resolution is unlikely to be independent of other resolutions. This is not unexpected, since resolution themselves can be viewed as features, which, of course are prone to interactions.

Both interactions resolutions discussed above require new behavior of advice around FilterQuery. Basically a FilterQuery feature is used or applying a check on the permissions granted to various users/locations. For every raised query, it either processes the query or discard it. Interestingly, there is an antithesis between two resolutions. The first, i.e the case of FilterQuery and ForwardQuery, says that if the query is a forwarded query then the FilterQuery makes a check by using the filtered list against which it is to be filtered. It always demands the filter list from concerned locations which made an extra burdon on the system. This problem can be rescued by keeping the filter list unique or keeping the filtered list at all locations. While second, i.e the FilterQuery and ResendQuery, says that a query is discarded if their exist acknowledgement in the acknowledgement list for the same query, the situation may be that the acknowledgement and result is sent from the server but is not received at the location because of communication channel problem. The resolution for this circumstance is that we must do something to rescue it from being discarded.

When composing the two resolution features together, the problem is: while one resolution require the processing of query the other resolution wants to discard it. The problem can be reduced by considering the comprehensive view in Fig.4 about the queries that are to be processed after forward of resend query. This typical configuration is shown as follows:
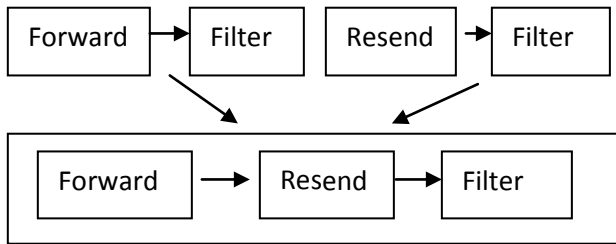
Fig. 4 : Comprehensive view of all features arrangements.

IV. Evolution Of Our Approach

Our evolution can be classified into a number of different properties including cleanness of separation, faithfulness of implementation to specification, re use, adaptability to requirement change etc. Name of all the specified properties shows that they are qualitative than quantitative.

a)   Cleanness Of Separation
1. The approach discussed in this paper avoids the tangling of core behavior with resolution code, it allow a feature to work with other features.
2. All the features illustrate an elegant separation when implemented. Important to note is that not every interaction require a separate resolution module thus motivating our search for more general interaction resolution patterns.

b)   Faithfulness Of Implementation To Specification:
1. The design of two level architecture keeps the feature's implementation faithful to its specification.
2. This design can be used as a base to generative programming techniques to generate code automatically from specification.

c)   Re Use
1. Reuse for very specific interaction resolution modules (Fig. 2 and Fig. 3) is limited. The best opportunity to re use is at the base level (signature) rather than the meta level.
2. The re-factored GUI (if build) modules can be reused in other implementations since all interactions concerns are extracted thus leaving a generic feature component

d)   Adaptability To Requirement Change:
1. The separation proposed by our architecture allows the developer to integrate new features into the system, without needing to consider, or worse rewrite, existing feature.
2. The aspect oriented approach for the separate resolution modules allow the developer to implement a feature without considering the interaction with other features, then focus on the interaction issues separately.
3. Removal of a feature from a system to avoid redundant code being left embedded in feature boxes, a situation that leads to unnecessary complexity and low efficiency.

V. Conclusion And Future Work

Heterogeneous service nature of distributed features make the problem of FI in today's applications more sever. It is believed that the separation of interaction concerns is the key to the success of reusability and maintenance of an evolving system. Signature and transformation separation are metaphors for the relationship between a feature's functional logic and its adaption logic. The signature provide a way to transformation so as to allow it to adapt to a feature interaction. Lifting up the transformation code to a meta level is the vital decision for the separation. The emerging area of aspect oriented programming provides a new dimension for the implementation of this concept.

More investigations are required to be carried out to abstract further interaction resolution patterns, and further interaction resolution pattern libraries for different domains. The focus of interaction resolution is the composition problem, namely the semantic conflicts occurring when two interactions resolutions composing together.

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Personalized Web Search Techniques - A Review

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Abstracts - Searching is one of the commonly used task on the Internet. Search engines are the basic tool of the internet, from which related information can be collected according to the specified query or keyword given by the user, and are extremely popular for recurrently used sites. With the remarkable development of the World Wide Web (WWW), the information search has grown to be a major business segment of a global, competitive and money-making market. A perfect search engine is the one which should travel through all the web pages inthe WWW and should list the related information based on the given user keyword. In spite of the recent developments on web search technologies, there are still many conditions in which search engine users obtains the non-relevant search results from the search engines. A personalized Web search has various levels of efficiency for different users, queries, and search contexts. Even though personalized search has been a major research area for many years and many personalization approaches have been examined, it is still uncertain whether personalization is always significant on different queries for diverse users and under different search contexts. This paper focusses on the survey of many efficient personalized Web search approaches which were proposed by many authors.

Keywords : Personalized Web Search, Ontology-based Multi-Facet (OMF), Personal Agent for Web Search (PAWS).

GJCST Classification : H.3.3, H.3.5

PERSONALIZED WEB SEARCH TECHNIQUES –A REVIEW

Strictly as per the compliance and regulations of:

Personalized Web Search Techniques - A Review

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Abstract - Searching is one of the commonly used task on the Internet. Search engines are the basic tool of the internet, from which related information can be collected according to the specified query or keyword given by the user, and are extremely popular for recurrently used sites. With the remarkable development of the World Wide Web (WWW), the information search has grown to be a major business segment of a global, competitive and money-making market. A perfect search engine is the one which should travel through all the web pages in the WWW and should list the related information based on the given user keyword. In spite of the recent developments on web search technologies, there are still many conditions in which search engine users obtains the non-relevant search results from the search engines. A personalized Web search has various levels of efficiency for different users, queries, and search contexts. Even though personalized search has been a major research area for many years and many personalization approaches have been examined, it is still uncertain whether personalization is always significant on different queries for diverse users and under different search contexts. This paper focusses on the survey of many efficient personalized Web search approaches which were proposed by many authors.

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I. Introduction

Search engines present a well - organized way to search the relevant information from the Web. However, the search results acquired might not always be helpful to the user, as search engine fail to recognize the user intention behind the query. A particular word could mean many things in dissimilar contexts and the anticipated context can be determined by the user alone. For illustration, specified a search keyword "apple", a user might be searching for fruit apple or for apple computers. A typical search engine provides similar set of results without considering of who submitted the query. Therefore, the requirement arises to have personalized web search [1] system which gives outputs appropriate to the user as highly ranked pages.

With the growth of Internet, people are becoming more and more dependant on the Web search engines for their various information needs. In spite of the extensive use, there are still several challenges for search engine. Particularly, when queries are entered to a search engine, similar results are returned to different users. To avoid this difficulty, personalized Web search [1, 16] has been developed. In personalized search, how to efficiently acquire user's real-time information requirement is a key issue. User's query inputted to the search engine is the most important source of evaluating information need. However, the query has the characteristics of shortness, ambiguousness and incompleteness which control the clear expression of user's information requirements and thus influences the qualification for personalized search. Consequently, it is far from sufficient to achieve user's requirement only from the query.

The most common problem of most Web search systems is that they do not think about the differences among individual user needs. The result of the search process relies exclusively upon the query. The underlying search engine presents the same search results for different users when they submit the same query, not considering about their different information needs and preferences.

Some information systems planned to understand such adaptive systems have been developed that personalize information or present more appropriate information for users. Three categories of Web search systems present such information: (a) systems that make use of relevance feedback, (b) systems in which users register their interest or demographic information, and (c) systems that suggest information according to users' ratings. In these systems, users are required to register personal information for instance, their interests, age, and so on, or users are required to give feedback on relevant or irrelevant results, ratings on a scale basis from 1 (very bad) to 5 (very good). This is time consuming and hence users desire to use some other easier methods. To avoid these difficulties, some new approaches have to be proposed to reduce the difficulties of users.

In most of these systems and techniques, however, only users' static information, like interest, information [17] , such as feedback , browsing, etc., are utilized to carry out personalized web search,

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and the situation/circumstance of users are not taken into account. On the other hand, the user's information needs completely depend on his situations/circumstances, so such information should be considered to realize personalized web search.

Through the application of high-speed internet, high capacity networks, and highly developed interactive websites, like Facebook, Youtube and blogging, searching has grown to be much easier for the internet users to publish data over the Web. With this information flooding era, it has become very difficult for a user to recognize the right information over the Web.

Personalized Web search is to perform retrieval for each user by taking his/her own situations/circumstances into account. As the competition in search market grows rapidly, some search engines have presented the personalized search service. For instance, Google's Personalized Search permits users to specify the Web page categories of interest. Some Web search systems use relevance feedback to process user requirements or inquire users to register their demographic information earlier so as to present better service. Since these approaches requires users to engage in extra activities to specify their preferences manually further than search, approaches that are capable of implicitly recognizing users' information needs should be developed. Since the need for Personalized Web search is increasing, many researches have to be done to provide the relevant information by considering the users situations. The next section describes the various Personalized Web search approaches proposed by many authors.

II. LITERATURE SURVEY

Nauman *et al.,* [1] used personalized web search for enhancing common sense and folksonomy based intelligent search systems. A huge division of the contemporary web is characterized by user generated content classified using collaborative tagging or folksonomy. It makes very tricky to search for appropriate content because of ambiguity in lexical illustration of concepts and variances in preferences of users. With additional services relying on tags for content classification, it is significant that search approaches progress to better suit the scenario. A promising technique in avoiding these difficulties is to use machine common sense in combination with folksonomy. A past effort to use this technique has shown encouraging results in obtaining relevant content but it does not deal with the issue of noise in search results. In this paper, the authors make use of the personalized web search approach of conventional web search systems to concentrate on the issue of irrelevant search outcomes in common sense and folksonomy dependent search systems. In personalized web search, outcomes are reflective of user's favorites, which are based on the search history and kind of interest shown by the user. This paper proposes alterations to personalized web search approach. Using this personalized approach, the authors extend the fundamental common sense and folksonomy dependent search systems to deal with the problem of noise in search results.

Zhengyu Zhu *et al.,* [2] proposed query expansion based on a personalized web search model. An innovative query expansion approach is proposed in this paper. It depends on a representation of personalized web search organization. The novel system, as a middleware connecting a user and a Web search engine, is fixed on the client machine. It can study the user's favorite implicitly and then produce the user profile automatically. When the user enters query keywords, more personalized expansion words are produced by the proposed approach, and then these words in common with the query keywords are forwarded to a famous search engine such as Baidu or Google. These expansion words can facilitate search engine retrieval information for a user based on his/her implicit search objectives. The novel Web search representation can build an ordinary search engine personalized, specifically all the way through personalized query expansion the search engine can provide different search results to different users who enter the equivalent keywords. The experimental observations demonstrate the consequence and use of the proposed work for personalized information service of a search engine.

P. Palleti *et al.,* [3] developed personalized web search using probabilistic query expansion. The Web comprises of enormous amount of data and search engine recommends professional ways to assist navigate the Web to obtain the relevant information. Most common search engines, on the other hand, provide query results without taking user's purpose behind the query. Personalized Web search system intends to offer relevant outputs to users by considering user interests into account. In this approach, the authors developed a personalized Web search system applied at proxy which changes to user interests perfectly by generating user profile with the use of collaborative filtering. A user profile basically consists of probabilistic correlations among query terms and document terms which are utilized for providing personalized search results. Experimental outcomes prove that this proposed personalized Web search system is very effective and efficient.

Jie Yu *et al.,* [4] suggested mining user context based on interactive computing for personalized Web search. Personalized Web search is a successful way of same query. How to achieve user's real-time information requirement is a key subject in personalized search. Existing approaches focus more on constructing user profile which depends on Web pages/documents which influences the effectiveness [5] of search engine.

Additionally, dynamics of user profile is frequently ignored. To deal with this problem, the authors have introduced a technique that acquires the user context to perfectly present preferences of users for successful personalized search in this paper. Initially, small-term query context is created from Web-snippets to take part a role of semantic background of user's search behavior, recognizing associated concepts of the query. Then, user context snap is constructed depending on query context based on user's interactive search behavior. Finally, development of user context is taken into account by introducing forgetting factor to combine the independent user context snap in a user session. The experimental outputs completely reveal that this technique can effectively construct user context based on individual user information need.

Fang Liu *et al.,* [5] recommended personalized Web search for improving retrieval effectiveness. Modern Web search engines are generated to serve all users, independent of the particular requirements of any individual user. Personalization of Web search is to perform retrieval for every user according to his/her interests. In this paper, the authors propose a novel approach to learn user profiles from users' search histories. The user profiles are then utilized to enhance retrieval efficiency in Web search. A user profile and a common profile are studied from the search history of the user's and a category hierarchy, respectively. These two profiles are integrated to map a user query into a group of categories which corresponds to the user's search intention and provide a context to disambiguate the words in the user's query. Web search is performed according to both the user query and the group of categories. A number of profile learning and category mapping approaches and a fusion algorithm are presented and evaluated. Experimental outcomes show that this approach to personalize Web search is very effective.

Xuwei Pan *et al.,* [6] proposed context-based adaptive personalized Web Search for improving information retrieval effectiveness. Recent Web search/meta search engines are constructed to serve all users, independent of the particular requirements of any individual user in dissimilar situations. Personalization of web search is to perform retrieval for each user integrating his/her interests. In this approach, the authors proposed a novel adaptive personalized technique based on context to adapting search outputs consistent with each user's requirement in different situations for relevant information with slight user effort. Personalized Web search is a successful way of offering precise results to different users when they present the Following to the process of the context-based adaptive personalized search investigation, three important technologies to execute this method are provided, which are semantic indexing for Web resources, modeling and obtaining user context and semantic resemblance matching among Web resources and user context.

Experimental observations prove that the adaptive personalized search system is executed by most of users and the approach to personalize Web search is effective.

Kyung-Joong Kim *et al.,* [7] developed a personalized Web search engine using fuzzy concept network with link structure. Most of the famous search engines make use of link structure to discover precision result. Typically, a link-based search engine provides superior-quality outputs than a text-based search engine. On the other hand, they have complexity in providing the result that satisfies the specific user's preference. Personalization is necessary to maintain a more suitable result. Among many approaches, the fuzzy concept network according to a user profile can characterize a user's subjective interest appropriately. The paper proposes another search engine that utilizes the fuzzy concept network to personalize the outputs from a link-based search technique. Depending on a user profile, the fuzzy concept network rearranges five outputs of the link-based search engine, and the system presents a personalized superior quality result. Experimental observations with the three subjects show that the system proposed searches not only appropriate but also personalized Web pages on a user's preference.

Chen Ding *et al.,* [8] suggested personalized Web search with self-organizing map. The commonly used Web search engines provide the similar answer set for different users, even though the users possibly will have different preferences. Personalized Web search performs the search for all users according to their preference. With the intention of minimizing the consumption of time on browsing irrelevant documents, this paper suggests an intelligent Personal Agent for Web Search (PAWS). The PAWS cleverly utilizes the self organizing map (SOM) as the user's profile and therefore, is capable of providing high quality answer set to the user.

C. Biancalana *et al.,* [9] proposed a new way for personalized Web search using social tagging in query expansion. Social networks and collaborative tagging systems are quickly attaining more recognition as most important means for categorization and sharing data: users tag their bookmarks so as to make things easier for information distribution and later visit. Social Bookmarking approaches are helpful in two essential respects: first, they can permit an individual to remember the browsed URLs, and second, tags can be made by the group of people to direct users towards important content. This paper concentrates on the latter use. The authors present a novel method for personalized web search with the use of query expansion [2, 3]. This paper additionally extends the group of recognized co-occurrence matrix approach models by using a new method of exploring social tagging services. The proposed approach illustrates its

power especially in the case of disambiguation of word contexts. This paper shows steps to plan and execute such a system in practice and performed numerous experiments on a real web-dataset. This is the first study focused on the use of social bookmarking and tagging approaches for personalization of web search and its performance in a real-world application.

Personalized Web search with location preferences is recommended by K.W.-T. Leung *et al.,* [10]. Since the amount of Web information develops at very fast pace, search engines must be capable of retrieving information based on the user's preference. In this paper, the authors recommended a novel web search personalization technique that recognizes the user's interests and preferences with the help of concepts by mining search outputs and their clickthroughs. Because of the significant role played by the location information in mobile search, the author planned to divide concepts into content concepts and location concepts, and categorize them into ontologies to generate an ontology-based, multi-facet (OMF) profile to exactly recognize the user's content and location interests and hence enhance the search accuracy. Furthermore, identifying the information that different users and queries may have different importance on content and location information, this paper introduces the idea of content and location entropies to determine the amount of content and location information linked with a query, and click content and location entropies to calculate how much the user is concerned in the content and location information in the results. As a result, the authors proposed to define personalization efficiency based on the entropies and utilize it to equal the weights among the content and location facets. Finally, based on the resultant ontologies and personalization efficiency, the author trained an SVM to adapt a personalized ranking function for re-ranking of future search. Many experiments were carried out to evaluate the precision produced by this OMF profiles and that of baseline method. Experimental outcome shows that OMF enhances the precision considerably compared to the baseline.

J. Lai *et al.,* [11] compared personalized Web search results with user profile. The huge information available on the Internet makes it difficult for users to acquire necessary information from the Web searched results in a more personalized approach. For the same key word, most of the search engines provide the similar result to each user without considering user preference. For many users, it is no longer adequate to obtain non-customized outputs. It is vital to evaluate users' search and browsing activities [17] based on searching keywords inputted by users, the clicking rate of each link in the output and the time they used on each site. To this end, the authors have proposed a technique to obtain user searching profiles. This paper also proposed a method to obtain document profiles, according to similarity score of documents. In this paper, the authors discussed how to utilize this model to integrate the user searching profiles and the document profile, with the intention of presenting personalized search results to the users.

B. Smyth [12] proposed a community-based approach to personalizing Web search. Researchers can influence the underlying knowledge produced within search communities by gathering users' search behaviors - the queries they enter and results they choose - at the community level. They can make use of this data to construct a relevance model that provides the promotion of community-relevant results throughout standard Web search. This paper focuses on the collaborative Web search technique that encourages the suggestion that community search behaviors can offer valuable form of search knowledge and sharing of this knowledge makes adapting conventional search-engine outputs possible.

O. Shafiq *et al.,* [13] put forth community aware personalized Web search. Searching for the accurate information over the Web is not easy. In the era of high speed internet, elevated capacity networks, and interactive Web applications, it has turned out to be even easier for the users to publish data online. A huge amount of data is published over the internet; every data is in the form of web pages, news, blogs and other material, etc. In the same way, for search engines like Google and Yahoo, it becomes slightly hard to discover the accurate information, i.e., as per user's preferences; search results for same query would be different in priority for different users. In this paper, the authors proposed a technique to prioritize search results of search engines like Google, according to the individual interests and context of users. With the purpose of finding out personal interest and context, this paper follows a distinctive method of (a) finding out behaviors of a user of his/her social-network, (b) finding out what information does the social networks (i.e., friends and community) present to the user. Based on this information, the authors have formulated a methodology that considers the information about social networks and prioritize search outputs from Web search engine.

Han-joon Kim *et al.,* [14] suggested building a concept network-based user profile for personalized Web search. This paper presents an innovative approach of building the user profile of concept network for personalized search. The user profile is characterized as a concept network, where each concept is approximately denoted with the formal concept analysis (FCA) theory. Consider a concept, called `session interest concept', include a user's query intention throughout a query session and it can reproduce the user's preference. Every time a user enters his/her query, a session interest concept is

created. Then, these innovative concepts are combined into the existing concept network (i.e., a user profile) wherein recent user preferences are gathered. Based on FCA, a session interest concept is characterized as a pair of extent and intent where the extent integrates a set of documents preferred by the user among the search outputs and the intent comprises of a set of keyword features obtained from the chosen documents. And, with the intention of making a concept network develop, it is necessary to estimate the resemblance among a new concept and presented concepts, and to this end, the author makes use of a reference concept hierarchy called Open Directory Project. The user profile of concept network is ultimately utilized to develop a user's initial query. The experimental result proves that this approach increases the accuracy of search results based on the personal preference.

Yan Chen *et al.,* [15] recommended a personalized context-dependent Web search agent using semantic trees. In Web searching applications, contexts and users' preferences are two significant features for Internet searches in some way that outputs would be much more appropriate to users' requests than with existing search engines. Researchers had planned a concept-based search agent which utilizes conceptual fuzzy set (CFS) for matching contexts-dependent keywords and concepts. In the CFS model, a word accurate meaning may be determined by other words in contexts. Owing to the fact that various combinations of words may become visible in queries and documents, it may be complicated to identify the relations between concepts in all possible combinations. To avoid this problem, the authors proposed a semantic tree (ST) model to identify the relations between concepts. Concepts are symbolized as nodes in the ST, and relations connecting these concepts are represented by the distances between nodes. Furthermore, this paper makes use of the users' preferences for personalizing search results. Finally, the fuzzy logic will be utilized for finding which factor, semantic relations or users' preferences will control results.

Wen-Chih Peng *et al.,* [16] proposed ranking Web search results from personalized perspective. In this paper, the authors develop the approach of data mining to mine common access patterns from user browsing activities. By considering common access patterns, developed an approach to automatically obtain user interests. Additionally, according to the user interests mined and feedbacks of users, a new approach is proposed with the plan of dynamically altering the ranking scores of Web pages. In particular, algorithm PPR standing for Personalized Page Rank, is segmented into four stages. The first stage allots the initial weights according to user interests. In the second stage, the virtual links and hubs are generated based on user interests. By examining user click streams; this proposed algorithm will incrementally reproduce user favors for the personalized ranking in the third stage. To enhance the accuracy of ranking, collaborative filtering is considered when the new query is entered. By carrying out simulation experiments, it is shown that algorithm PPR is not only very efficient but also very adaptive in offering personalized ranking to users.

M. Kutub *et al.,* [17] examined the user Web search behaviour. Since the beginning of the web searching technology, people have been searching for almost everything and anything on the internet. The ever-increasing habits of users on these search engines and the dynamic nature of the World Wide Web has diminished the accurateness of the search results and raised the search time of an individual. In recent days, more than ever before, there is a necessity for search engines to be appropriate and accurate to the user's requirements and to be capable of making decisions about what the user desires to search, and should be competent to suggest him similar or related topics of his interest. This mounting necessity of the search engine to develop into a decision engine brought to fore different creative technological approaches like Tag clouds and AutoComplete. For enhanced and more appropriate search experience, it is essential that the study of existing search behavior of users and its equivalent response by the search engine. This approach considers the nature of searches made and how they change from time to time. In this paper, the authors examined and take data from different angles and then present suggestions and conclusions for improved, more personalized and relevant search.

B. Arzanian *et al.,* [18] proposed a multi-agent based personalized meta-search engine using automatic fuzzy concept networks. Since the dynamic content of the web develops rapidly, the common purpose web search engines are becoming poor. Even though the meta-search engines can assist by raising the search coverage of the web, the vast number of unrelated results returned by a meta-search engine is still causing problems for the users. The personalization of meta-search engines avoids this problem by filtering results according to individual user's interests. In this paper, a multi-agent structural design is developed for personalizing meta-search engine by means of the fuzzy concept networks. The most important objective of this paper is to use automatic fuzzy concept networks to personalize outputs of a meta-search engine presented with a multi-agent architecture for searching and fast retrieving. Experimental outputs indicate that the personalized meta-search results of the system are more appropriate than the combined results of the search engines.

Dik Lun Lee *et al.,* [19] put forth personalized concept-based clustering of search engine queries. The remarkable development of information on the Web has forced new challenges for the construction of effective

search engines. The most important problem of Web search is that search queries are typically short and ambiguous, and thus are inadequate for identifying the precise user needs. To alleviate this difficulty, a few search engines recommend terms that are semantically connected to the specified queries so that users can select from the suggestions the ones that return their information needs. In this paper, the author introduced an efficient technique that recognizes the user's conceptual preferences with the intention of providing personalized query suggestions. This objective can be realized with two new strategies. At first, develop online approaches that extract concepts from the Web-snippets of the search outputs returned from a query and utilize the concepts to recognize related queries for that query. Then, propose a novel two-phase personalized agglomerative clustering approach that is capable of creating personalized query clusters. No earlier work has focused personalization for query suggestions, according to author's knowledge. To estimate the efficiency of this technique, a Google middleware was formulated for collecting clickthrough data to perform experimental evaluation. Experimental results show that this technique has enhanced precision than the existing query clustering approaches.

F. Akhlaghian *et al.,* [20] proposed a personalized search engine using ontology-based fuzzy concept networks. At the moment, personalization of search engines as the only web search tool plays significant role in raising the speed of access to web information. Since the users may have various backgrounds and anticipations for a specified query, personalization of search engines outputs based on user's profile can assist to better match the overall interests of an individual user. In this paper the authors personalize the search engine outputs with the help of automatic fuzzy concept networks. The main objective is to make use of the concepts of ontology to improve the common fuzzy concept networks built according to user's profile. Experimental output shows enhancement in personalized search engine outputs using enriched fuzzy concept networks contrast to common fuzzy concept networks.

III. PROBLEMS AND DIRECTIONS

Many Personalized Web search approaches have been discussed in the literature survey. The following directions will help the researchers and guide them to develop the best Personalized Web search approach.

a) Information about the Users Community in Social Networks

A framework to rank Web search outcomes according to the information provided by the user in his/her community from the social networks. This approach can assist in providing more relevant information for a particular user by reorganizing the search results from Web search engines. Hence it enables users to acquire the right information in accordance with their interest uncomplicatedly.

b) Input Query with the Category of Search

The input query is associated with a small set of categories. For example, the input query "windows" can be entered with the category "software" or "computer", and then the user's objective becomes understandable. Also the construction of specific search engines for specific purpose will satisfy the users.

IV. CONCLUSION

The remarkable development of information on the Web has forced new challenges for the construction of effective search engines. The only input to the search engine is the keyword and it searches the whole WWW to provide the relevant information to the users. However, most of users are likely to use only a few keywords to convey their information requirements, and thus the search queries usually do not correspond to what the users want specifically. In addition, with the huge development of the information presented on the Web, it is very complicated for Web search engines to satisfy the user information requirement only with a short ambiguous query. To overcome such a basic difficulty of information retrieval, personalized search, which is to provide the customized search results to each user, is a very promising solution. Fundamentally, in studying how a search can be personalized, the most significant thing is to accurately identify users' information. This survey will guide the researchers to develop a promising technique for Personalized Web search technique.

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72

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An Expert System for the Intelligent Diagnosis of Hiv Using Fuzzy Cluster Means Algorithm

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Abstracts -   Human Immunodeficiency Virus (HIV) is a retrovirus that causes Acquired Immune Deficiency syndrome (AIDS) by infecting helper T cells or Lymphocyte of the immune system. HIV is transmitted primarily by exposure to contaminated body fluids, especially blood and semen. Other means of transmission of HIV include sharing contaminated sharp objects and blood transfusion. HIV symptoms can include: headache, chronic cough, diarrhea, swollen glands, lack of energy, loss of appetite, weight loss, frequent fevers, frequent yeast infections, skin rashes, pelvic/abdominal cramps, sores on certain parts of your body and short-term memory loss. The focal point of this paper is to describe and illustrate the application of fuzzy cluster means system to the diagnosis of HIV. It involves a sequence of methodological and analytical decision steps that enhances the quality and meaning of the clusters produced. The proposed system eliminates theuncertainties often associated with analysis of HIV test data.

Keywords : Fuzzylogic, Clustering, FuzzyC-Means, HIV.

GJCST Classification : I.2.1

AN EXPERT SYSTEM FOR THE INTELLIGENT DIAGNOSIS OF HIV USING FUZZY CLUSTER MEANS ALGORITHM

Strictly as per the compliance and regulations of:

An Expert System for the Intelligent Diagnosis of Hiv Using Fuzzy Cluster Means Algorithm

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Abstract - Human Immunodeficiency Virus (HIV) is a retrovirus that causes Acquired Immune Deficiency syndrome (AIDS) by infecting helper T cells or Lymphocyte of the immune system. HIV is transmitted primarily by exposure to contaminated body fluids, especially blood and semen. Other means of transmission of HIV include sharing contaminated sharp objects and blood transfusion. HIV symptoms can include: headache, chronic cough, diarrhea, swollen glands, lack of energy, loss of appetite, weight loss, frequent fevers, frequent yeast infections, skin rashes, pelvic/abdominal cramps, sores on certain parts of your body and short-term memory loss. The focal point of this paper is to describe and illustrate the application of fuzzy cluster means system to the diagnosis of HIV. It involves a sequence of methodological and analytical decision steps that enhances the quality and meaning of the clusters produced. The proposed system eliminates the uncertainties often associated with analysis of HIV test data.

Keywords :*Fuzzy logic, Clustering, Fuzzy C-Means, HIV*

I. INTRODUCTION

Human immunodeficiency virus (HIV) is a retrovirus (a virus whose genetic information is contained in Ribonucleic acid instead Deoxyribonucleic acid) that causes Acquired Immune Deficiency Syndrome (AIDS) by infecting helper T cells or Lymphocyte (cells that defense the body at foreign bodies) of the immune system.

Antigen are substances that stimuli the production of antibody. A serotype or serovar is a group of bacteria that share a characteristic set of antigen. The most common serotype or serovar, HIV-1, is distributed worldwide, while HIV-2 is primarily confined to West Africa (Healthline, 2011). AIDS is a severe immunological disorder caused by the retrovirus HIV, resulting in a defect in cell-mediated immune response that is manifested by increased susceptibility to opportunistic infections and to certain rare cancers, especially Kaposi's sarcoma (Healthline and MedicineNet, 2011). It is transmitted primarily by exposure to contaminated body fluids, especially blood and semen. Other means include sharing contaminated sharp objects and blood transfusion. Everybody who has AIDS also has HIV, but not everybody with HIV is classified by the United States (U.S.) government as having AIDS. The U.S. government uses CD4 cell counts (part of the immune system) to make this distinction (Healthline, 2011).

The earliest known case of HIV-1 came from a human blood sample collected in 1959 from a man in Kinshasa, Democratic Republic of Congo (healthline, 2011). The method by which he became infected is not known; however, genetic analysis of his blood sample suggested that HIV-1 might have stemmed from a single virus in the late 1940s or early 1950s. HIV has existed in the United States since the mid to late 1970s. During 1979 to 1981, rare types of pneumonia, cancer, and other illnesses were reported by physicians in Los Angeles and New York among a number of male patients who had sex with other men. Los Angeles and New York among a number of male patients who had sex with other men. Since it is rare to find these diseases in people with a healthy immune system, public health representatives became concerned that a new virus was emerging (Healthline, 2011).

In 1982, the term AIDS was introduced to describe the occurrences of opportunistic infections, Kaposi sarcoma, and pneumonia (*Pneumocystis carinii*) in previously healthy persons and formal tracking of these cases in the United States began that year. The virus that causes AIDS was discovered in 1983 and named human or helper T-cell (lymphotropic) virus-type III/ lymphadenopathy associated virus (HTLV-III/LAV) by an international scientific committee who later changed it to HIV (Healthline, 2011 and MedicineNet, 2011). Many theories as to the origins of HIV and how it appeared in the human population have been suggested. The majority of scientists believed that HIV originated in other primates and was somehow transmitted to man. In 1999, an international group reported the discovery of the origins of HIV-1, the predominant strain of HIV in the developed world (Healthline, 2011). A subspecies of chimpanzees native to west equatorial Africa were identified as the original source of the virus. The researchers believe that HIV-1 was introduced into the human population when hunters became exposed to infected blood (Healthline, 2011; MedicineNet, 2011 and WrongDiagnosis).

Most scientists believe that HIV causes AIDS by directly inducing the death of CD4+ T cells (helper T cells in the immune system) or interfering with their

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normal function and by triggering other events that weaken a person's immune function. For example, the network of signaling molecules that normally regulates a person's immune response is disrupted during HIV infection, impairing a person's ability to fight other infections. The HIV-mediated destruction of the lymph nodes and related immunologic organs also plays a major role in causing the immunosuppressant seen in persons with AIDS (Healthline, 2011).

In the absence of antiretroviral therapy, the median time from HIV infection to the development of AIDS-related symptoms has been approximately 10 to 12 years (Healthline, 2011 and WrongDiagnosis, 2011). A wide variation in disease progression, however, has been noted. Approximately 10 percent of HIV-infected persons have progressed to AIDS within the first two to three years after infection, whereas up to 5 percent of persons have stable CD4+ Tcell counts and no symptoms even after 12 or more years (Healthline, 2011). Factors such as age or genetic differences among persons with HIV, the level of virulence of an individual strain of virus, and co-infection with other microbes may influence the rate and severity of disease progression. Drugs that fight the infections associated with AIDS have improved and prolonged the lives of HIV-infected persons by preventing or treating conditions such as *Journal of Infectious Diseases*. This approach is known formally as short-cycle structured intermittent antiretroviral therapy (SIT) or colloquially as the "7-7" approach (Healthline, 2011).

HIV symptoms can include: headache, chronic cough, diarrhea, swollen glands, lack of energy, loss of appetite, weight loss, frequent fevers, frequent yeast infections, skin rashes, pelvic/abdominal cramps, sores on certain parts of your body and short-term memory loss (MedicineNet, 2011).

Existing methods of medical diagnosis employed by physicians for the analysis of HIV infection uses manual methods characterized by the inability to handle uncertain or vague data existing between intervals. More so, those systems are not self-learning or adaptive in nature. This paper has chosen to solve these problems by employing the rich facilities of fuzzy cluster means. The proposed system which is self-learning and adaptive, is a time-capsule (a cache of information) to be preserved for ages to medical engineers for the diagnosis and analysis of HIV infection.

II.   Literature Review

Cluster analysis is a statistical techniques used to classify objects into coherent categories based on a set of measurement, indicators or variables. A common use of cluster analysis in medicine is to categorize patients into subgroups or diagnostic categories based upon patterns of clinical signs and symptoms, in this case HIV infection (Brian et al., 2001). Two-way clustering techniques are frequently used to organize genes into groups or clusters with similar levels of expression across relevant subgroup of patient's tissues, sample or cell lines (Eisen et al., 1998)

In practice, a cluster analysis is the product of a series of analytical decisions. The analytical decisions made at each point in the series can significantly affect subsequent decisions, as well as the overall result of a cluster analysis (Everitt et al., 2003). This series of analytic decisions typically involves choices about what objects to cluster, unit of measurement to use for the variables, proximity measure and criteria for determining the number and quality of clusters within the data.

Likert scale is the most popular psychological measurement schemes that depend on human judgment. This scaling scheme assures that the human observer is good at quantitative observation and assignment of number or objects to reflect degrees of traits or statement being measured (Cartwrigh, 2003 and Chow, 2002). In this scoring scheme, subjects are asked to choose exactly one alternative that describe their substance (Yuan, 2008). However, this scheme disregard with human thinking as multi-valued, transitional and analogue, but rather clear-cut (precise) and digital.

The invention and application of Fuzzy Cluster Means (FCM) algorithm in pattern recognition allows entities (objects) to belong to many clusters or categories with different degrees of membership (Yi-ouyang et al.; 2007). In this paper a framework for partitioning, which proposes a model of how data are generated from a cluster structure is presented. The Fuzzy Logic and Neural networks of personnel performance within organizations has been studied with a view of evaluating them for productivity and promotion (Akinyokun and Uzoka, 2004). The application of Fuzzy C-means (FCM) algorithm to medical diagnostic expert systems is presented in (Albayrak and Amasyali, 2003 and Berk et al., 2000). This algorithm is used in assigning patients to different cluster of disease. The application of fuzzy C-means in clustering has been demonstrated in (Yang and Wang, 2001; De Fazio and Galeazzi, 2004 and Jantzen , 1998). In this paper, fuzzy C-means algorithm is used to assign patients with HIV conditions to clusters of HIV.

Overview of Fuzzy C-Means Clustering (FCM)

The FCM algorithm is one of the most widely used fuzzy clustering algorithms. The FCM algorithm attempts to partition a finite collection of elements $X = \{X_1, X_2,...,X_n\}$ into a collection of c fuzzy clusters with respect to some given criterion. Given a finite set of data, the algorithm returns a list of c cluster centers V, such that

$V = V_i,\ i = 1, 2,..., c$

and a partition matrix U such that

$U = U_{ij},\ i = 1,..., c\ ,\ j = 1,..., n$

where U_{ij} is a numerical value in [0, 1] that tells the degree to which the element X_j belongs to the i-th cluster.

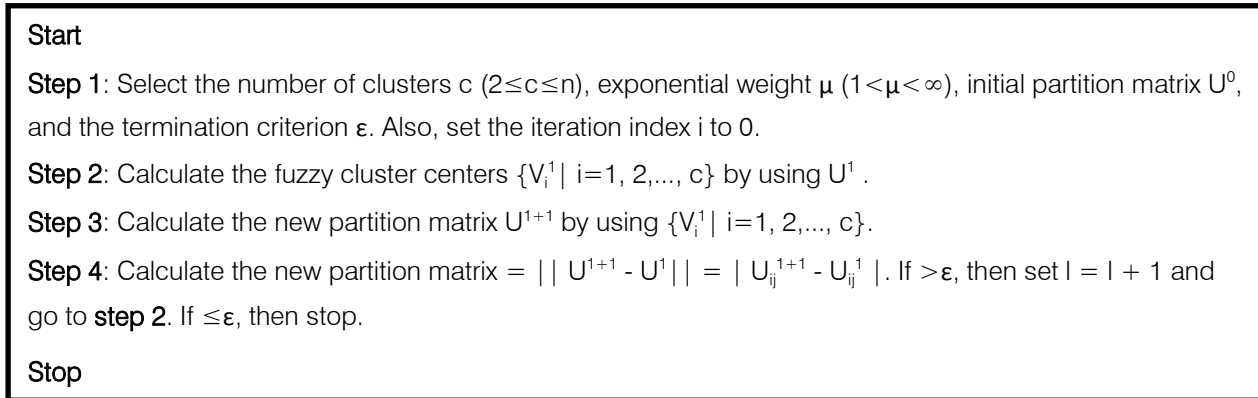The fuzzy logic linguistic description of the typical FCM algorithm is presented in Figure **1**

Start

Step 1: Select the number of clusters c ($2 \leq c \leq n$), exponential weight μ ($1 < \mu < \infty$), initial partition matrix U^0, and the termination criterion ε. Also, set the iteration index i to 0.

Step 2: Calculate the fuzzy cluster centers $\{V_i^1 | i=1, 2,..., c\}$ by using U^1 .

Step 3: Calculate the new partition matrix U^{1+1} by using $\{V_i^1 | i=1, 2,..., c\}$.

Step 4: Calculate the new partition matrix = $|| U^{1+1} - U^1 || = | U_{ij}^{1+1} - U_{ij}^1 |$. If $> \varepsilon$, then set l = l + 1 and go to **step 2**. If $\leq \varepsilon$, then stop.

Stop

Figure 1 : Typical FCM Clustering Algorithm

III. METHODOLOGY

The process for the medical diagnosis of HIV starts when an individual consults a physician (doctor) and presents a set of complaints (symptoms). The physician then requests further information from the patient or from others close to him who knows about the patient's symptoms in severe cases. Data collected include patient's previous state of health, living condition and other medical conditions. A physical examination of the patient condition is conducted and in most cases, a medical observation along with medical test(s) is carried out on the patient prior to medical treatment.

From the symptoms presented by the patient, the physician narrows down the possibilities of the illness that corresponds to the apparent symptoms and make a list of the conditions that could account for what is wrong with the patient. The physician then conducts a physical examination of the patient, studies his or her medical records and ask further questions, as he goes in an effort to rule out as many of the potential conditions as possible. When the list has been narrowed down to a single condition, it is called differential diagnosis and provides the basis for a hypothesis of what is ailing the patient. Until the physician is certain of the condition present; further medical test are performed or schedule such as medical imaging, scan, X-rays in part to conform or disprove the diagnosis or to update the patient medical history. Other Physicians, specialist and expert in the field may be consulted (sought) for further advices.

Despite all these complexities, most patient consultations are relatively brief because many diseases are obvious or the physician's experience may enable him to recognize the condition quickly. Upon the completion of the diagnosis by the physician, a treatment plan is proposed, which includes therapy and follow-up (further meeting and test to monitor the ailment and progress of the treatment if needed). Review of diagnosis may be conducted again if there is failure of the patient to respond to treatment that would normally work. The procedure of diagnosing a patient suffering from HIV is synonymous to the general approach to medical diagnosis. The physician may carry out a precise diagnosis, which requires a complete evaluation to determine whether the patient is having HIV. The examining physician accounts for possibilities of having HIV through interview, physical examination and laboratory test. Many primary health care physicians use screening tools for HIV evaluation.

A diagnostic evaluation of HIV may include a complete history of the following:

a. When did the symptoms start?
b. How long have the symptoms lasted?
c. How severe are the symptoms?
d. Have the symptoms occurred before, and if so, were they treated and what treatment was received?

IV. RESULTS AND DISCUSSION

To design the FCM Knowledge Base System for diagnosis of HIV, we design a system which consists of a set of parameters needed for diagnosis (here, we are using 13 basic and major parameters) presented in Table 1.

Table 1 : Symptoms of HIV

Symptom. Codes	Symptoms of HIV (Human Immunodeficiency Virus)
P01	Headache
P02	Chronic cough
P03	Diarrhea
P04	Swollen glands
P05	Lack of energy
P06	Loss of appetite
P07	Weight loss
P08	Frequent fever
P09	Frequent yeast infection
P10	Skin rashes
P11	Pelvic/ abdominal cramps,
P12	Sores on certain parts of your body
P13	Short-term memory loss

Figure 2 presents the model of the FCM system for the diagnosis of HIV. It comprises of knowledge base system, fuzzy c-means inference engine and decision support system. The knowledge base system holds the symptoms for HIV. The values of the parameters are vague and imprecise hence the adoption of fuzzy logic as a means of analyzing these information. Those parameters therefore constitute the fuzzy parameter of the knowledge base. The fuzzy set of parameters is represented by 'P' which is defined as $P = P_1, P_2, ..., P_n$ Where P_i represents the jth parameter and n is the total number of parameter (in this case n=13). The set of linguistic values which is modelled as a linker scale denoted by 'L' is given as L = (Low, Average and High).

Clustering of the data is achieved using the typical FCM algorithm presented in Figure 2. Neural networks provide the structure for the parameters which serves as a platform for the inference engine. The inference engine consists of reasoning algorithms driven by production rules. These production rules are evaluated by using the forward chaining approach of reasoning. The inference mechanism is fuzzy logic driven. The cognitive filter of the decision support engine takes as input the output report of the inference engine and applies the objective rules to rank the individual on the presence or absence of HIV infection. The emotional filter takes as input the output report of the cognitive filter and applies the subjective rules in the domain of HIV studies in order to rank individuals on the extent of the HIV infection.

The expert system is developed in an environment characterized by Microsoft XP Professional operating system, Microsoft Access Database Management System, Visual BASIC Application Language and Microsoft Excel.
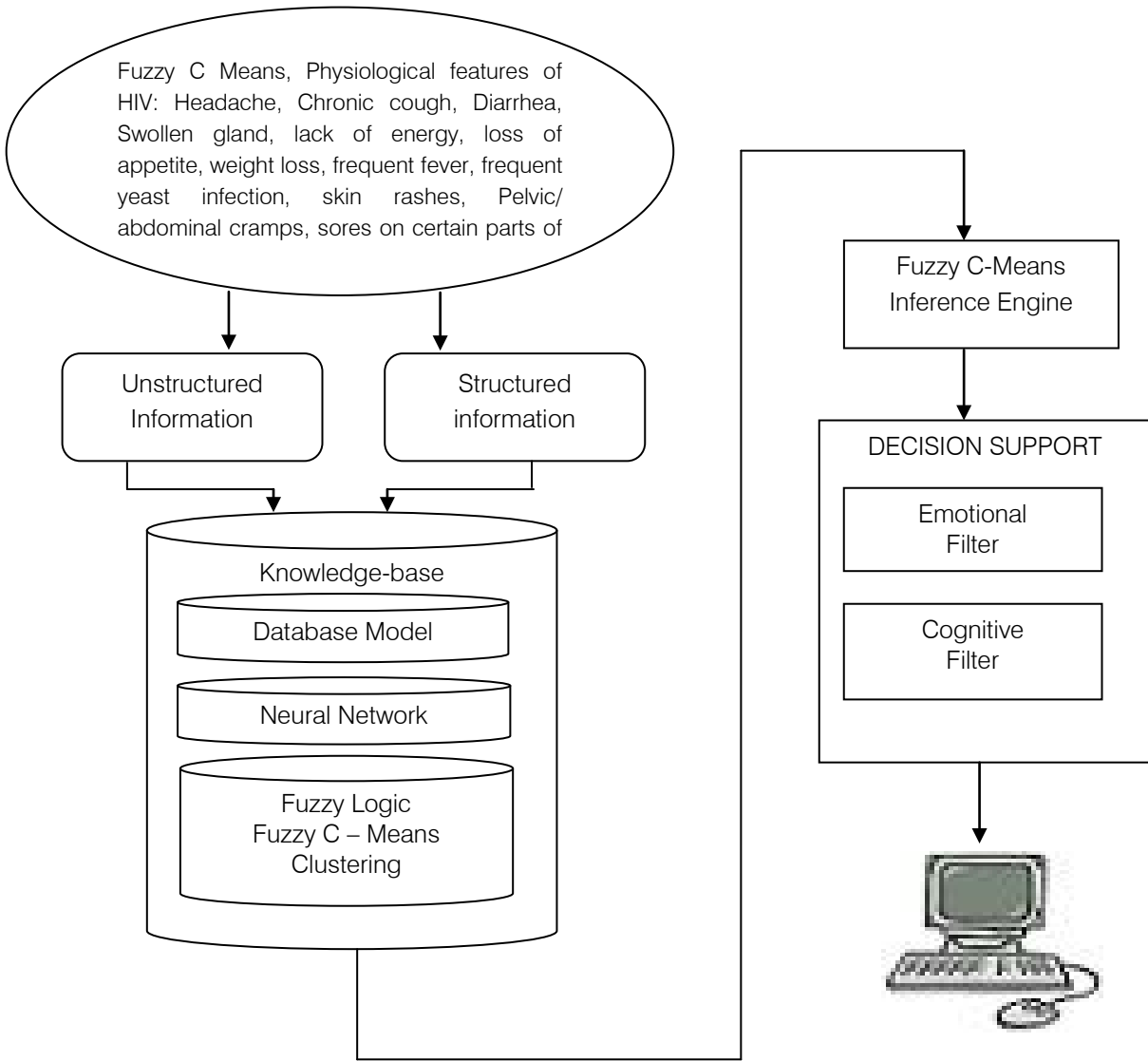
76

Fuzzy C Means, Physiological features of HIV: Headache, Chronic cough, Diarrhea, Swollen gland, lack of energy, loss of appetite, weight loss, frequent fever, frequent yeast infection, skin rashes, Pelvic/ abdominal cramps, sores on certain parts of

Unstructured Information

Structured information

Knowledge-base

Database Model

Neural Network

Fuzzy Logic
Fuzzy C – Means
Clustering

Fuzzy C-Means
Inference Engine

DECISION SUPPORT

Emotional Filter

Cognitive Filter

Figure 2 : Architecture of FCM Knowledge Base System for diagnosis/analysis of HIV

Table 2 : FCM membership grade table for Symptoms in all clusters Scale (0.00-1.00)

CODE	SYMPTOMS	DEGREE OF MEMBERSHIP		
		Cluster 1 (C_1)	Cluster 2 (C_2)	Cluster 3 (C_3)
P01	Headache	0.20	0.30	0.50
P02	Chronic cough	0.10	0.30	0.60
P03	Diarrhea	0.25	0.60	0.15
P04	Swollen gland	0.25	0.50	0.25
P05	Lack of energy	0.22	0.70	0.08
P06	Loss of appetite	0.20	0.80	0.00
P07	Weight loss	0.27	0.53	0.20
P08	Frequent fever	0.30	0.65	0.05
P09	Frequent yeast infection	0.10	0.80	0.10
P10	Skin rashes	0.56	0.44	0.00
P11	Pelvic/ abdominal cramps,	0.80	0.15	0.05
P12	Sores on certain parts of your body	0.50	0.37	0.13
P13	Short -term memory loss	0.70	0.15	0.15
RESULTS		Might be HIV Infected	HIV Infected	Not HIV Infected

A typical FCM membership grade table (Table 2) with 13 parameters and 3 clusters which shows the degree of membership of each parameter of HIV is represented using the graph in Figure 3.

From Figure 3, it is shown that there are no unitary (crisp) coefficients, indicating that each data point belongs to more than one cluster. For example the parameter " Frequent yeast infection" has its fuzzy set membership function as $\{0.1/C_1 + 0.8/C_2 + 0.1/C_3\}$ where C_1, C_2 and C_3 are clusters and in this study represents "Might be HIV infected", "HIV infected" and "Not HIV infected". This represents the degree of membership in terms of percentage as 10%, 80% and 10% match with "Might be HIV infected", "HIV infected" and "Not HIV infected" respectively.

Finally, Table 2 presents membership grades of parameters in all clusters whereas the degree of membership of the clusters is presented in Figure 3.
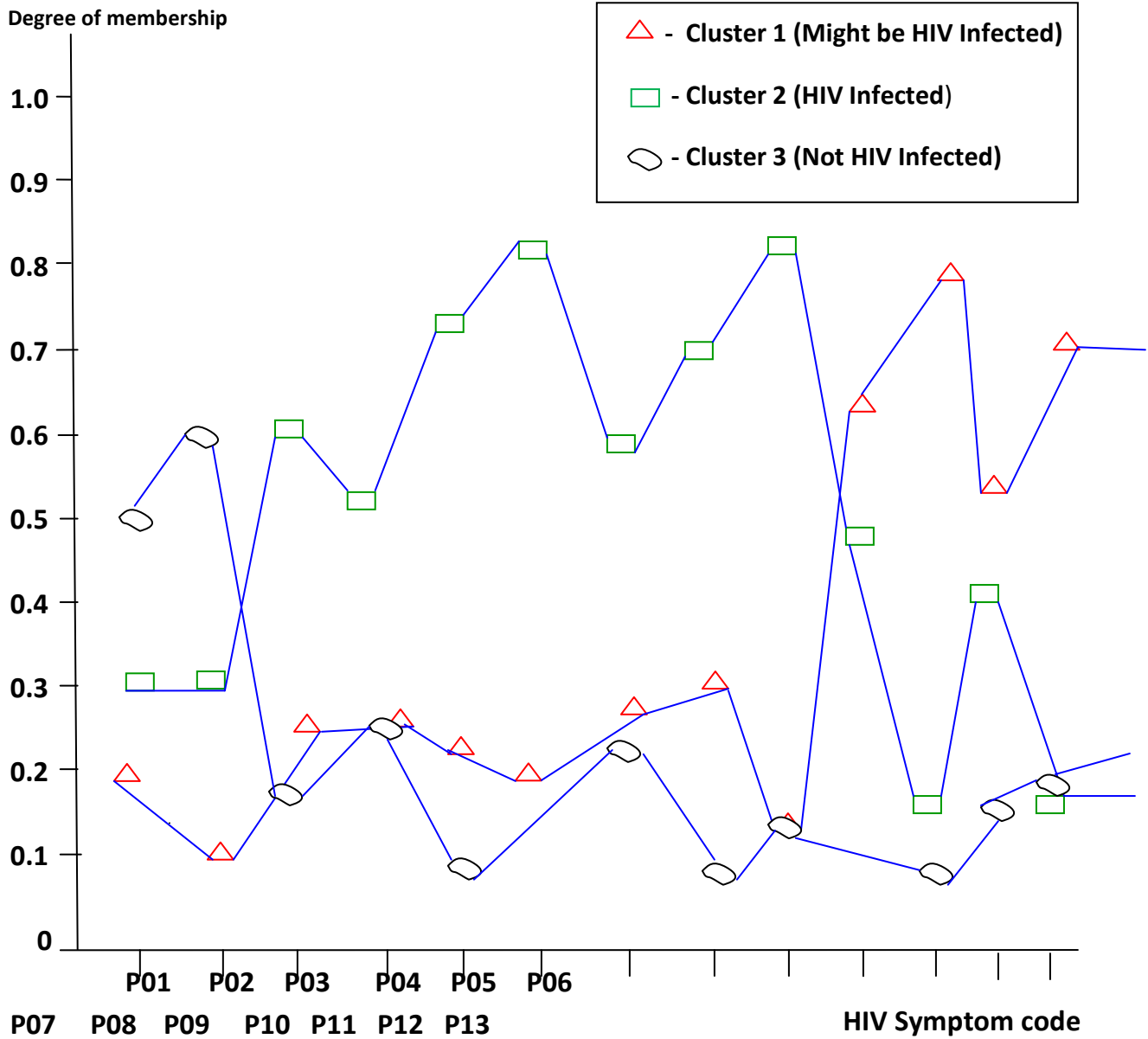
Figure 3 : Graphical representation of Membership Grades of HIV symptoms.

Figure 3 above shows the degree of membership of the various clusters. The parameters are grouped into various clusters using the degree of membership of each parameter to any particular cluster.

V. Conclusion

The need to design a system that would assist doctors in medical diagnosis has become imperative and hence cannot be over emphasized. This paper present a diagnostic fuzzy cluster means system to help in diagnosis of HIV using a set of symptoms and demonstrates the practical application of ICT (Information and Communication Technology) in the domain of diagnostic pattern appraisal by determining the extent of membership of individual symptoms. This advanced system which uses a set of clustered data set

is more precise than the traditional system. The classification, verification and matching of symptoms to the three groups of clusters was necessary especially in some complex scenarios. The fuzzy- cluster means system proposed and tested in this paper appears to be a more natural and intelligent way of classification and matching of symptoms to HIV.

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28. Make colleagues: Always try to make colleagues. No matter how sharper or intelligent you are, if you make colleagues you can have several ideas, which will be helpful for your research.

29. Think technically: Always think technically. If anything happens, then search its reasons, its benefits, and demerits.

30. Think and then print: When you will go to print your paper, notice that tables are not be split, headings are not detached from their descriptions, and page sequence is maintained.

31. Adding unnecessary information: Do not add unnecessary information, like, I have used MS Excel to draw graph. Do not add irrelevant and inappropriate material. These all will create superfluous. Foreign terminology and phrases are not apropos. One should NEVER take a broad view. Analogy in script is like feathers on a snake. Not at all use a large word when a very small one would be

sufficient. Use words properly, regardless of how others use them. Remove quotations. Puns are for kids, not grunt readers. Amplification is a billion times of inferior quality than sarcasm.

32. Never oversimplify everything: To add material in your research paper, never go for oversimplification. This will definitely irritate the evaluator. Be more or less specific. Also too, by no means, ever use rhythmic redundancies. Contractions aren't essential and shouldn't be there used. Comparisons are as terrible as clichés. Give up ampersands and abbreviations, and so on. Remove commas, that are, not necessary. Parenthetical words however should be together with this in commas. Understatement is all the time the complete best way to put onward earth-shaking thoughts. Give a detailed literary review.

33. Report concluded results: Use concluded results. From raw data, filter the results and then conclude your studies based on measurements and observations taken. Significant figures and appropriate number of decimal places should be used. Parenthetical remarks are prohibitive. Proofread carefully at final stage. In the end give outline to your arguments. Spot out perspectives of further study of this subject. Justify your conclusion by at the bottom of them with sufficient justifications and examples.

34. After conclusion: Once you have concluded your research, the next most important step is to present your findings. Presentation is extremely important as it is the definite medium though which your research is going to be in print to the rest of the crowd. Care should be taken to categorize your thoughts well and present them in a logical and neat manner. A good quality research paper format is essential because it serves to highlight your research paper and bring to light all necessary aspects in your research.

INFORMAL GUIDELINES OF RESEARCH PAPER WRITING

Key points to remember:

- Submit all work in its final form.
- Write your paper in the form, which is presented in the guidelines using the template.
- Please note the criterion for grading the final paper by peer-reviewers.

Final Points:

A purpose of organizing a research paper is to let people to interpret your effort selectively. The journal requires the following sections, submitted in the order listed, each section to start on a new page.

The introduction will be compiled from reference matter and will reflect the design processes or outline of basis that direct you to make study. As you will carry out the process of study, the method and process section will be constructed as like that. The result segment will show related statistics in nearly sequential order and will direct the reviewers next to the similar intellectual paths throughout the data that you took to carry out your study. The discussion section will provide understanding of the data and projections as to the implication of the results. The use of good quality references all through the paper will give the effort trustworthiness by representing an alertness of prior workings.

Writing a research paper is not an easy job no matter how trouble-free the actual research or concept. Practice, excellent preparation, and controlled record keeping are the only means to make straightforward the progression.

General style:

Specific editorial column necessities for compliance of a manuscript will always take over from directions in these general guidelines.

To make a paper clear

· Adhere to recommended page limits

Mistakes to evade

- Insertion a title at the foot of a page with the subsequent text on the next page

- Separating a table/chart or figure - impound each figure/table to a single page
- Submitting a manuscript with pages out of sequence

In every sections of your document

· Use standard writing style including articles ("a", "the," etc.)

· Keep on paying attention on the research topic of the paper

· Use paragraphs to split each significant point (excluding for the abstract)

· Align the primary line of each section

· Present your points in sound order

· Use present tense to report well accepted

· Use past tense to describe specific results

· Shun familiar wording, don't address the reviewer directly, and don't use slang, slang language, or superlatives

· Shun use of extra pictures - include only those figures essential to presenting results

Title Page:

Choose a revealing title. It should be short. It should not have non-standard acronyms or abbreviations. It should not exceed two printed lines. It should include the name(s) and address (es) of all authors.

Abstract:

The summary should be two hundred words or less. It should briefly and clearly explain the key findings reported in the manuscript--must have precise statistics. It should not have abnormal acronyms or abbreviations. It should be logical in itself. Shun citing references at this point.

An abstract is a brief distinct paragraph summary of finished work or work in development. In a minute or less a reviewer can be taught the foundation behind the study, common approach to the problem, relevant results, and significant conclusions or new questions.

Write your summary when your paper is completed because how can you write the summary of anything which is not yet written? Wealth of terminology is very essential in abstract. Yet, use comprehensive sentences and do not let go readability for briefness. You can maintain it succinct by phrasing sentences so that they provide more than lone rationale. The author can at this moment go straight to

shortening the outcome. Sum up the study, with the subsequent elements in any summary. Try to maintain the initial two items to no more than one ruling each.

- Reason of the study - theory, overall issue, purpose
- Fundamental goal
- To the point depiction of the research
- Consequences, including <u>definite statistics</u> - if the consequences are quantitative in nature, account quantitative data; results of any numerical analysis should be reported
- Significant conclusions or questions that track from the research(es)

Approach:

- Single section, and succinct
- As a outline of job done, it is always written in past tense
- A conceptual should situate on its own, and not submit to any other part of the paper such as a form or table
- Center on shortening results - bound background information to a verdict or two, if completely necessary
- What you account in an conceptual must be regular with what you reported in the manuscript
- Exact spelling, clearness of sentences and phrases, and appropriate reporting of quantities (proper units, important statistics) are just as significant in an abstract as they are anywhere else

Introduction:

The **Introduction** should "introduce" the manuscript. The reviewer should be presented with sufficient background information to be capable to comprehend and calculate the purpose of your study without having to submit to other works. The basis for the study should be offered. Give most important references but shun difficult to make a comprehensive appraisal of the topic. In the introduction, describe the problem visibly. If the problem is not acknowledged in a logical, reasonable way, the reviewer will have no attention in your result. Speak in common terms about techniques used to explain the problem, if needed, but do not present any particulars about the protocols here. Following approach can create a valuable beginning:

- Explain the value (significance) of the study
- Shield the model - why did you employ this particular system or method? What is its compensation? You strength remark on its appropriateness from a abstract point of vision as well as point out sensible reasons for using it.
- Present a justification. Status your particular theory (es) or aim(s), and describe the logic that led you to choose them.
- Very for a short time explain the tentative propose and how it skilled the declared objectives.

Approach:

- Use past tense except for when referring to recognized facts. After all, the manuscript will be submitted after the entire job is done.
- Sort out your thoughts; manufacture one key point with every section. If you make the four points listed above, you will need a least of four paragraphs.
- Present surroundings information only as desirable in order hold up a situation. The reviewer does not desire to read the whole thing you know about a topic.
- Shape the theory/purpose specifically - do not take a broad view.
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Procedures (Methods and Materials):

This part is supposed to be the easiest to carve if you have good skills. A sound written Procedures segment allows a capable scientist to replacement your results. Present precise information about your supplies. The suppliers and clarity of reagents can be helpful bits of information. Present methods in sequential order but linked methodologies can be grouped as a segment. Be concise when relating the protocols. Attempt for the least amount of information that would permit another capable scientist to spare your outcome but be cautious that vital information is integrated. The use of subheadings is suggested and ought to be synchronized with the results section. When a technique is used that has been well described in another object, mention the specific item describing a way but draw the basic

principle while stating the situation. The purpose is to text all particular resources and broad procedures, so that another person may use some or all of the methods in one more study or referee the scientific value of your work. It is not to be a step by step report of the whole thing you did, nor is a methods section a set of orders.

Materials:

- Explain materials individually only if the study is so complex that it saves liberty this way.
- Embrace particular materials, and any tools or provisions that are not frequently found in laboratories.
- Do not take in frequently found.
- If use of a definite type of tools.
- Materials may be reported in a part section or else they may be recognized along with your measures.

Methods:

- Report the method (not particulars of each process that engaged the same methodology)
- Describe the method entirely
- To be succinct, present methods under headings dedicated to specific dealings or groups of measures
- Simplify - details how procedures were completed not how they were exclusively performed on a particular day.
- If well known procedures were used, account the procedure by name, possibly with reference, and that's all.

Approach:

- It is embarrassed or not possible to use vigorous voice when documenting methods with no using first person, which would focus the reviewer's interest on the researcher rather than the job. As a result when script up the methods most authors use third person passive voice.
- Use standard style in this and in every other part of the paper - avoid familiar lists, and use full sentences.

What to keep away from

- Resources and methods are not a set of information.
- Skip all descriptive information and surroundings - save it for the argument.
- Leave out information that is immaterial to a third party.

Results:

The principle of a results segment is to present and demonstrate your conclusion. Create this part a entirely objective details of the outcome, and save all understanding for the discussion.

The page length of this segment is set by the sum and types of data to be reported. Carry on to be to the point, by means of statistics and tables, if suitable, to present consequences most efficiently.You must obviously differentiate material that would usually be incorporated in a study editorial from any unprocessed data or additional appendix matter that would not be available. In fact, such matter should not be submitted at all except requested by the instructor.

Content

- Sum up your conclusion in text and demonstrate them, if suitable, with figures and tables.
- In manuscript, explain each of your consequences, point the reader to remarks that are most appropriate.
- Present a background, such as by describing the question that was addressed by creation an exacting study.
- Explain results of control experiments and comprise remarks that are not accessible in a prescribed figure or table, if appropriate.
- Examine your data, then prepare the analyzed (transformed) data in the form of a figure (graph), table, or in manuscript form.

What to stay away from

- Do not discuss or infer your outcome, report surroundings information, or try to explain anything.
- Not at all, take in raw data or intermediate calculations in a research manuscript.

- Do not present the similar data more than once.
- Manuscript should complement any figures or tables, not duplicate the identical information.
- Never confuse figures with tables - there is a difference.

Approach
- As forever, use past tense when you submit to your results, and put the whole thing in a reasonable order.
- Put figures and tables, appropriately numbered, in order at the end of the report
- If you desire, you may place your figures and tables properly within the text of your results part.

Figures and tables
- If you put figures and tables at the end of the details, make certain that they are visibly distinguished from any attach appendix materials, such as raw facts
- Despite of position, each figure must be numbered one after the other and complete with subtitle
- In spite of position, each table must be titled, numbered one after the other and complete with heading
- All figure and table must be adequately complete that it could situate on its own, divide from text

Discussion:

The Discussion is expected the trickiest segment to write and describe. A lot of papers submitted for journal are discarded based on problems with the Discussion. There is no head of state for how long a argument should be. Position your understanding of the outcome visibly to lead the reviewer through your conclusions, and then finish the paper with a summing up of the implication of the study. The purpose here is to offer an understanding of your results and hold up for all of your conclusions, using facts from your research and generally accepted information, if suitable. The implication of result should be visibly described. Infer your data in the conversation in suitable depth. This means that when you clarify an observable fact you must explain mechanisms that may account for the observation. If your results vary from your prospect, make clear why that may have happened. If your results agree, then explain the theory that the proof supported. It is never suitable to just state that the data approved with prospect, and let it drop at that.

- Make a decision if each premise is supported, discarded, or if you cannot make a conclusion with assurance. Do not just dismiss a study or part of a study as "uncertain."
- Research papers are not acknowledged if the work is imperfect. Draw what conclusions you can based upon the results that you have, and take care of the study as a finished work
- You may propose future guidelines, such as how the experiment might be personalized to accomplish a new idea.
- Give details all of your remarks as much as possible, focus on mechanisms.
- Make a decision if the tentative design sufficiently addressed the theory, and whether or not it was correctly restricted.
- Try to present substitute explanations if sensible alternatives be present.
- One research will not counter an overall question, so maintain the large picture in mind, where do you go next? The best studies unlock new avenues of study. What questions remain?
- Recommendations for detailed papers will offer supplementary suggestions.

Approach:

- When you refer to information, differentiate data generated by your own studies from available information
- Submit to work done by specific persons (including you) in past tense.
- Submit to generally acknowledged facts and main beliefs in present tense.

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Introduction	Containing all background details with clear goal and appropriate details, flow specification, no grammar and spelling mistake, well organized sentence and paragraph, reference cited	Unclear and confusing data, appropriate format, grammar and spelling errors with unorganized matter	Out of place depth and content, hazy format
Methods and Procedures	Clear and to the point with well arranged paragraph, precision and accuracy of facts and figures, well organized subheads	Difficult to comprehend with embarrassed text, too much explanation but completed	Incorrect and unorganized structure with hazy meaning
Result	Well organized, Clear and specific, Correct units with precision, correct data, well structuring of paragraph, no grammar and spelling mistake	Complete and embarrassed text, difficult to comprehend	Irregular format with wrong facts and figures
Discussion	Well organized, meaningful specification, sound conclusion, logical and concise explanation, highly structured paragraph reference cited	Wordy, unclear conclusion, spurious	Conclusion is not cited, unorganized, difficult to comprehend
References	Complete and correct format, well organized	Beside the point, Incomplete	Wrong format and structuring

INDEX

A

Abnormalities · 100, 102, 104, 106, 108, 110, 112, 114
Academic · 82
Acknowledge · 51
adapting · 129, 132
Although · 16, 24, 56, 62, 79, 82
announcements · 79
antecedents · 2, 7
anticipations · 135
application · 7, 9, 47, 51, 76, 77, 79, 83, 85, 97, 103, 105, 112, 115, 117, 127, 131
approaches · 1, 3, 48, 60, 125, 126, 127, 128, 129, 130, 131, 134, 135
appropriate · 46, 78, 89, 110, 125, 127, 130, 133, 134
Argumentation · 32
Association · 1, 3, 4, 5, 7, 9, 11, 12, 13, 15, 41
Atrial · 100, 102, 108, 112
attribute · 3, 5, 48, 49, 50, 51, 53, 55, 56

B

blood · 85, 86, 87, 100, 102, 103
bradycardia · 100, 102, 108
Bradycardia · 100, 101, 102
browser · 77, 100, 104
browsing · 13, 78, 126, 130, 131, 133
building · 8, 38, 75, 116, 132

C

captured · 68, 70, 71, 73
Cardiac · 100, 102, 103, 104, 106, 108, 110, 111, 112, 114
characterized · 91, 127, 132, 133
chromosome · 4, 5
circumstances · 33, 38, 127
clustering · 1, 2, 3, 4, 6, 7, 8, 9, 10, 11, 134, 135
Clustering · 3, 4, 6, 9, 13, 138
cognitive · 27, 28, 30, 37, 41, 44, 89, 93
collector · 50, 51, 53, 55
commercialized · 28
conceptualize · 35
Conference · 13, 22, 57, 58, 97, 123, 136, 137, 138

configuration · 121, 123
consequent · 1, 2, 4, 5, 6, 7, 8, 9, 95
consistency · 46, 48, 50, 56

consistent · 46, 120, 129
corrupted · 60, 66, 68, 70, 73
criteria · 9, 48, 110
cryptography · 16, 18

D

dangerous · 38
Defuzzification · 97
Democratizing · 44
densities · 64, 70, 71, 72, 73
departments · 40, 81, 104
development · 26, 28, 34, 40, 41, 43, 44, 75, 77, 79, 81, 82, 87, 115, 119, 125, 129, 134, 136
Diagnosis · 85, 87, 89, 91, 93, 95, 97, 98, 99
diagrammatic · 20
Digestive · 91, 94
Digital · 60, 62, 64, 66, 68, 70, 72, 73, 75, 76, 77, 79, 81, 82, 83, 84, 106
dispersion · 7
distinguish · 119
Distributed · 58, 75, 115, 117, 119, 121, 122, 123, 124
disturbances · 60, 68
dramatically · 87

E

economics · 26, 42
Electrocardiol · 113
electronic · 79, 81, 88
Engineering · 1, 40, 41, 43, 47, 56, 57, 58, 83, 97, 99, 101, 112, 123, 125, 136, 137, 138
evolutionary · 1, 3, 4, 5, 11
experimental · 34, 64, 68, 72, 128, 129, 133, 135
Expert · 85, 87, 89, 91, 93, 95, 97, 99, 100
extensive · 82, 125
extracted · 4, 104, 107, 122

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