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A Modified Version of the K-Means Clustering Algorithm

By Juhi Katara & Naveen Choudhary

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Abstract- Clustering is a technique in data mining which divides given data set into small clusters based on their similarity. K-means clustering algorithm is a popular, unsupervised and iterative clustering algorithm which divides given dataset into k clusters. But there are some drawbacks of traditional k-means clustering algorithm such as it takes more time to run as it has to calculate distance between each data object and all centroids in each iteration. Accuracy of final clustering result is mainly depends on correctness of the initial centroids, which are selected randomly. This paper proposes a methodology which finds better initial centroids further this method is combined with existing improved method for assigning data objects to clusters which requires two simple data structures to store information about each iteration, which is to be used in the next iteration. Proposed algorithm is compared in terms of time and accuracy with traditional k-means clustering algorithm as well as with a popular improved k-means clustering algorithm.

Keywords: clustering, data mining, initial centroids, k-means clustering.

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A Modified Version of the K-Means Clustering Algorithm

Juhi Katara^α & Naveen Choudhary^ο

Abstract Clustering is a technique in data mining which divides given data set into small clusters based on their similarity. K-means clustering algorithm is a popular, unsupervised and iterative clustering algorithm which divides given dataset into k clusters. But there are some drawbacks of traditional k-means clustering algorithm such as it takes more time to run as it has to calculate distance between each data object and all centroids in each iteration. Accuracy of final clustering result is mainly depends on correctness of the initial centroids, which are selected randomly. This paper proposes a methodology which finds better initial centroids further this method is combined with existing improved method for assigning data objects to clusters which requires two simple data structures to store information about each iteration, which is to be used in the next iteration. Proposed algorithm is compared in terms of time and accuracy with traditional k-means clustering algorithm as well as with a popular improved k-means clustering algorithm.

Keywords: clustering, data mining, initial centroids, K-means clustering.

I. INTRODUCTION

Data mining refers to using a variety of data analysis techniques and tools to discover previously unknown, valid patterns and relationship in large dataset[5]. Data mining techniques like clustering and associations can be used to find meaningful patterns for future predictions. Clustering may be defined as preprocessing step in all data mining algorithms in which the data objects are divided into clusters which contains high intra-cluster similarity and low inter-cluster similarity [3], [10].

Clustering can be applied to a wide range of fields like pattern recognition, marketing, image processing etc[3]. Clustering algorithms are mainly divided into partitioning, hierarchical, density based, grid based, model based clustering algorithms.

Partitioning clustering algorithm first creates an initial set of k partition, where parameter k is the number of partitions to construct. It then uses an iterative relocation technique that tries to improve the clustering by moving objects from one class to another. Hierarchical clustering algorithm creates a hierarchical decomposition of the dataset using some criterion. The method can be categorized as being either

agglomerative or divisive, based on how the hierarchical decomposition is designed. Density based clustering algorithm uses notion of density for clustering data objects. It either grows clusters according to the density of neighborhood objects or according to some density function. Grid based clustering algorithm first quantizes the object space into a finite number of cells that form a grid structure, and then performs clustering on the grid structure. Model based clustering algorithm attempts to optimize the fit between the given data and some mathematical model.

K-means clustering is a partitioning clustering technique in which clusters are formed with the help of centroids. It follows unsupervised, non deterministic and iterative approach towards clustering. K-means clustering is processed by the minimization of the average squared Euclidean distance between the data objects and the cluster centroids. The result of the k-means clustering algorithm is affected by the choice of initial centroid. Distinct initial centroid might result in distinct final clusters. Centroid of the cluster may be defined as the mean of the objects in a cluster. It may not necessarily be a member of the dataset.

II. TRADITIONAL K-MEANS CLUSTERING ALGORITHM

K-means clustering is the most popular clustering algorithm [9]. In the traditional k-means clustering given dataset is classified into k numbers of disjoint clusters, where the value of k is given as input to the algorithm. The algorithm is implemented in two phases. In the first phase k centroids are selected randomly. In the second phase assignment of each data object to the closest centroid cluster is done. Distance between data objects and centroids is generally calculated by Euclidean distance. When all data objects are assigned to any of the k clusters, first iteration is completed and an early grouping is done. After completion of first iteration recalculation of centroids are done by taking mean of data objects of each cluster. As k new centroids are calculated, a new assignment is to be done between the same data objects and new centroids, generating loops which results in number of iterations. As a result of this loop k centroids and data objects may change their position in a step by step manner. Ultimately the situation will occur where the centroids do not update anymore. This means the

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convergence criterion for clustering is achieved. In this algorithm generally Euclidean distance is used to find distance between data objects and centroids [3]. Between one data object $X = (x_1, x_2, \dots, x_n)$ and another data object $Y = (y_1, y_2, \dots, y_n)$ the Euclidean distance $d(X, Y)$ be calculated as follows:

$$d(X, Y) = \{ (X_1 - Y_1)^2 + (X_2 - Y_2)^2 + \dots + (X_n - Y_n)^2 \}^{1/2}$$

Algorithm 1 : The Traditional K-Means Clustering Algorithm [3]

Input: $D = \{d_1, d_2, \dots, d_n\}$ //set of n data objects.
 k // number of required clusters.

Output: k clusters

Steps:

1. Randomly select K data objects as initial centroids from D .
2. Calculate the distance between each data object d_i ($1 \leq i \leq n$) and all k cluster centroids c_j ($1 \leq j \leq k$), then allocate data object d_i to the cluster which has closest centroid.
3. Calculate new mean for each cluster.
 //new mean is the updated centroid of cluster.
4. Repeat step 3 and 4 until no change in the centroid of cluster.

III. DRAWBACKS OF TRADITIONAL K-MEANS CLUSTERING ALGORITHM

Traditional K-means clustering algorithm has several drawbacks. The major drawback of traditional K-means clustering algorithm is its performance is mainly depends on the initial centroids, which are selected randomly and resulting clusters are different for different runs for the same input dataset. Another drawback includes distance calculation process of traditional k-means algorithm which takes long time to converge clustering result, as it calculates the distance from each data object to every cluster centroids in each iteration while there is no need to calculate that distance each time. As in the resulting clusters some data objects still remains in the same cluster after several iteration. It affects the performance of the algorithms. One more drawback of k-means clustering is the requirement to give number of clusters formed as input by the user.

IV. RELATED WORK

Xiuyun Li et al. [1] proposed enhanced k-means clustering algorithm based on fuzzy feature selection. This algorithm generates weight of feature important factor to describe the contribution of each feature to the clustering and makes use of FIF to improve the similarity measure and then achieve the improved clustering result.

Wang Shunye et al. [5] proposed an improved k-means clustering algorithm in the optimal initial centroids based on dissimilarity. This algorithm achieves the dissimilarity to reflect the degree of correlation between data objects then uses a Huffman tree to find the initial centroids. It takes less amount of time because the iteration diminishes through the Huffman algorithm.

Shi Na et al. [3] proposed an improved k-means clustering algorithm to increase efficiency of k-means clustering algorithm. This algorithm requires two simple data structures to store information in every iteration which is to be used in the next iteration. The improved algorithm does less calculation, which saves run time.

Mohammed El Agha et al. [4] proposed improved k-means clustering algorithm which has ElAgha initialization that uses a guided random technique as k-means clustering algorithm suffers from initial centroids problem. ElAgha initialization outperformed the random initialization and enhanced the quality of clustering with a big margin in complex datasets.

K.A Abdul Nazeer et al. [2] proposed an algorithm to enhance accuracy and efficiency of the k-means clustering algorithm. This algorithm consist of two phases. First phase is used to determine initial centroids systematically so as to produce clusters with better accuracy. Second phase is used for allocating data objects to the appropriate clusters in less amount of time. This algorithm outputs good clusters in less amount of time to run.

V. PROPOSED ALGORITHM

In this section a modified algorithm is proposed for improving the performance of k-means clustering algorithm. In the paper [3], authors proposed an improved k-means clustering algorithm to improve the efficiency of the k-means clustering algorithm but in this algorithm the initial centroids are selected randomly so this method is very sensitive to the initial centroids as random selection of initial centroids does not guarantee to output unique clustering result. In the paper [5], authors proposed an improved k-means clustering algorithm in the optimal initial centroids based on dissimilarity. However this algorithm is computationally complex and requires more time to run.

In this paper we proposed a new approach for selecting better initial centroids which outputs the unique clustering result and increases the accuracy of basic k-means clustering algorithm and proposed approach is combined with the algorithm of paper [3] for allocating the data objects to the suitable cluster. The algorithm of paper [3] is referred as shina improved k-means clustering algorithm in this paper. We compared the traditional k-means clustering algorithm, shina improved k-means clustering algorithm [3] and proposed algorithm in terms of time and accuracy parameters.

Algorithm 2: Modified k-means clustering algorithm

Input : $D = \{d_1, d_2, d_3, \dots, d_n\}$
 //Dataset of n data objects
 k // Number of required clusters

Output : A set of k clusters.

Steps :

1. Calculate distance from origin of each data object d_i in the dataset D.
2. Apply sorting on the distances obtained in step 1. Sort the data objects according to distance.
3. Now divide the sorted data objects into k equal sets.
4. Select the middle data object as the initial centroid from each set.
5. Calculate the distance between each data object $d_i (1 \leq i \leq n)$ and all k cluster centroids $c_j (1 \leq j \leq k)$ as Euclidean distance $d(d_i, c_j)$.
6. For each data object d_i find the closest centroid c_j and assign d_i to that cluster j.
7. Repeat step 8 to 11 until no change in the centroid of clusters.
8. Store the cluster number in array cluster[]. Set cluster[i]=j.
9. Store the distance of data object from the closest centroid in the array dist[]. Set dist[j] = $d(d_i, c_j)$.
10. For each cluster $j (1 \leq j \leq k)$ recalculate the cluster centroid.
11. For each data object d_i
 - 11.1 Compute its distance from the new computed centroid of the present cluster.
 - 11.2 If this distance is less than or equal to the present closest centroid, the data remains in the same cluster.

Else

- 11.2.1 For every centroid $c_j (1 \leq j \leq k)$ Calculate the distance $d(d_i, c_j)$, then assign d_i to the cluster which closest centroids.

End For

In the proposed algorithm distance of each data object from origin is calculated. Then the original data objects are sorted accordance with the sorted distance. Insertion sort is used for sorting in this paper. Now divide the sorted data objects into k equal sets. Take middle data object as the initial centroid from each set. This process of selecting centroid outputs better unique clustering result. Now for every data object in the dataset calculate distance from every initial centroid. The next step is an iterative process which reduces the required time to run. The data objects are assigned to the cluster which has the closest centroid. Two data structures *cluster []* and *dist[]* are required to store information about the completed iteration of the algorithm. Array *cluster []* stores the cluster number of data object from which it belongs to and array *dist []* stores the distance of every data object from closest centroid. Next, for each cluster obtained in completed iteration the new centroid is calculated by taking the mean of its data objects.

Then for each data object the distance is calculated from the new calculated centroid of its present cluster. If this distance is less than or equal to the previous closest distance, the data object remains in the same cluster otherwise for every remaining data object, calculate the distance from all new calculated centroids. Next, the data objects are assigned to the cluster which has the closest centroids. Now array *cluster* and *dist* are updated storing new values obtained in this step. This reassigning process is repeated until no change in the centroids of cluster.

VI. EXPERIMENTAL RESULTS AND DISCUSSION

All the experiments are carried out on core i3 Intel based PC machine with 4 GB RAM, running on WINDOWS 7 64 bits operating environment and Programming Platform is MATLAB version R2013a.

In this paper two different datasets are taken from the UCI repository of machine learning databases [6] to test the performance of the proposed k-means clustering algorithm and for comparing the traditional k-means clustering algorithm, shina improved k-means clustering algorithm [3] and proposed algorithm of this paper. IRIS and WINE datasets are selected as the test datasets [6]. The values of attributes are numeric.

A brief introduction of the datasets used in experimental evaluation is given in the table below:

Table 1 : Characteristics of datasets

Dataset	Number of attributes	Number of instances
Iris	4	150
Wine	13	178

a) *Iris dataset*

Iris dataset contains the three classes of iris flower: setosa, versicolour and virginica. This dataset contains 150 instances and three classes. In iris dataset, each class contains 50 instances with four attributes: sepal length, sepal width, petal length, petal width.

b) *Wine dataset*

This dataset contains the chemical analysis of wine in the same region of Italy but three different cultivators. The dataset contains 178 instances and three classes with 13 attributes. First class contains 59, second class contains 71 and third class contains 48 instances. The attributes of dataset are alcohol, malic acid, ash, alkalinity of ash, magnesium, total phenols, flavonoids, nonflavanoids phenols, proanthocyanins, Color intensity, hue, OD280/OD315 of diluted wines and proline.

The same datasets are given as input to all the algorithms. Number of k is given three for both the datasets. Experiment compares proposed k-means clustering algorithm with the traditional k-means clustering algorithm and with the shina improved k-means [3] in terms of time and accuracy.

Accuracy: Accuracy is the ratio of correctly predicted instances divided by total number of instances.

Time: It is the amount of time that passes from the start of an algorithm to its finish.

Accuracy of clustering is determined by comparing the clustering results with the clusters already available in the UCI datasets [6]. Traditional and shina improved k-means clustering algorithm gives different accuracy and time for every run as it selects initial centroid randomly. So these algorithms are executed several time and average of accuracy and time is taken. Accuracy of proposed k-means clustering algorithm is unique at every run but time is different for each run so it is also executed several time and average of time is taken.

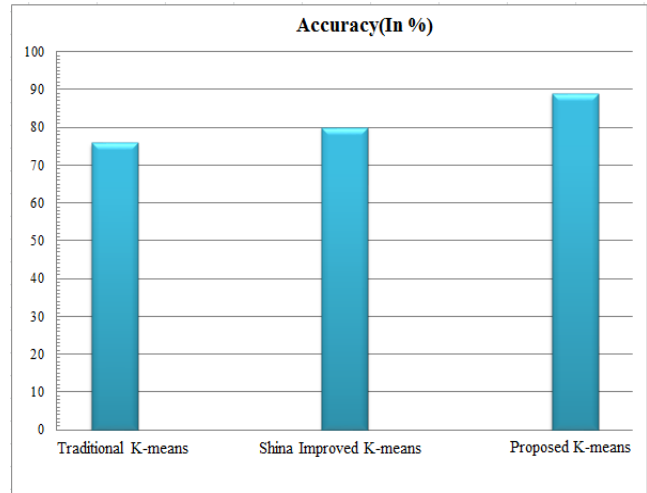


Fig. 1 : Accuracy comparison chart for Iris dataset

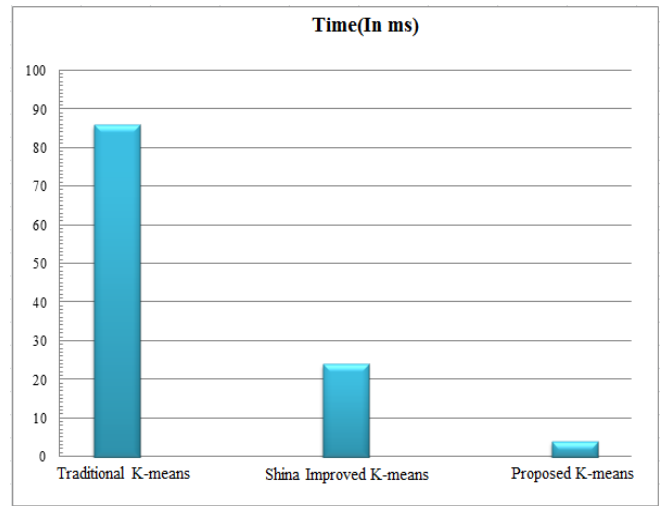


Fig. 2 : Time comparison chart for iris dataset

Table 2 : Performance comparison on Iris dataset

Parameters	Traditional K-means clustering algorithm	Shina Improved k-means clustering algorithm	Proposed K-means clustering algorithm
Accuracy (In %)	76	80	89
Time (In ms)	86	24	4

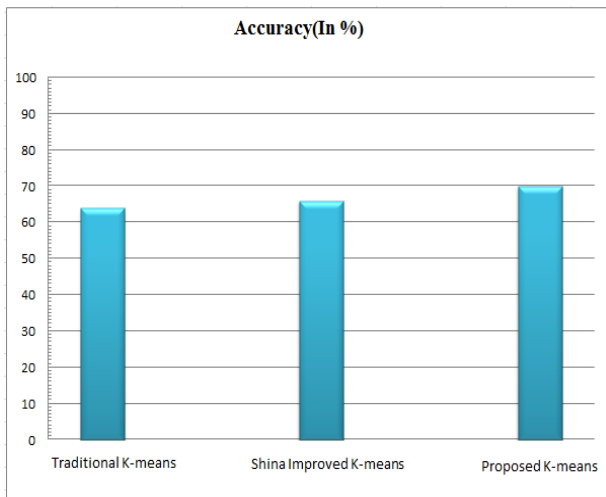


Fig. 3 : Accuracy comparison chart for Wine data set

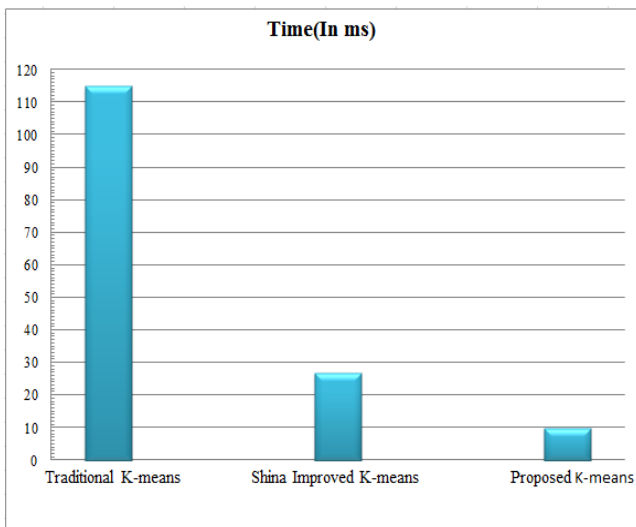


Fig. 4 : Time comparison chart for wine dataset

Table 3 : Performance comparison on Wine data set

Parameters	Traditional K-means clustering algorithm	Shina Improved k-means clustering algorithm	Proposed K-means clustering algorithm
Accuracy (In %)	64	66	70
Time (In ms)	115	27	10

The result of experiment shows that the proposed k-means clustering algorithm can output the better unique clustering result in less amount of time than traditional k-means clustering algorithm and shina improved k-means clustering algorithm [3]. As it selects better initial centroids which result in reduction of iterations. Shina improved method [3] of assigning data objects to the appropriate clusters results in less

number of distance calculations. So proposed algorithm combines both this methods and results in less time to run. At the same time the proposed k-means clustering algorithm can improve the accuracy of the algorithm.

VII. CONCLUSION

K-means clustering algorithm is one of the most popular and an effective algorithm to cluster datasets which is used in number of fields like scientific and commercial applications. However, this algorithm has several drawbacks such as selection of initial centroid is random which does not guarantee to output unique clustering result and k-means clustering has more number of iterations and distance calculations which finally result in more amount of time to run. Various enhancements have been carried out on the Traditional k-means clustering algorithm by different researchers considering different drawbacks. The proposed algorithm combines a systematic way for selecting initial centroids and an efficient method for assigning data objects to clusters. So proposed algorithm is found to be more accurate, efficient and feasible. The value of k required number of clusters is still required to be given as an input to the proposed algorithm. Intelligent pre estimation of the value of k is suggested as a future work.

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An Implementation of Virtual Classroom and Performance Analysis of Teaching-Learning Outcome

By Md Zobair Khondaker Rion & Md Mahmudul Hasan

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Abstract- Virtual classroom is an irreplaceable part of distant learning systems and an important direction in the online education research field. A number of research works have been carried out in this area and many of them have been successfully implemented. However, most of them are video tutorial-based learning portal and video streaming classroom. In this paper, a model of real-time interactive virtual classroom has been proposed and implemented that provides real-time interactive classes with the collaboration of teacher and students in a single portal. It allows some responsive and co-operative tools that help teachers and students to interact easily irrespective of their distance. This virtual classroom has been designed to focus on the learners living in remote areas who cannot access the modern amenities of education. One of the main research goals is to provide the effective teaching and learning system where the distance between teacher and students can be reduced. Moreover, this paper makes some analysis and discussion about the testing and effectiveness of virtual classroom and analyzes the learning outcome.

Keywords: *virtual classroom; e-learning; e-teaching; web based learning portal; interactive web application.*

GJCST-C Classification : *H.5.1 I.2.6*



AN IMPLEMENTATION OF VIRTUAL CLASSROOM AND PERFORMANCE ANALYSIS OF TEACHING LEARNING OUTCOME

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An Implementation of Virtual Classroom and Performance Analysis of Teaching-Learning Outcome

Md Zobair Khondaker Rion^α & Md Mahmudul Hasan^ο

Abstract- Virtual classroom is an irreplaceable part of distant learning systems and an important direction in the online education research field. A number of research works have been carried out in this area and many of them have been successfully implemented. However, most of them are video tutorial-based learning portal and video streaming classroom. In this paper, a model of real-time interactive virtual classroom has been proposed and implemented that provides real-time interactive classes with the collaboration of teacher and students in a single portal. It allows some responsive and cooperative tools that help teachers and students to interact easily irrespective of their distance. This virtual classroom has been designed to focus on the learners living in remote areas who cannot access the modern amenities of education. One of the main research goals is to provide the effective teaching and learning system where the distance between teacher and students can be reduced. Moreover, this paper makes some analysis and discussion about the testing and effectiveness of virtual classroom and analyzes the learning outcome.

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I. INTRODUCTION

An interactive web based virtual classroom can be defined as an online teaching (e.g. electronic-teaching or mobile-teaching) and learning (e.g. electronic-learning or mobile-learning) portal similar to the environment of physical classroom. Here the word 'Interactive' means face-to-face communication as commonly seen in the traditional classroom [1]. Web based virtual classroom is very common in this modern era. Many developed countries are using virtual classroom to provide online education to the students. As the world is being developed with the new technologies, discovering and manipulating new ideas and concepts of doing work are changing rapidly. There have been many research in the area of virtual education and many of them have been successful to implement such system [2]. Now enrolling themselves in virtual education is benefiting students. Some of the virtual classrooms are getting positive feedback for providing quality education [3].

The percentage of student engagement in online education is increasing day by day. For example, a statistic

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shows - over 6.7 million students are enrolled in online education in United States and in last 5 years, 96% students have registered for online courses [3]. Not only in developed countries but also in third world countries like - Bangladesh, many students are engaged in online educational activities and social networks. Even though many virtual classrooms have been developed and implemented maximum of them are tutorial-based learning portal like video streaming and blogging. Students are still looking for something that is interactive, user friendly and most importantly easy to learn.

The goal of this research is to make an interactive web based virtual classroom that will help teachers and students. It has been designed with a view to replicating a face-to-face classroom. The virtual application for education can be implemented in the rural areas to improve the accessibility of quality education. In the context of Bangladesh or any third world countries, the educational resources are not equally distributed. The villages or remote areas are often deprived of modern facilities.

The rest of the paper is organized as follows. Chapter two describes literature review with background and related works. Proposed model has been described in chapter III. Results has been described and analyzed in chapter IV. Finally, concluding remarks have been mentioned in the last chapter.

II. LITERATURE REVIEW

a) Background

Though many research works have been done to explore the effective way of virtual education, very few of them have been conducted in the context of Bangladesh. There are several organizations which are trying to research and develop the virtual education system in Bangladesh such as - a large publishing company of technological magazines and news (www.comjagat.com) [4], Jaago School (www.jaago.com.bd) an online school [5] [19]. Hasan et.al (2013) shows how a facebook-based app can be utilized in terms of learning English [6]. Some existing classrooms deals with tutorial based video streaming classes where high bandwidth is needed [7]. The people of pastoral area or villagers may not afford the bandwidth

enough to attend those online classes and another problem is that those online classrooms are not designed in the context of Bangladesh. Therefore, some research questions have been formed for this argument -

- How to explore the concept of a virtual classroom where teachers and students can play their role interactively?
- How to make it more effective in the context of Bangladesh?
- How can it be run with lower bandwidth?
- How can the distant learners be benefited using this virtual classroom?
- How can the modern education be spread to each district of Bangladesh and other countries?

In this case, an extensive research has been done in the area of virtual education to contribute in the context of Bangladesh.

b) *Previous Research and Related Works*

In this section we discussed the recent research and related works evolving this area. Patrikab Monda, Swagato Misra and Iti Saha Misra (2013) proposed a plan to conduct virtual classroom with low cost and lesser bandwidth where they showed mainly two components of the virtual classroom – 1) the shared visual module and 2) Voice streaming module [7].

Jiamao Liu, Junjie Wang and NingGu (2003) illustrates a virtual classroom with three-layer client/server architecture integrating some supported tools, cooperative mechanism and a real-time learning mode based on synchronization [8]. Matthew M. Chingos and Guido Schwerd (2014) showed a statistics of students engagement in Florida Virtual School (FLVS). FLVS is the statewide Internet-based public high school in the United States. FLVS deals with education virtually using social networks like – online blog, email, virtual chat system, audio, video and tutorial based learning. In 2012- 2013, 30 states had multi-district, fully online schools with enrollment of about 310,000 students, and 26 states had state virtual schools with over 740,000 course enrollments (Watson et al. 2013)[9].

An online teaching and learning portal named Coursera is a non-profit educational organization founded by computer science professors *Andrew Ng* and *Daphne Koller* from Stanford University that deals with massive open online courses (MOOC) [9]. Generally it works with cooperation of different Universities to make some of their courses which are available in online classroom. As the latest report in October 2014, Coursera has 10 million users in 839 courses from 114 institutions [10].

Nicenet announced the public viability in the new Internet Classroom Assistant (ICA), an effective online communication tool for web based conferencing, messaging, scheduling, link-resource sharing to different kinds of learning environments (January 2, 1998) [11]. CIA is designed for the distance learning and completing

collaborative academic projects, this web application is free for all, though who finds it useful is welcome to use it. The fully dynamic site CIA is customized with two different levels – i) the user and ii) the class. Anyone can set up a class within a minute and allow others to join.

The ICA was intentionally designed as a low graphics environment to decrease the load time of each page. Nicenet is organized into classes. One person can belong to many classes but they are accessed individually [12]. A class is composed of sections or topics. It is within each topic that messages are stored and can be arranged by date and by posting. It is possible to have written conversations with the members of the virtual class and the instructors or moderators. In addition, each member of the class will have a mailbox for private messages that no one else will be able to access. Setting up a class on the Internet Classroom Assistant takes about 2 minutes. It needs to choose a username and password, then a name for your class, some contact information. It uses an unique 'key' which is assigned for class that can be given to the students so they can create user accounts and access the classes [11].

CJ online classroom is the first ever online LIVE classroom in Bangladesh developed by a large IT Magazine company 'Computer Jagat'[13]. Computer Jagat(CJ) classroom is live for all that allows online live classes with live classroom of different kinds of options. Grablele Piccoli, Rami Ahmed and Blake Levs (2001) proposed a model for an effective virtual learning environment (VLE) in the context of basic information technology skill training [14].

Udemy.com also offers a marketplace where anyone can initiate a course to teach and learn. It has both paid and free version [15]. It also offers the facilities to attract corporate trainers seeking to create coursework their employees. It is reported that Udemy has served more than 4 million students, and offers 20,000 course alternatives [16].

Ferreira, J.M.M. (2014) introduces Flipped classrooms which implements Google Apps. An essential Google Apps can be used in the context of pedagogical model that ensures collaborative, students-centered learning and describes how a teaching and learning framework can be implemented as a Google site [17].

Google Classroom is a new tool coming to Google Apps for Education later in 2014. This classroom facilitates the teachers to create and organize assignments quickly, provide feedback efficiently, and communicate with their classes with ease. Google Classroom helps students to organize their work in Google Drive, complete any assignments, and communicate directly with teachers and peers [18] [19].

Rachel Fishman (2013) shows in his paper how the next generation will conduct online education, mostly public universities to adopt innovative, cost effective

approaches to teaching and learning [20]. A “Next Gen U” allows a holistic online student experience by offering not only online courses (i.e. either hybrid or fully-online) and credentials, but also student services like early warning systems, counseling and support, financial aid, and even library and research services. To understand why more public institutions have not moved as quickly into the virtual world-transitioning to a Next Generation University model. It explores the different strategies employed by successful universities including Arizona State University, University at Buffalo, University of Central Florida, University of California at Riverside, Georgia State University, and University of Texas at Arlington to overcome these common roadblocks, and how they have shaped their institutional policies to help large and increasingly diverse student populations earn degrees [20].

There are some web based solutions or portal which are available for e-learning such as Accu Conference which needs no software to be installed and configured [21]. Adobe Connect is another popular tool which gives the facility to create online meeting rooms and interactive web conferencing [22]. AT&T Connect which is an Enterprise-class application that transforms voice, web and video conferencing from multiple point tools into one core communication [23]. Big Blue Button Enables universities and colleges to deliver high-quality learning experience to remote students [24]. Blackboard Collaborate helps to create virtual classrooms, offices and meeting spaces that open more possibilities to more students [25]. Moreover, Cisco WebEx is used to show presentations, demonstrate application and share anything on your computer screen. Encourage interaction with easy-to-use tools, including interactive annotations and chat [26]. Click Meeting gives a user to deliver video presentations and demos. Teams can share desktops, documents and applications and control the interaction [27]. Wimba Classroom offers a virtual classroom environment with robust features that include audio, video, application sharing and content display, and MP4 capabilities [28].

In this chapter several research and related works of virtual classroom have been described. From the above discussion, it is clear that virtual education is being spread all over the world and students are now more engaged in e-learning.

III. PROPOSED MODEL

The proposed model has been designed with the help of previous research and related works which are discussed in the earlier section.

a) Mathematical representation of the proposed model

The key objects used to create the virtual classroom model are: Courses, Students, Teachers and Assessments. This conceptual model or Course Tree Structure (CTS) has been shown in the following figure 1.

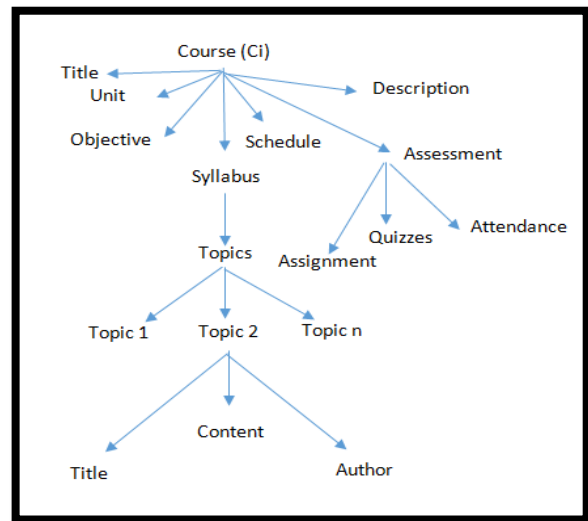


Figure 1 : Course Tree Structure of course details

Mathematical model of course instructor
Let,

- c_i = Courses Created by teacher
- tp_j = Course topics provided by teacher
- q_k = Questions created by teacher
- a_y = Assignments given by teacher
- ld_m = Lecture duration

where, $i, j, n, k, y, m = 1, 2, 3, \dots, n$

The functions of a teacher (Tx) can be represented by the following equation 1:

$$Tx = \sum_{i=1}^n c_i + \sum_{j=1}^n \sum_{i=1}^n tp_j c_i + \sum_{k=1}^n \sum_{i=1}^n q_k c_i + \sum_{y=1}^n \sum_{i=1}^n a_y c_i + \sum_{m=1}^n \sum_{i=1}^n ld_m c_i \dots \dots \dots (1)$$

Mathematical Model of Course

The functions of a course (Cx) can be represented by the following equation 2:

Let,

- sc_d = Course Schedule

$$Cx = \sum_{j=1}^n tp_j + \sum_{k=1}^n q_k + \sum_{y=1}^n a_y + \sum_{j=1}^n ld_m + \sum_{k=1}^n sc_d \dots \dots \dots (2)$$

Mathematical Model of students Activities

- pc_z = Class participation
 - Gx = group study performance
 - s_v = n number of students
 - Se = Students activities
- where, $v, z = 1, 2, 3, \dots, n$

The functions of a Student (S_a) can be represented by the following equation 3:

$$\sum_{v=1}^n \sum_{i=1}^n s_v c_i + \sum_{v=1}^n \sum_{i=1}^n \sum_{j=1}^n s_v c_i t p_j + \sum_{i=1}^n \sum_{j=1}^n \sum_{k=1}^n c_i t p_j q_k + \sum_{i=1}^n \sum_{y=1}^n \sum_{v=1}^n c_i a_y s_v + \sum_{i=1}^n \sum_{z=1}^n \sum_{v=1}^n c_i p c_z s_v \dots \dots \dots (3)$$

The functions of a Group Work (G_x) can be represented by the following equation 4

$$G_x = \sum_{i=1}^n \sum_{j=1}^n \sum_{v=1}^n c_i t p_j s_v \dots \dots \dots (4)$$

b) High-Level Architecture

The following figure 2 illustrates a high level architecture of the developed system.

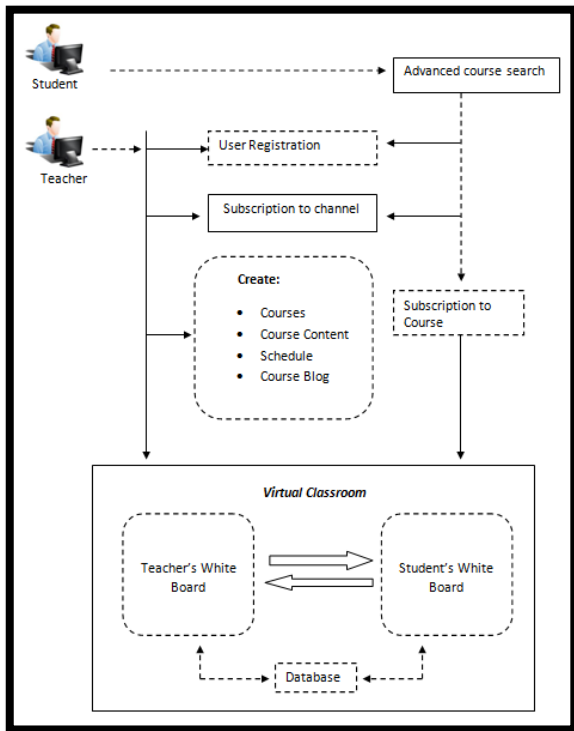


Figure 2: High level Architecture of the proposed model
From the above figure 2, we can clearly identify how teachers and students can collaborate in our developed system.

c) Use-Case of the developed system

In this subsection, two use cases have been described in the perspective of teacher's and student's view. The following figure 3 shows the use case of a teacher/course instructor.

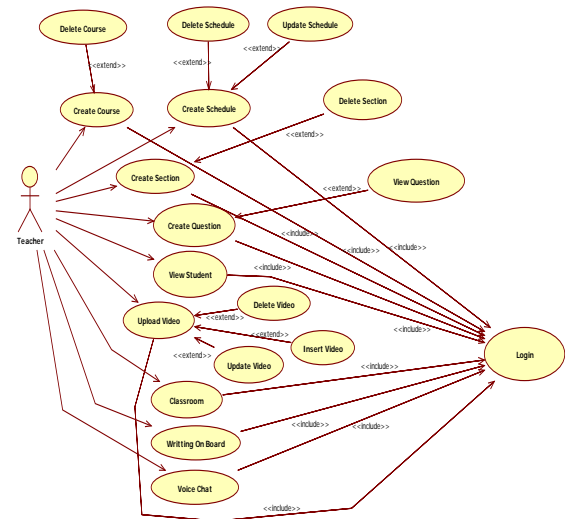


Figure 3 : Use case for teachers' in virtual classroom

The following figure 4 illustrates the use case of the student's activities.

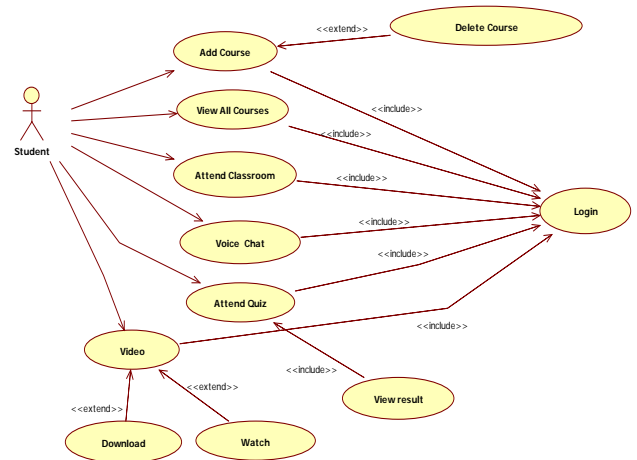


Figure 4 : Use case for students' activities in virtual classroom

In this research work, there are two main parts which needed to develop for teaching and learning purpose. In the following figure 5, a screenshot has been showed where teachers taking classes and students are attending classes in a real time. The figure also demonstrates ongoing students who can directly chat with their instructors.



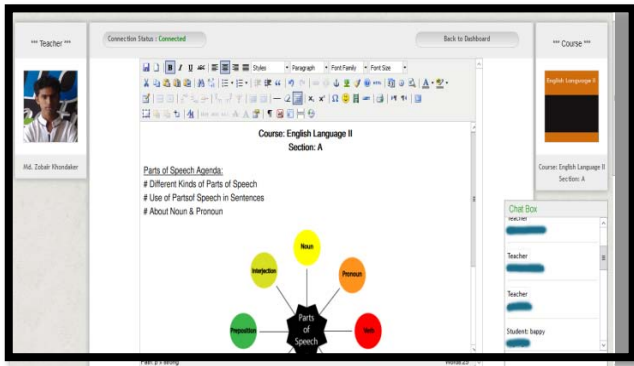


Figure 5 : An online class is in progress

[Full application is available at: http://piconetit.com/virtual_classroom/, last accessed on 21-09-2015]

IV. RESULTS AND DISCUSSIONS

In this section, we are going to describe the results and analysis of the developed system. We have taken quizzes in several educational institutions to measure the effectiveness of our developed virtual classroom and its effectiveness.

Result Analysis

Let,

qz_g = marks of quizzes

az_b = marks of the assignment

pz_c = marks of the attendance

Where $g, b \& c = 1, 2, 3, \dots, n$

Result for a quiz of a student (qr) is defined as follows:

$$qr = \frac{1}{q_n} \sum_{i=1}^n \sum_{j=1}^n \sum_{v=1}^n \sum_{g=1}^n c_i t p_j s_v qz_g \dots\dots\dots (5)$$

Here, q_n = number of all quizzes

Result for an assignment of a student (ar) is defined by the following equation 6.

$$ar = \frac{1}{a_n} \sum_{i=1}^n \sum_{j=1}^n \sum_{v=1}^n \sum_{b=1}^n c_i t p_j s_v az_b \dots\dots\dots (6)$$

Here, a_n = number of all assignments

Result of Class Participation of a student(pcr) is defined as follows:

$$pcr = \frac{1}{pc_n} \sum_{i=1}^n \sum_{j=1}^n \sum_{v=1}^n \sum_{c=1}^n c_i t p_j s_v pz_c \dots\dots\dots (7)$$

Here, pc_n = number of class attended

Here,

qr = Average marks of all quizzes (70% marks)

ar = Average marks of all Assignment (20% marks)

pcr = Average marks of Class participations(10% marks)

Therefore total performances of the student can be calculated by the following equation 8.

$$Sr = qr + ar + pcr \dots\dots\dots (8)$$

Here, Sr is the total marks counted for a student

$$qf = 0\% \leq Sr \leq 100\%$$

Here qf is the overall performance of a student.

We have implemented the virtual classroom in four different institutions. According to the above accumulated calculations, we have found the following results of effectiveness of learning and teaching in these institutions which is shown in the following table 1:

Table 1 : Effectiveness testing results summary

Name of the Institutions	Total point of Actual Output Out of 5.00
Bogra Azizul Haque Govt. College, Bogra (BAGC)	4.15
Adamdighi Govt. Girls School and College, Bogra (AGSC)	3.85
Adamdighi Senior Fazil Madrasah (ASFM)	3.65
Adamdighi I.P.J Pilot High school , Bogra (APH)	4.17
The average point of Actual Output	3.95

From the above table 1, the effectiveness of implementing virtual classroom is 3.95 (i.e. average point) out of 5.00.

Performance analysis of virtual classroom in the case of learning is shown in the following figure 6:

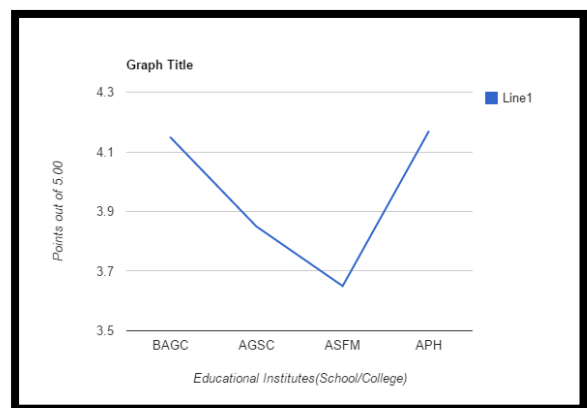


Figure 6 : Performance of Virtual Classroom (learning mode)

The performance of teaching through the virtual classroom is illustrated in the following figure 7

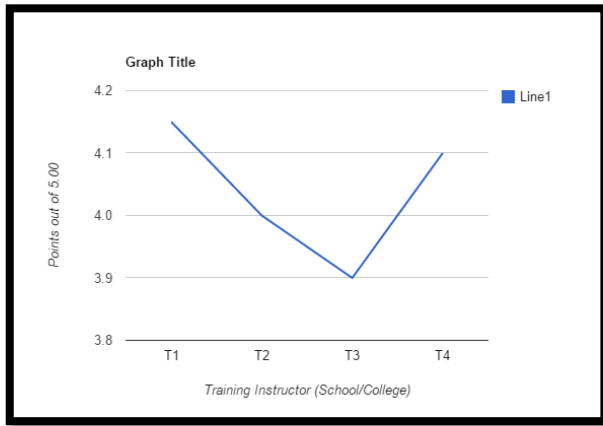


Figure 7 : Performance of Virtual Classroom (Teaching mode)

According to the above graph the performance has been tested in several educational institutions by conducting live classes through the virtual classroom. And the results of the test vary because of the teaching style of the same class by different instructors (e.g. T1, T2, T3 and T4). However, it is to be noted that implementing virtual class room in these institutions has been satisfactorily performed well in a comparison of physical classroom.

V. CONCLUSIONS

Virtual Classroom is a web application that provides users with an effective environment of teaching and learning. Both teachers and students can be benefitted in training and learning by this application. Classroom environment becomes friendlier as it is easy to navigate and find the resources and class lectures. It can be a better solution in the field of learning and teaching to make education more accessible. The main goal was to create a web application where both students and teachers can collaborate at the same time and get benefit in terms of teaching and learning. Improving collaboration among teachers and students is one of the important goals of our application.

The virtual classroom minimizes the physical barriers between classroom and students. In addition, the performance of teaching-learning outcome was satisfactorily good and can be improved through further research.

The future scope of this research work is to make a reliable application that will be compatible in any platforms and more user friendly based on user experience.

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Designing Intelligent Technology Applications using the Visual Basic Files

By Dr. Dan Mircea Trană

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Abstract- This paper proposes an overview of the approach to design management computer applications using advanced programming languages and having the Visual Basic demonstration as support, which is one of the most popular object-oriented programming languages, in the area of programmer training. After a brief introduction to the Visual Basic syntax instructions for working with files, the description of how to build applications out of school activities for students - application that is set up as an illustration of features offered by the Visual Basic in working with collections of independent data - the files.

Key-Terms: *file, open, close, sequential, random, binary, line input, print, get, put.*

GJCST-C Classification : C880



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Designing Intelligent Technology Applications using the Visual Basic Files

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Key-Terms: file, open, close, sequential, random, binary, line input, print, get, put.

I. INTRODUCTION

Computer programming for the development of management applications can be achieved through advanced programming languages, the most widely currently used being the object oriented ones. One of the most recommended in this category, especially in terms of teaching is Visual Basic. If we relate to computer management applications, the huge amount of data they manipulate leads to the necessity of working with collections of data, especially files, usually regarded as independent, their relationship being done just by the help of the computer programs that exploit them.

Visual Basic has several peculiarities in the use of data files, which is why we approached the present study, providing the following aspects to the reader: the concept of files in Visual Basic, general self-documenting format of instructions that allow translation into programming language operations with files and obviously the needed illustration. For the latter approach we chose an example that has a strong teaching purpose, the problem solved being intentionally simplified by proposing a Visual Basic project.

We describe the operations in detail, for the programmer to enable any reader, that has minimal knowledge of programming in Visual Basic, to achieve the proposed project on their own, including the completion of its functions with code-programs, that are missing from the material.

The material is on the one hand, a systematization of knowledge that is necessary for the development of projects using Visual Basic files and, on

the other hand, the setting out of the proper conditions for training the programming skills in this area, even for amateur or novice programmers.

II. REVIEW OF THE PAPER ON THE SUBJECT MATTER

The specialized literature in programming in Visual Basic is very generous lately. The current trend in the development of documentation for help in programmer training is to provide the computer user, willing to make a major step towards becoming a programmer, a self-documented documentation and accompanied, on each major section, by examples that enhance the attractiveness of the reader.

We considered that such work is welcome, and we wanted it to be an effective means of learning and, at the same time, a model for the development of the documentation for current or prospective programmers.

III. THEORETICAL BASIS

In the development of the present material, we approached the theoretical and practical issues, having the documentation connected to the bibliography in Paragraphs 1 and especially 2, as a starting point.

a) Working with files in VB [2]

The large amount of the data to be processed requires the storage of the data in collections that have records of a well defined structure. As we mentioned before these are called files. Like other advanced programming languages, VB offers the possibility of processing the data stored in files.

To enable the writing or reading of information to /from files and to protect the data stored in files, they must undergo some opening, respectively closing tasks, before or after their "use". For the description of the tasks as open, close, read or write of information stored in files, in the VB programs, the program has specific instructions defined.

i. Open a file [2]

Prior to input / output operations on the data stored in files, VB requires the opening of the file. This process is described in VB by the *Open* instruction, whose general syntax is the following one:

Open file specifier *For mode* [*Access*] access [*lock*] *As* [#] file number [*Len* = length article]

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The significance of the parameters that appear in the command syntax is as follows:

- *file specifier*: specifies the file to be submitted to the opening operation. Let us remember that by file specifier we understand: [<username> disc>] [<path of acces>] name [. Extension]. If the thus specified file does not exist on the disk, and the way of opening corresponds to an opening file is then it is created.
- *access*: allows specifying the type of access of the data in the file. Thus, the sequential access mode should be indicated *Append* (add new records to an existing file), *Input* (reading data from an existing file) or *Output* (creating a new file), and, in case you want to open a direct access you use the *Random* option.
- *file number*: a file identification number between 1 and 255. It is a work area in which the file opens. Thus for the Input or Random modes, we can open a file without closing a copy of the attached work elsewhere, namely another file number. For the Append and Output modes, opening the file can be done only after closing the copy which is already opened into another area.

To open multiple files simultaneously, it is recommended that the number of work area attached to the file, to contain the value returned by Free Find (this function returns the next number of a free zone in which the file can be opened). To determine the record length of a file RecLength function can be used.

Open instruction can be used only for opening files from VB applications, not other applications such as Word, Excel or Access.

ii. Closing a file [2]

To ensure the security of data stored in files, after their use, these should be subject to the closing operation. The shutdown operation of files in VB is achieved by *Close* instruction having the following general syntax:

Close [list of file numbers]

Close instruction without parameter has the effect of closing all files that are active at the time. For files opened with Append or Output, all data in the buffer area associated with the file are transferred before closing. Closing a file results in ending the relation between the file and the associated buffer zone, which is thus released.

iii. Accessing a file [1] [2]

Files can be accessed through VB programs in several ways:

- Sequentially
- Randomly
- Binarily

Sequential access is possible for files opened in the Input, Output or Append ways. It is recommended in

processing data stored in files on several lines of different lengths. To accomplish this way of using VB, access instructions / O Line Input # and Print # are used. They have the following general format:
Line Input # file number, variable name
Print # file number, the list of output variables

Line Input instruction has the effect of reading a record from the file indicated by file number and storing the data read in the internal memory (buffer) associated to the variable whose name appears as a parameter of the instruction. Following the execution of this instruction on an open file with the Open instruction, the data are read from the file, character by character, to meet the CRLF code sequence (Carriage Return Line Fide), which marks the end of a line in the file, and are transferred to the buffer are associated to the file.

Print instruction allows indication of the the operation of VB program writes data in a file identified by the file number currently the command parameter. List of output variables contains variables, arithmetic expressions or strings that are intended to be stored on a new line of the file. If this parameter is missing, the file will be written a blank line.

Random access (Random) is used when data records are structured the same length and the same structure in fields. In this case access to the data stored in the file is done directly on the registration sought. To ensure that the description of the input / output files opened in Random mode have been designed in VB following instructions:

Get # file number [number of article] variable name

Put # file number, [number of article] variable name

Get instruction allows reading from the file identified by the file number of the article with the number indicated as a parameter and storing it in a variable whose name is mentioned.

Put instruction allows data transfer from the variable indicated in an article name of the file that was specified via the file number.

Next we consider an *issue that requires the use of files to solve it in VB: the record of student academic situation of a university regarding the computer science subjects*. Each student must store the following information: registration number, first name second name, faculty, group and year of study, grade connected to practical examination1, grade connected to practical examination 2, final grade for each semester.

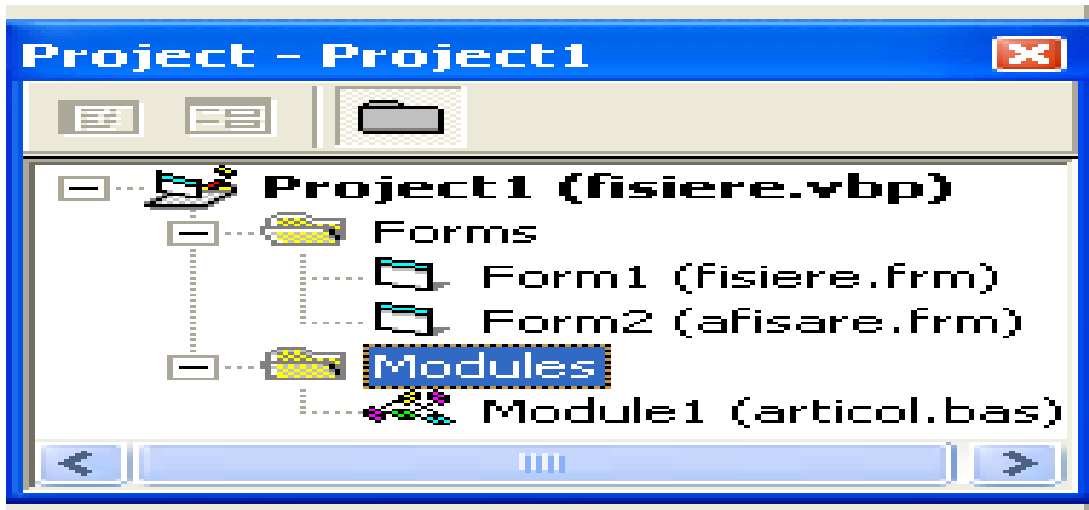


Fig. 1 : VB project structure

We associated two forms and one module to the application as shown in Fig.1

In *Module1* (stored on the hard disk in file *articol.bas*) we described the structure of an article in the *student* file. It is created in the Random way to store information regarding a student as required by the issue. The program code associated with the *article* module is the following one:

Type articol

```
nr_matr As Integer
nume As String * 20
pren As String * 25
modulus
fac As String * 10
grupa As Byte
notap1_1 As Byte
notap2_1 As Byte
notas_1 As Byte
nota1 As Byte
notap_2 As Byte
```

```
notas_2 As Byte
nota2 As Byte
End Type
```

Fisiere.vbp project consists of *fisiere.frm* and *afisare.frm* forms and *articol.bas* way, whose content was previously presented. We remind you that if the first form is automatically created a project, for the introduction of other forms in the project we proceed as follows: click the mouse Right on *Forms* from *Project Explorer* and access the *Add* function. You can then select *Form* and a new form in the project is included.

Form1 form of the project will have the interface shown in Fig. 2 . We can notice the presence of a *label* type controller which has the task to enter a title for the window managing the project, of 5 *control buttons* for the implementation of the project functions and a *text casset* type controller for the transmission of the parameters necessary to *Form2* form.

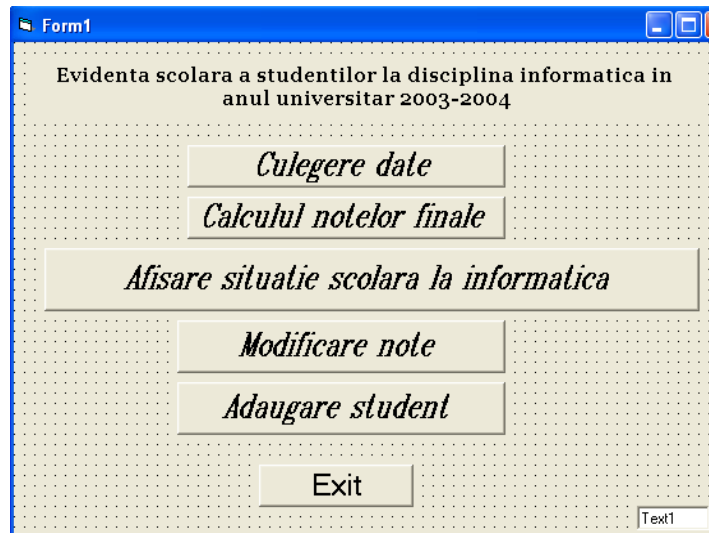


Fig. 2 : The opening window of the project

Form 1

Student study situation record regarding the IT subject in 2014-2015 accademic year

<i>Data gathering</i>
<i>Final grades calculation</i>
<i>Displaying the student study situation regarding the IT subject</i>
<i>Modify grade</i>
<i>Add student</i>
<i>Exit</i>

Further on we present the program code associated to the first form and objects in its interface:

```

Dim s As articol
Dim i, j As Byte
Private Sub Command1_Click()
Dim gata As Boolean
Dim r As String * 1
Open "student" For Random As #1
i = 1
Data = False
While Not gata
    s.nr_matr = InputBox("Numarul matricol al studentului" Student registration number)
    s.numa = InputBox("Numele studentului" Student last name)
    s.pren = InputBox("Prenumele studentului" Student first name)
    s.grupa = InputBox("Grupa si anul de studiu" Group and year of study)
    s.notap1_1 = InputBox("Nota la prima proba practica sem. I" Grade for the first practical examination -1st semester)
    s.notap2_1 = InputBox("Nota la a doua proba practica sem. I" Grade for the second practical examination -1st semester)
    s.notas_1 = InputBox("Nota la proba scrisa sem. I" Grade for the written examination -1st semester)

    s.notap_2 = InputBox("Nota la a doua proba practica sem. II" Grade for the second practical examination -2 nd semester)
    s.notas_2 = InputBox("Nota la proba scrisa sem. II" Grade for the written examination -2nd semester)
    Put #1, i, s
    r = InputBox("Gata adugare? [d/n]" Ready to add[y/n] ?)
    If r = "d" Then
        gata = True
    Else
        i = i + 1
    End If
Wend
Close #1
End Sub
Private Sub Command2_Click()
i = InputBox("Cati studenti aveti in vedere?"How many students do you take into consideration?)
Open "student" For Random As #2
j = 1
While j <= i
    Get #2, j, s
    If s.notap1_1 > 4 Then
        If s.notap2_1 > 4 Then

```

```

    If s.notas_1 > 4 Then
        s.nota1 = (s.notap1_1 + s.notap2_1 + s.notas_1) / 3
    End If
End If
Else
    s.nota1 = 0
End If
If (s.notap_2 > 4) And (s.notas_2 > 4) Then
    s.nota2 = (s.notap_2 + s.notas_2) / 2
Else
    s.nota2 = 0
End If
Put #2, j, s
j = j + 1
Wend
Close #2
End Sub
Private Sub Command3_Click()
Form1.Hide
i = InputBox("Cati studenti aveti in vedere?" How many students do you take into consideration?)
Form1.Text1.Text = Str(i)
Form2.Command1.Enabled = True
If i = 1 Then
    Form2.Command1.Enabled = False
End If
Form2.Show
End Sub
Private Sub Command6_Click()
End
End Sub
Private Sub Form_Load()
    Form1.Text1.Visible = False
End Sub

```

It should be mentioned that we only developed the software codes associated to the first three of them and to the last of the control buttons. The other two (changing or adding a new record) were left as an exercise for the reader.

Form2 form meets only the function to ensure the school situation display for each and every student. Data are displayed on the screen in the form *afisare.frm* interface whose interface is shown in FIG. 3. The form contains text and label type controllers and command buttons.

Fig. 3 : Data gathering layout

Student's last name
 Student's first name
 Student's grade - first practical examination
 Student's grade - second practical examination
 Student's grade for the written examination
 Student's final grade- first semester
 Student's final grade- second semester

The program code associated to *Form2* form is the following one:

Private Sub Form_Load()

```
Open "student" For Random As #3
Dim s As articol
Get #3, 1, s
Form2.Text1.Text = s.ume
Form2.Text2.Text = s.pren
Form2.Text3.Text = Str(s.notap1_1)
Form2.Text4.Text = Str(s.notap2_1)
Form2.Text5.Text = Str(s.notas_1)
Form2.Text6.Text = Str(s.nota1)
Form2.Text7.Text = Str(s.nota2)
Close #3
```

End Sub

This program code opens the "student" file and displays the data related to the first student and closes this file.

The program code associated with the command button is as follows:

```
Dim i As Byte
```

Private Sub Command1_Click()

```
i = CInt(Form1.Text1.Text)
j = 2
Open "student" For Random As #3
Dim s As articol
While j <= i
Get #3, j, s
Form2.Text1.Text = s.ume
Form2.Text2.Text = s.pren
Form2.Text3.Text = Str(s.notap1_1)
Form2.Text4.Text = Str(s.notap2_1)
Form2.Text5.Text = Str(s.notas_1)
Form2.Text6.Text = Str(s.nota1)
```



```

Form2.Text7.Text = Str(s.nota2)
j = j + 1
Wend
Close #3
Form2.Command1.Enabled = False

```

End Sub

The program code contains the receiving of the number of students for which display is wanted, the opening of the file and the displaying of the student academic situation for all students, beginning with the second one. At the end of the listing process, the *next* button is disabled (the last instruction of the code).

The program code associated to the *ies* button has the purpose to revert to the first form and is given as follows:

Private Sub Command2_Click()

```

Form2.Hide
Form1.Show

```

End Sub

We leave the designing of a program code associated to the command buttons *Change student grades* and *Add student* in window shown in Fig.2, as an exercise to the reader.

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Simulation for Optimizing Repository of COTS

By P. K. Suri & Karambir

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Abstract- Sufficient warehousing management is critical for procurement, storage and delivery of software component. Therefore it is important to find and implement the optimized warehousing system. In Component based software Engineering, it is considered a two-level multi product warehousing control system which controls the requirement of user and fast development of system in the age of hard competition of days. For delivering the software, it is assumed that the client and the developer want their product by minimizing the total cost in mind by reducing the cost of reorder, holding and losses of customer from unavailability of the software in time. The demand of customer for the particular service or component as well as the time of delivering the software component from the vendor are random values with known probability of distribution. Multi location warehousing models are one of the most widely faced real time problem in mathematical warehousing theory, but the analytically models suffer from various restrictive assumptions and solutions.

Keywords: *warehousing, component delivery time, client request time, simulation methods, component based software.*

GJCST-C Classification : *H.3.5*



SIMULATIONFOROPTIMIZINGREPOSITORYOFCOTS

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Simulation for Optimizing Repository of COTS

P. K. Suri ^α & Karambir ^σ

Abstract- Sufficient warehousing management is critical for procurement, storage and delivery of software component. Therefore it is important to find and implement the optimized warehousing system. In Component based software Engineering, it is considered a two-level multi product warehousing control system which controls the requirement of user and fast development of system in the age of hard competition of days. For delivering the software, it is assumed that the client and the developer want their product by minimizing the total cost in mind by reducing the cost of reorder, holding and losses of customer from unavailability of the software in time. The demand of customer for the particular service or component as well as the time of delivering the software component from the vendor are random values with known probability of distribution. Multi location warehousing models are one of the most widely faced real time problem in mathematical warehousing theory, but the analytically models suffer from various restrictive assumptions and solutions. In the given paper, a simulation model of the above warehousing assumptions is proposed so that developer may not accumulate the extra and large heaps of components and also may not have shortage of the software for the developer or client.

Keywords: warehousing, component delivery time, client request time, simulation methods, component based software.

1. INTRODUCTION

While developing new software, we search for all library components that satisfy a given requirement of client query. Even the reuse of this component, the environmental constraints decide the compatibility and how much it fulfills the requirements. To select the component, the requirement does not exactly matches the specification of component, then degree of matching takes place like satisfy or relevant or equivalent of behavior. The architecture of software is lay down by the requirement team and then plug and play components allow developers to assemble customized applications without configuration or much programming effort. Dynamically composed plug-and-play components allow users to reconfigure an application on the maintaining the software.

Composition of software points dynamic composability, where components can be added or removed at any time. It may be done at design time or

run time. In an architectural system, positions of one component may avail the service of other component or it may provide the service to other component.

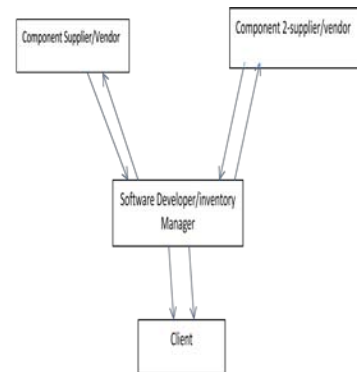


Fig.1 : Two-level Model of Software Developer

The big issue for the software developer is that there is a limit of number of components same time in their storage. At present, the repository of library of software component may be huge collection and after some time the new version of this component that has better feature or available at the cheap rate with the change in technology. Then this will be a huge loss or wastage of space to developer. Even this is not possible for developer, that he places order when the client put his requirements in front of him. The distribution and availability of that component may take more time. This may cause the loss of client and delay of development of software. The distribution time of component and arrival of client is assumed stochastic random. Practically, there are many cases when a software developer is involved in ordering process or integrating the component, he has to take into account that the sum of total costs for goods ordering [1], holding and losses from deficit per day and per component should be minimal. In proposed criteria total costs [2] are sum of corresponding costs for all factor taking part in the ordering process i.e. reorder cost, interest on investment on the purchasing of component the loss of client. The developer and client use different ordering strategies. Developer wants to earn more money without much investment. But in client side, the client wants to get software developed early and as per his requirement. Theoretically, it is only possible if the developer has some critical component in his library and the optimum solution is provided to the client. For today's complex production and distribution systems it becomes more and more important to have efficient and easy

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applicable tools that model [3] and control the flows of goods through the various locations of the system. One of the top questions is how to guarantee in defined sense optimal inventories. In the past answers were found above all by analytical investigations of three tier models. Thus we propose to combine simulation with an appropriate optimization tool and to derive by such a way solutions for complex control, design and availability to client problems.

II. OPTIMIZATION OF COST IN WAREHOUSING SYSTEM

COST system of component Based Software System (CBSE) is the integration of software component as per the service required by the clients. The software developer has to keep the library of the commercial components. The client has different requirement of different service. The services are not exactly matched with the available components. So the developer has to keep a variety of software components with number of user permissions. The warehousing management problem is to maintain the warehousing of these components to meet out an random demand. The developer has to keep the cost of holding the components in own library and the loss of client and wastage of valuable time of client.

a) Assumptions

Consider a system with average demand (dem) of a particular component, a reorder number of components Q. The developer has non zero warehousing of components for time t and for (1-t) time backlog of order is kept. As soon as backlog is completed as soon as the next delivery of vendor arrives. The arrival of client and demand for the particular component and time of arrival of order is not fixed. In this algorithm, the following situation is considered (1) the arrival of client to the developer is Poisson Distributed. (2) the lambda for Poisson distribution is 5.0 (3) the arrival of reorder is Erlang distributed. (4) Erlang distribution has two variable i.e. m=3, beta=7 was assumed for simulation. The simulation was done for 500 days for fixed value of P and Q. (5) The reorder cost per day, the carrying cost per day and loss due shortage was assumed fixed for different quantity of order and fixed level of reorder. Average of warehousing in warehousing for the time t is given by equation by equation (1) is

$$\text{Inv}(\text{avg}) = \frac{Qt}{2} \quad \text{--- 1}$$

For the average time (t), the warehousing is determined by equation (2)

$$\text{Inv}(\text{avg}) T(\text{avg}) = \frac{Q * t^2}{2} \quad \text{--- 2}$$

If the holding or storing any software and maintaining software is constant k , then for average cost for these is given by equation (3)

$$MC(\text{avg}) = k * \frac{Qt^2}{2} \quad \text{--- 3}$$

When the order is placed, then average reorder cost is given below by equation (4) is

$$RC(\text{avg}) = r * \frac{D}{Q} \quad \text{--- 4}$$

Total cost average per day is given here below

$$TC = k * \frac{Qt^2}{2} + b * \frac{Q(1-t)^2}{2} + \frac{r * D}{Q} \quad \text{--- 5}$$

To determine the optimal cost for time t , the differentiation of of equation (6) w.r.t. to t and for the minimum this is set equal to zero. After differentiation, the equation is

$$\frac{dTC}{dt} = \frac{Q[2kt - 2b(1-t)]}{2} = 0 \quad \text{--- 6}$$

And value of t is equal to

$$t_{\text{coefficient}} = \frac{b}{k+b} \quad \text{--- 7}$$

After putting the value of t in equation 6 , the total cost is equal to

$$TC = \frac{Q \left[\frac{bk}{k+b} \right]}{2} + \frac{Dr}{Q} \quad \text{--- 8}$$

In order to determine the optimal number of reorder components, the equation 8 is differentiated with respect to Q and put it equal to zero.

$$\frac{dTC}{dQ} = \frac{bk}{2(k+b)} - \frac{Dr}{Q^2} = 0 \quad \text{--- 9}$$

$$Q(\text{warehouse}) = \frac{\sqrt{2Dr}}{k} \cdot \frac{\sqrt{k+b}}{b} \quad \text{--- 10}$$

It was observed that due to finite value of shortage cost b the optimal, the optimum size of reorder number of component increases, but the maximum number of component decreases.

b) Algorithm of Simulation of Warehousing of Component

The below mentioned algorithm is for the simulation of arrival of client to the developer and preparation time of software by the developer and arrival of component from the vendor to the developer. Initially the variable h =1 for storing the value by increment step of h, m=3, beta=7 for Erlang distribution and mean value lambda=5 for poison distribution was taken. Here P is the level of warehouse that the developer must place order and Q stands for the number of user for

particular component. The warehouse and position of warehousing(invpos) was taken initially 10. then total software actually given to the client(tus), cumulative warehouse, number of refusal of order of software (nbo), number of reorder(nord) was taken as 0 and time of delivery if order not placed was assumed infinity here it is 999 taken. The demand of software or component (dem) was poison with $\lambda = 5$ was calculated. After iteration of 500 days of software developer the average daily sale(adsale), average daily refusal of order of software (adbo), average warehouse (avstok), average buffer warehouse (abstok), cost spent on carrying the component (ccost), the cost spent on the reorder includes phones/internet usage, payment given for time idle of developer(rcost), the loss occurred due to refusal or lost of client (scost), the total cost spent on the whole process of practical case (totcost) was calculated and displayed

Step 1: set $h = 1$, $m = 3$, $\beta = 7.0$, $\lambda = 5.0$

Step 2: [start] repeat loop $p = 100$ to 120
step increment of 5

Step 3: [start] repeat loop $q = 50$ to 70
step increment of 5

Step 4: initialize $nbo = 0$,
warehouse = 10,
invpos = 10,
tus = 0, csh = 0,
cbfstk = 0,
cnbo = 0,
nord = 0

Step 5: [start] repeat loop $i = 1$ to 3(step increment of 1)
Set array $dd(i) = 999$ (end loop)

Step 6: [start] repeat loop $nday = 0$ to 500
increment by 1
Set $dem = \text{poissrnd}(\lambda)$

Step 7: [start] repeat loop $i = 1$ to 3 step increment of 1

Step 8: if $dd(i) = nday$ then
Set $cbfstk = cbfstk + warehouse$,
warehouse = warehouse + q ,
array $dd(i) = 999$ [endif][end loop]

Step 9: if $warehouse \geq nbo$ then
Set $Tus = tus + nbo$,
warehouse = warehouse - nbo ,
invpos = invpos - nbo ,
 $nbo = 0$

Step 10: if $warehouse \geq dem$ then
Set $tus = tus + dem$,
warehouse = warehouse - dem ,
invpos = invpos - dem ,

Else then
Set $nbo = nbo + dem - warehouse$,
 $cnbo = cnbo + nbo$,

$tus = tus + warehouse$,
invpos = invpos - warehouse,
warehouse = 0[endif]

Step 11: else then

Set $nbo = nbo + dem - warehouse$,
 $cnbo = cnbo + nbo$,
 $tus = tus + warehouse$,
invpos = invpos - warehouse,
warehouse = 0[endif]

Step 12: if $invpos \leq p$ then

Step 13: repeat loop for $i = 1$ to 3
increment step of 1

Step 14: if $dd(i) \geq 999$ then
Set $invpos = invpos + q$,
 $y = \text{ceil}(\text{gamrnd}(m, \beta))$,
 $dd(i) = nday + y$, $nord = nord + 1$
Break of loop [endif]
[endforloop][endif]

Step 15: set $csh = csh + warehouse$ [endfor]

Step 16: calculate

$adsale(h) = tus / 500$
 $adbo(h) = cnbo / 500$
 $avstok(h) = csh / 500$
 $abstok(h) = cbfstk / 500$
 $ccost(h) = 0.2 * csh / 500$;
 $rcost(h) = 200 * nord / 500$;
 $scost(h) = 2.0 * cnbo / 500$;
 $totcost(h) = ccost(h) + rcost(h) + scost(h)$;

Step 17: print adsale, adbo, avstok, abstok, ccost, rcost, scost, totcost

Step 18: Set $h = h + 1$ [endfor loop][endfor loop]

Step 19: [end of program]

III. SIMULATION AND RESULT

The result of running of simulation in octave software is based on the assumptions that the Demand of Software Component to Software Developer with Number of Days. The variation of demand with the 500 of days were analyzed and is shown in fig 2. The arrival time of client is also not certain. The arrival time of client to the software developer is shown in fig 3. The Average Daily Warehouse with respect to order of level(p) and Reorder quantity(Q) is not fixed. The amount of component changes with the number of new components required and time to place the order for new component. Fig 4 shows the Average Daily Warehouse with respect to order of level(p) and Reorder quantity(Q). Fig 6 shows the average daily sale on the basis of the data shown in fig 5. After 500 days of iteration, the average daily cost for reorder of component is shown in fig 7. The loss of client if software is not available in time the Average daily shortage cost is shown in fig 8. There are three factor

which were assumed for calculating the total cost in maintain the library of the commercial off the shelf components. The Effect of different factor of total cost of maintain library is shown in fig 10. From the fig 10, it can be seen that the loss due to shortage cost greatly affects the total cost.

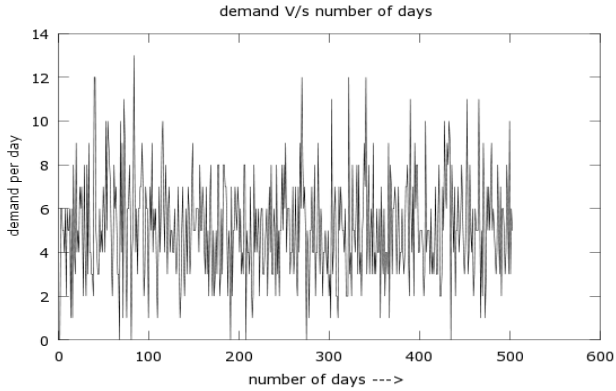


Fig. 2 : Demand of Software Component to Software Developer with Number of Days

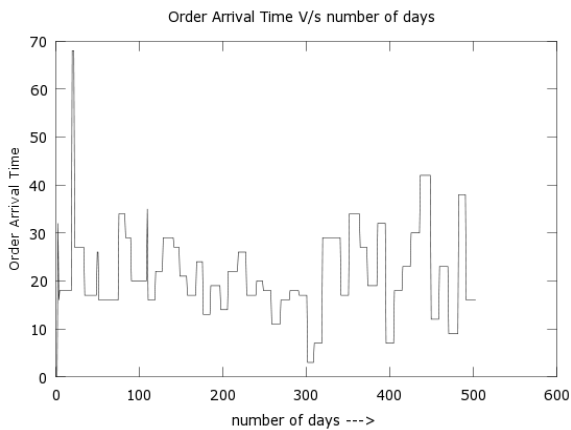


Fig. 3 : The Arrival Time of Client to Software Developer with Days

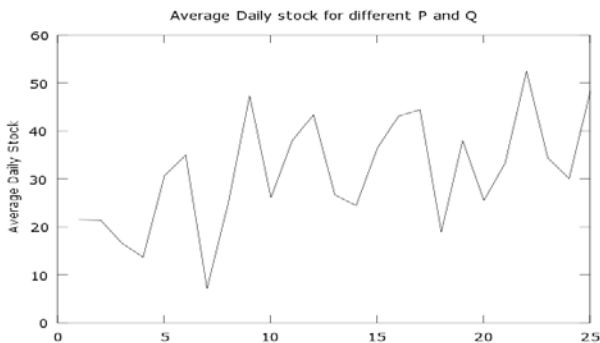


Fig. 4 : Average Daily Warehouse with respect to order of level(p) and Reorder quantity(Q)

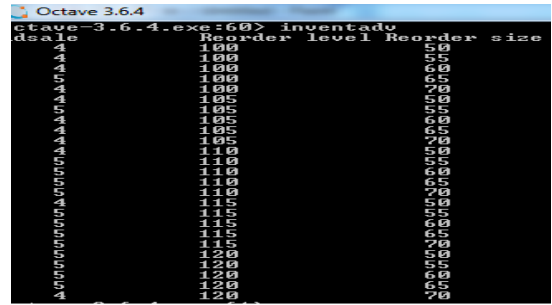


Fig. 5 : Average Daily Sale with respect to order of level(p) and Reorder quantity(Q)

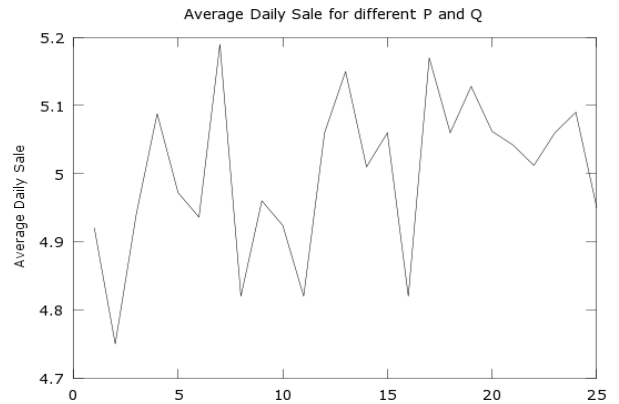


Fig. 6 : Average Daily Sale with respect to Order of Level(p) and Reorder quantity(Q)

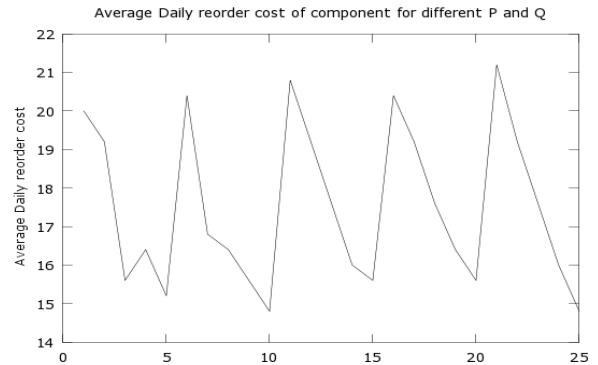


Fig. 7 : Average Daily Cost For Reorder of Component

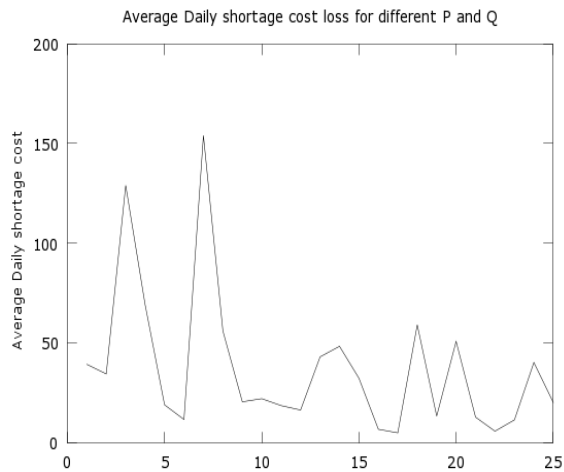


Fig. 8 : Average daily shortage cost

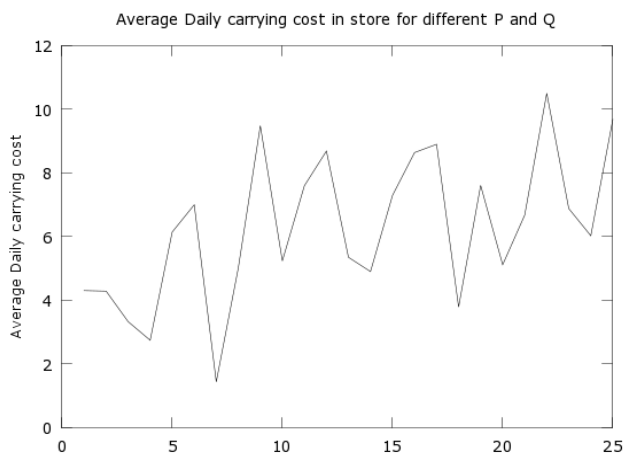


Fig. 9 : Average daily carrying cost due to maintaining repository

IV. CONCLUSION

For delivering the software and designing the software, it is assumed that the client, developer and vendor of supplier of component of services and different specification abide by the two layer model. Software developer want their product by minimizing the total cost in mind as well as reducing the cost of reorder, holding and losses of customer from unavailability of the software in time. The customers' demands for the particular service or component and the time of delivering the software component from the vendor are random values with known probability of distribution. In the given paper, a simulation model of the above warehousing assumptions is proposed so that developer may not accumulate the extra and large heaps of components and also may not provide the software to the client in time. It was observed from the fig 9 that the shortage of component has major effect on the cost of maintaining the library of commercial components. It was that the total cost was minimum i.e. 32 at $p=110$ and at $Q=55$ on an average optimum as a result of simulation.

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An Efficient Mapreduce-based System to Find Userlikeness on Social Networks

By D. Ravikiran & Dr. S.V.N Srinivasu

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Keywords: social networking, userlikeness, mapreduce, mapper.

GJCST-C Classification : K.6.3 D.2.12



AN EFFICIENT MAPREDUCE BASED SYSTEM OF FINDING USER LIKENESS ON SOCIAL NETWORKS

Strictly as per the compliance and regulations of:



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D. Ravikiran^α & Dr. S.V.N Srinivasu^ο

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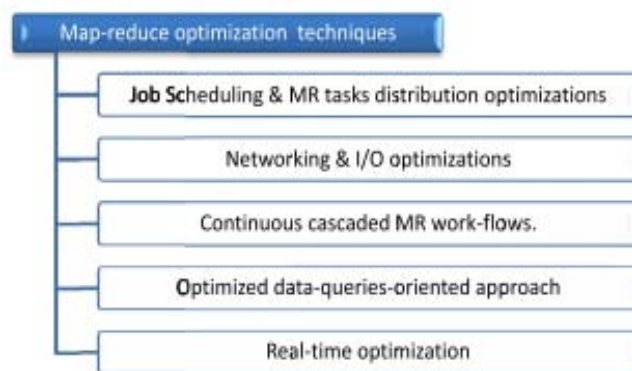
1. INTRODUCTION

Now a days, with huge volume of user data contraction, common or frequent database management systems cannot effectively sustain data management and analysis in many fields, including meteorology, scientific instruments, social networks, and medical networks. In these and other fields we need a pattern shift to address our problems. Capturing, storing and retrieving information in a timely manner are vital issues in these systems. It is necessary to have available and reliable solutions for these kinds of problems because the prevalent single-node and parallel approaches are far from offering a timely solution. On the other hand, reliable and available resolutions have their own troubles, in particular network bottlenecks, low performance of hardware nodes, and necessities for other nodes' information. Social Network is one of the fields that need reliable and data available solutions, because current solutions cannot properly solve this area's problems. One of the most important problems in this area is identifying user's likeness, or ULi, defined as the rate of likeness between two or more users in terms of their like, interests, personal information, etc. The goal in ULi is to identify those Users who have the greatest amount of information in common in order to use their Preferences or recommendations for new users.

We have two main issues in ULi: the huge amount of information per users; and the fact that most

of this data is nonstructured, lacking a predefined record structure that is common among all users. A large number of fields per users may add complexity to ULi problems as well. Given these characteristics, we have to use so-called “big data” solutions. One of the methods which can be used for reliable and data available solutions for big data is MapReduce. MapReduce is used to solve Social Network problems. But MapReduce and other data available solutions have problems such as data locality, network bottlenecks, hardware inefficiency etc. In this paper, we propose RiDaULi, a reliable and data available method for investigating user's likeness. In this method, a MapReduce-based method is used to solve ULi problems. Unlike other approaches, we do not use structured or semi-structured methods for user's information storage. RiDaULi can use different data sources with different data items. Even the same data source can have different data items for two users. Rather, RiDaULi uses a dynamic method to store user's information which can be easily dispersed over hardware nodes. In the proposed method hardware nodes can execute their tasks simultaneously, and none of the nodes needs information from other nodes which is the main problem of MapReduce-based methods. The structure of this paper is as follows. Section 2 investigates some preliminaries concerning MapReduce and Social Network problems. In Section 3, ULi-related literature is discussed. Section 4 focuses on the proposed method. Section 5 presents the evaluation of the proposed method. Section 6 provides the conclusion.

Fig 1: MapReduce Optimization



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II. GROUND WORK

In this part, both MapReduce and the relationship between Social Network and big data are explained.

a) MapReduce

In this section, the literature related to MapReduce design is discussed, a decomposable algorithm, partitionable data, and sufficient small data partition are the main characteristics required for effective use of MapReduce. In [23], classic MapReduce was optimized to decrease the data transformation load. In the method described in [23], a shared area for information was considered. This type of design is suitable for solving problems, such as k-nn and top k queries. MPI (Message passing interface) was used for message passing in a MapReduce structure. The goal of that paper was to decrease the amount of data transferred in the MapReduce network. A method was developed for tackling workloads in hierarchical MapReduce architectures. Hadoop and uses a deduplication-based snapshot differential algorithm (D-SD) and update propagation. Haloop is another type of MapReduce structure suitable for iterative problems. iMapreduce also supports iterative processes. In [20], HDFS (Hadoop file system) was substituted with a concurrency optimized data storage layer based on the BlobSeer data management service. In [22], a model was presented to estimate I/O behavior of MapReduce applications. In [21], optimization over MapReduce

structure was divided into five groups. Fig. 1 shows these groups

b) Social Network and big data

In this section, Social Network and its relation to big data are investigated. These days, users' information is generated at an exponential rate. This information has different formats and standards. According to [19], there are various standard data sources, As shown in Fig. 2, huge Volume of information is generated in Various formats with high Velocity; therefore, we have three Vs of Big data in Social Network networks. With ULi there is an additional challenge, namely Veracity, meaning that for many users we typically have doubtful or uncertain information. Social Network problems visible all of the V's, and therefore it is inevitable that we will use big data solutions to solve them but, according to [19], existing big data technologies do not effectively deal with the full spectrum of Social Network problems, so it is necessary to customize them for our purposes. According to high volume of information in Social Network big data is necessary for data analysis .Also costs are reduced by using big data analytics in Social Network. In a users-centered framework is proposed that Can personalize Social Network with a big data driven approach. In [35] big data is used to solve problems like the selection of appropriate recommendation paths or improvement of Social Network systems. AITION [37] proposed a reliable knowledge data discovery platform for big data Social Network.



Fig. 2 : Standard data sources in Social Network

III. LITERATURE ON ULI

In this section, literature specifically concerned with ULI is investigated. According to [1], finding ULI solutions can be divided into two parts. Fig. 3 shows this categorization. The first category is solutions that identify ULI relationships by machine learning algorithms [3–5]. These types of solutions are offline and they require a long time for the machine learning to take place. Also there are data mining methods which work on streaming data and they can be considered as online data mining methods. These methods can only work on a part of data. In other word they have methods like sliding window, sampling, synopsis etc. over stream data; therefore, this method is not appropriate for ULI problem because we need to analyze all data items [40]. The second category uses information retrieval techniques. Some techniques use simple search [6,7]; however, searching over limited keywords within a predefined structure may have severe limitations. Another information retrieval solution involves Using Entity Relationship Graphs (ERG) to investigate similarities between de- fined entities [8,9]. These types of solutions

are expensive, and some are not online [8,9]. Some methods try to improve the ERG solution by unified search [10,11]. In [2] MapReduce is used to solve the problem. They tried to reduce algorithm execution time by distributing computation on hardware nodes. PARAMO [36] is a method which uses MapReduce to develop a predictive modeling platform in the Social Network analytics domain. Some methods used LSH [39] (Locality-Sensitive Hashing) for finding similarities [31]. In [31] LSH and MapReduce are used to extract user's likeness. LSH is not suitable for ULI problem because it works with predefined data structure and with ever changing data sources accuracy will reduced dramatically. According to our investigation, none of the above-mentioned methods are fully effective for solving ULI problems, because of the following considerations: ULI requires a dynamic structure to store users' information. Different users have different data items, and thus require a structure which can store data with different standards and different data formats with no default assumptions.

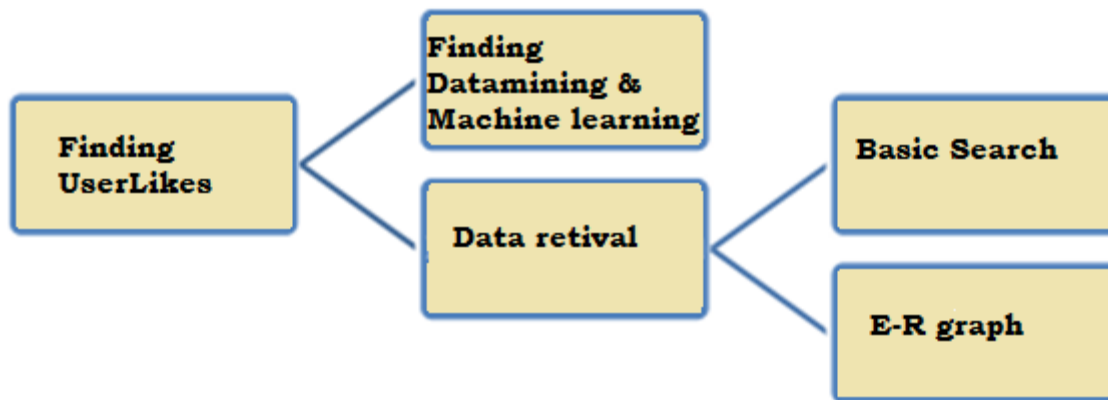


Fig. 3 : Finding user likes

- In the ULI data retrieval phase, the proposed method has to accept all types of input data items and be able to dynamically create queries over all users' data fields.
- ULI implementation time is very important; the method has to implement in a appropriate manner and with high precision. Offline and long-time query execution is not satisfactory.
- Given the huge volume of data generation, distributed solutions are necessary. In this paper we introduce RiDaULI, a reliable and data available method that uses dynamic data structure to store users' data items from data sources with different formats. It can also retrieve data items by dynamic query generation. In this connection our system achieves reliable and data available architecture of

RiDaULI, acceptable query execution time is achieved. To the best of our knowledge, RiDaULI is unique in being able to offer a solution to the ULI problem.

IV. PROPOSED METHOD

With our proposed method we illustrated RiDaULI is a reliable and data available method which is based on MapReduce. In this method, users' input data is converted to a integrated format as explained below. This adaptation has two main primitive advantages. First, varying in input data does not affect the RiDaULI format; therefore, we can allow any data format without any changes in our format. Second, this format is suitable for MapReduce architecture and helps us to dispense data over nodes. Moreover, each node can do its tasks without the need for other nodes' information.

Because of these advantages, we can easily solve ULI problems over distributed nodes. Users' records in various formats can be stored, and efficiency can be achieved by autonomous calculations.

Table 1: RiDaULi data source

Source ID	Source name
1	Facebook
2	Twitter
3	Linkedin
....

Table 2 : Input data items

Id	Name	age	Gender	habits	Likes1	Likes2
1211	sai	20	Male	Reading books	Spiritual	fiction
1212	ram	40	Male	Watching Movies	Action	comedy
1213	seetha	35	Female	Listening Music	melody	devotional

Table 3 : RiDaULicolumn

Column Id	Column name	Data Source ID
1	ID	1
2	name	1
3	age	1

Table 4 : Data(fact)

Column Id	Row Id	Value
1	1211	sai
2	1211	20
3	1211	male

Table 1 shows RiDaULiDataSource structure. In this table data source names and ID are stored.

Suppose that we are working with the information in Table 2 from Facebook data source. If we define the columns as in Table 3 (RiDaULi Column), the Table 2 data items can be converted into Table 4 (RiDaULi Fact). The data format in Table 4 has several advantages:

- Dynamic columns definition
- Completion of all fields is not necessary
- Unified data format
- Data storage size reduction

The proposed data format is suitable for the MapReduce structure, and allows us to execute queries simultaneously on different nodes. There are several steps to Using RiDaULi:

- ETL (Extract/Transform/Load): First, information from different data sources is gathered, and the metadata table (like Table 3) and data table (like Table 4) are created.

GetColumnID function retrieves ColumnID of a specific field from the RiDaULiColumn table. Input parameters are DataSourceID and ColumnName.

Also to identify equal fields on different data sources it is necessary to have the RiDaULiEqual table. Table 5 shows RiDaULiEqual.

a) Data allocation

Because of the unified data format of RiDaULi, data can be distributed over different nodes. Processing power and memory of each hardware node can be important factors to allocate data items to each node.

b) Query execution

To execute queries over MapReduce architecture, the queries first have to be converted to an appropriate format for RiDaULi. Then each converted query is sent to the nodes separately for execution, and the RowIDs of the results are returned. Finally, the extracted RowIDs are sent to the Phase 2 Mappers, and users' information is retrieved.

As shown in Fig. 4, each Phase 1 Mapper sends its results as triples. In the Phase 1 Reducer, aggregation is done on Score based on RowID, and the final Score per RowID is calculated. In the Phase 2 Mapper, other fields with corresponding RowIDs are extracted. The resulting formats of Phase 2 Mappers areas. In Phase 2 Reducer, results of Phase 2 Mappers are aggregated. Also, Phase 1 Reducer results are sent directly to the likeness Ranker, which sorts RowIDs according to their scores; then, when a RowID is selected by the user, other related information is extracted.

And ...". First all ColumnIDs are extracted from the RiDaULiColumn table. Then all rows that are equal to extracted ColumnIDs are retrieved from the RiDaULiFact table. Emit function execute queries and put results into the specified table on the specified server. If the specified table does not exist it creates a table with the specified name. For the Score calculation, many algorithms can be used. Here we use a simple algorithm, in which input users data items are compared with the same data items of existing users. If the data item value of the existing users is exactly equal to the input user's data item value, then its Score is equal to

two. Otherwise, if the user's data item value is partially similar to an existing user's data item value, then the Score is equal to one. If there is no likeness between the input data item value and the existing data item values then the Score is equal to zero. In the data sources there are many misspellings, imprecise terms, colloquial terms, etc. To solve these problems we use metadata to create associations between columns. In the Query builder phase, we can define column groups which contain the main term together with its colloquial terms, imprecise terms and prevalent misspellings. When an input column is used in a query, all other

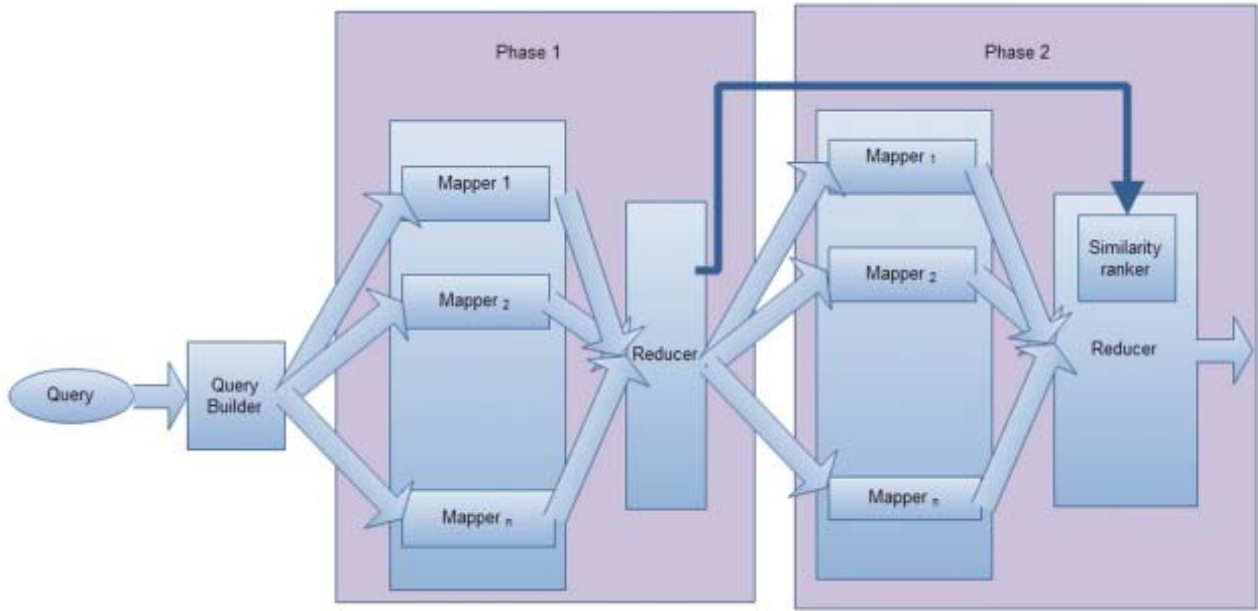


Fig. 4 : RiDaULi Process to execute query

Group members are considered and their related information is gathered. If there is a bottleneck in

the Reducer phase, we remove these via combiners. Fig. 5 shows the RiDaULi architecture with combiners.

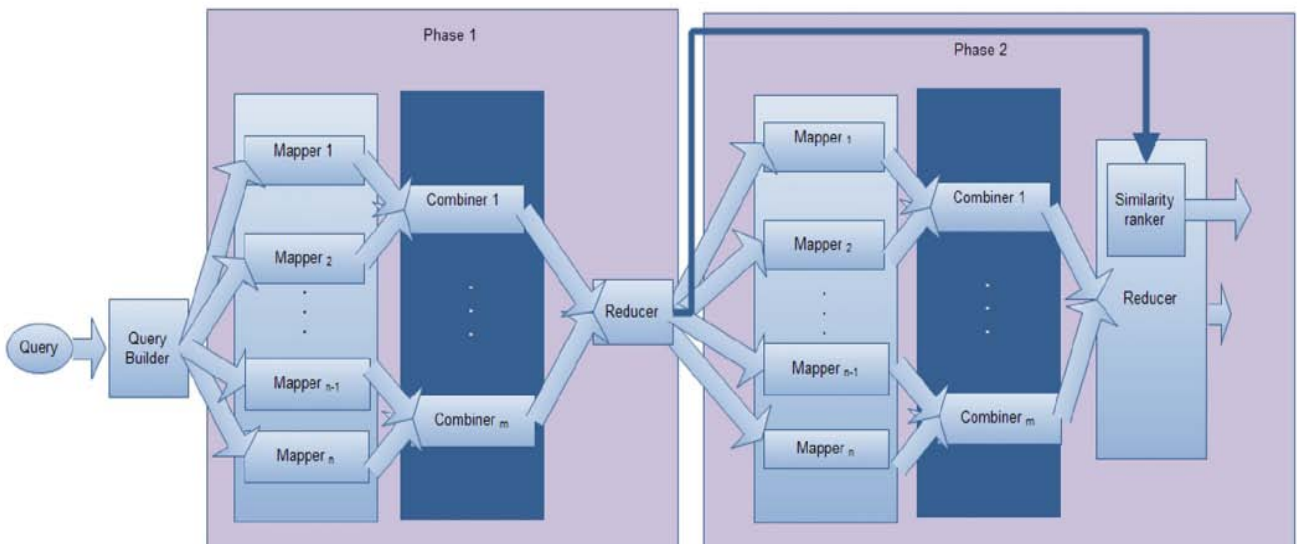


Fig. 5 : RiDaULi architecture with combiner

V. EVALUATION

In this section we evaluate RiDaULi from two views. First the execution time of the proposed method is evaluated, and second the accuracy of RiDaULi is calculated. As per illustration we producing sample Expected results.

a) Execution time

In this We used data from different Social Network systems, which in turn have different standards for storing data, by Using RiDaULi, we found that we

could easily achieve the required results on a reliable and data available structure. As shown in Fig. 4, twenty-one servers were used in Phase 1 and twenty-one for Phase 2. For thirty seven different queries we achieved an average time of 9.42 seconds. As shown in Fig. 5, we then added five combiner servers with the same specifications to each of the two phases, for a total of 52 servers. The average execution time for thirty seven queries improved about 60%, decreasing to 5.65 seconds.

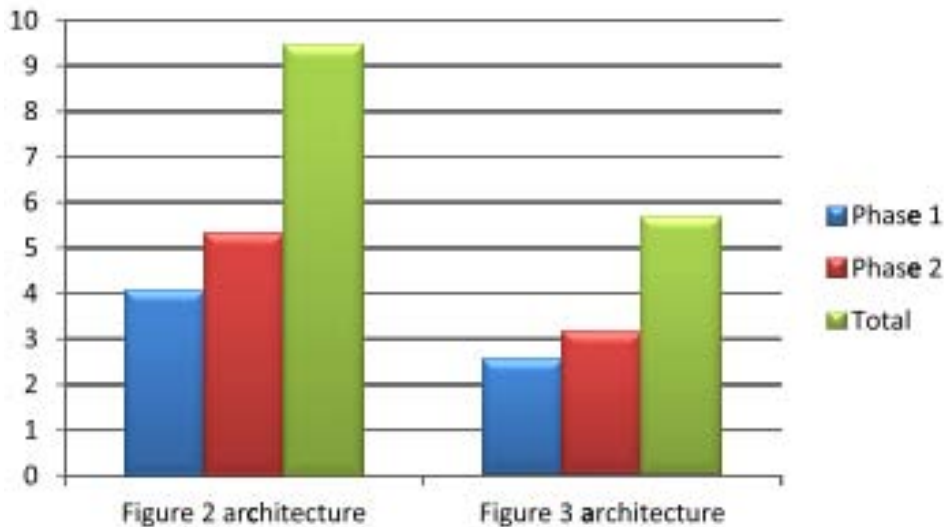


Fig. 6 : RiDaULi architecture with two combiners

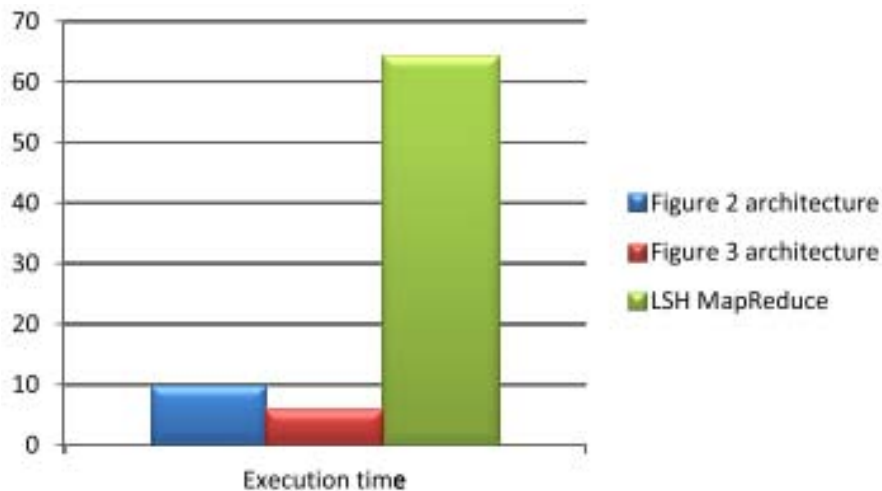


Fig 7 : Total Execution Time

Fig. 6 shows a comparison between the two phases of RiDaULi shown in the architectures of Figs. 4 and 5. Also we used the LSH algorithm over MapReduce for evaluation. 52 servers with the Table 7 specification were used. For thirty seven different queries we achieved an average time of 63.11 seconds. Fig. 7 shows the results.

VI. CONCLUSION

In this paper, we propose RiDaULi, a reliable and data available method to solve user likeness (ULi) problems over Social network. Previously, the standard methods were based on Machine Learning (ML) or Information Retrieval (IR). ML methods need a long time to execute, and are offline. Standard IR methods have

many limitations for information storing and query processing; they support only a basic user interface, and limit the kinds of queries that can be built. Online data mining methods have good performance with predefined data sources and are not suitable for dynamic data sources. Also there are some methods like LSH that can properly work over distributed environments but their performances are decreased when there are many changes in input data sources. RiDaULi is an IR method which supports different data formats. All of these formats can be retrieved by data unification. In this method all fields need not be completed, and for each user only the existing fields are entered. This feature allows for data storage size to be considerably reduced. Our evaluation shows that RiDaULi can solve ULi problems effectively. Because of the reliable and data available nature of RiDaULi, it can utilize hardware effectively in order to solve problems involving huge amounts of data.

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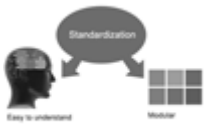




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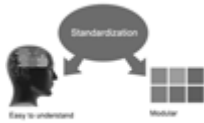
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24. Never copy others' work: Never copy others' work and give it your name because if evaluator has seen it anywhere you will be in trouble.

25. Take proper rest and food: No matter how many hours you spend for your research activity, if you are not taking care of your health then all your efforts will be in vain. For a quality research, study is must, and this can be done by taking proper rest and food.

26. Go for seminars: Attend seminars if the topic is relevant to your research area. Utilize all your resources.



27. Refresh your mind after intervals: Try to give rest to your mind by listening to soft music or by sleeping in intervals. This will also improve your memory.

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 through 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.

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- Adhere to recommended page limits

Mistakes to evade

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- 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.)
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- Align the primary line of each section
- Present your points in sound order
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- Use past tense to describe specific results
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- Shun use of extra pictures - include only those figures essential to presenting results

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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.

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- Fundamental goal
- To the point depiction of the research
- Consequences, including definite statistics - 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 an 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
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- 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.
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- 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.
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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.

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- 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
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- 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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<i>Introduction</i>	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
<i>Methods and Procedures</i>	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
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<i>References</i>	Complete and correct format, well organized	Beside the point, Incomplete	Wrong format and structuring



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