Online ISSN : 0975-4172
Print ISSN : 0975-4350

# Global Journal

## of Computer Science and Technology: B

# Cloud & Distributed

High-Speed Multimedia

Collaborative Cloud Computing

Highlights

Hybrid Genetic Algorithms

Perspective of Cloud Computing

Discovering Thoughts, Inventing Future

VOLUME 15 ISSUE 4 VERSION 1.0

Global Journal of Computer Science and Technology: B
Cloud & Distributed

Global Journal of Computer Science and Technology: B
Cloud & Distributed

Volume 15 Issue 4 (Ver. 1.0)

Open Association of Research Society

**Incorporation No.: 0423089**
**License No.: 42125/022010/1186**
**Registration No.: 430374**
**Import-Export Code: 1109007027**
**Employer Identification Number (EIN):**
**USA Tax ID: 98-0673427**

## Global Journals Inc.

*(A Delaware USA Incorporation with "Good Standing"; **Reg. Number: 0423089**)*

*Sponsors: Open Association of Research Society*
*Open Scientific Standards*

### *Publisher's Headquarters office*

Global Journals Headquarters
301st Edgewater Place Suite, 100 Edgewater Dr.-Pl,
**Wakefield MASSACHUSETTS,** Pin: 01880,
United States of America
*USA Toll Free: +001-888-839-7392*
*USA Toll Free Fax: +001-888-839-7392*

### *Offset Typesetting*

Global Journals Incorporated
2nd, Lansdowne, Lansdowne Rd., Croydon-Surrey,
Pin: CR9 2ER, United Kingdom

### *Packaging & Continental Dispatching*

Global Journals
E-3130 Sudama Nagar, Near Gopur Square,
Indore, M.P., Pin:452009, India

### *Find a correspondence nodal officer near you*

To find nodal officer of your country, please email us at *local@globaljournals.org*

### *eContacts*

Press Inquiries: *press@globaljournals.org*
Investor Inquiries: *investors@globaljournals.org*
Technical Support: *technology@globaljournals.org*
Media & Releases: *media@globaljournals.org*

### *Pricing (Including by Air Parcel Charges):*

*For Authors:*
22 USD (B/W) & 50 USD (Color)
*Yearly Subscription (Personal & Institutional):*
200 USD (B/W) & 250 USD (Color)

**Dr. Bart Lambrecht**
Director of Research in Accounting and FinanceProfessor of Finance
Lancaster University Management School
BA (Antwerp); MPhil, MA, PhD (Cambridge)

**Dr. Carlos García Pont**
Associate Professor of Marketing
IESE Business School, University of Navarra
Doctor of Philosophy (Management), Massachusetts Institute of Technology (MIT)
Master in Business Administration, IESE, University of Navarra
Degree in Industrial Engineering, Universitat Politècnica de Catalunya

**Dr. Fotini Labropulu**
Mathematics - Luther College
University of ReginaPh.D., M.Sc. in Mathematics
B.A. (Honors) in Mathematics
University of Windso

**Dr. Lynn Lim**
Reader in Business and Marketing
Roehampton University, London
BCom, PGDip, MBA (Distinction), PhD, FHEA

**Dr. Mihaly Mezei**
ASSOCIATE PROFESSOR
Department of Structural and Chemical Biology, Mount Sinai School of Medical Center
Ph.D., Etvs Lornd University
Postdoctoral Training,
New York University

**Dr. Söhnke M. Bartram**
Department of Accounting and FinanceLancaster University Management SchoolPh.D. (WHU Koblenz)
MBA/BBA (University of Saarbrücken)

**Dr. Miguel Angel Ariño**
Professor of Decision Sciences
IESE Business School
Barcelona, Spain (Universidad de Navarra)
CEIBS (China Europe International Business School).
Beijing, Shanghai and Shenzhen
Ph.D. in Mathematics
University of Barcelona
BA in Mathematics (Licenciatura)
University of Barcelona

**Philip G. Moscoso**
Technology and Operations Management
IESE Business School, University of Navarra
Ph.D in Industrial Engineering and Management, ETH Zurich
M.Sc. in Chemical Engineering, ETH Zurich

**Dr. Sanjay Dixit, M.D.**
Director, EP Laboratories, Philadelphia VA Medical Center
Cardiovascular Medicine - Cardiac Arrhythmia
Univ of Penn School of Medicine

**Dr. Han-Xiang Deng**
MD., Ph.D
Associate Professor and Research Department Division of Neuromuscular Medicine
Davee Department of Neurology and Clinical NeuroscienceNorthwestern University
Feinberg School of Medicine

# Contents of the Issue

Global Journal of Computer Science and Technology: B
Cloud and Distributed
Volume 15 Issue 4 Version 1.0 Year 2015
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals Inc. (USA)
Online ISSN: 0975-4172 & Print ISSN: 0975-4350

# Hybrid Genetic Algorithms for Scheduling High-Speed Multimedia Systems

By Oluwadare Samuel Adebayo, Olabode Olatunbo,
Iwasokun Gabriel Babatunde & Akinyede Raphael Olufemi
*The Federal University of Technology, Akure, Nigeria*

*Abstract-* It has been observed that most conventional operating systems could not cope with the scheduling of multimedia tasks owing to the large size of these files. For instance, processing of multimedia tasks using the traditional operating systems are fraught with problems such as low quality of service and delay jitters. In order to address these problems, a scheduling algorithm christened hybrid genetic algorithm for multimedia task scheduling (HGAMTS) was developed. It employed heuristic knowledge of the problem domain to model a hybrid genetic algorithm in a multiprocessor environment. The system is made up of the scheduler model and the task model. The scheduler model consist a centralized dynamic scheduling scheme. In this scheme, all tasks arrive at a central processor (scheduler). The model has a minimum of five and maximum of ten processors. Attached to each processor is a dispatch queue.

*Keywords: scheduling algorithms, hybrid genetic algorithm, multimedia system, operating system, multiprocessor system.*

*GJCST-B Classification : B.2.4*

HYBRIDGENETICALGORITHMSFORSCHEDULINGHIGHSPEEDMULTIMEDIASYSTEMS

*Strictly as per the compliance and regulations of:*

# Hybrid Genetic Algorithms for Scheduling High-Speed Multimedia Systems

Oluwadare Samuel Adebayo [α], Olabode Olatunbosun [σ], Iwasokun Gabriel Babatunde [ρ] & Akinyede Raphael Olufemi [ω]

*Abstract-* It has been observed that most conventional operating systems could not cope with the scheduling of multimedia tasks owing to the large size of these files. For instance, processing of multimedia tasks using the traditional operating systems are fraught with problems such as low quality of service and delay jitters. In order to address these problems, a scheduling algorithm christened hybrid genetic algorithm for multimedia task scheduling (HGAMTS) was developed. It employed heuristic knowledge of the problem domain to model a hybrid genetic algorithm in a multiprocessor environment. The system is made up of the scheduler model and the task model. The scheduler model consist a centralized dynamic scheduling scheme. In this scheme, all tasks arrive at a central processor (scheduler). The model has a minimum of five and maximum of ten processors. Attached to each processor is a dispatch queue. Communication is established between the scheduler and the processors through the dispatch queues. The scheduler ensured that each dispatch queue is filled with minimum number of tasks so that a processor could always find a task in its dispatch queue when it finishes executing a task. The algorithm was implemented using Java programming language. The experimental results were compared with two real-time conventional algorithms: rate monotonic (RM) and early deadline first (EDF). The result showed that the proposed algorithm has higher success rate ratio and guaranteed number of deadlines met.

*Keywords: scheduling algorithms, hybrid genetic algorithm, multimedia system, operating system, multiprocessor system.*

## I. Introduction

The advent of multimedia files has placed additional challenge on the traditional operating systems. This is due to the fact that multimedia tasks are characterized by large files running sometimes into hundreds of gigabytes. Most of these files has to be processed in real-time and in continuous stream. Any delay in the processing would lead to low quality of service. Multimedia files are made up of text, graphics, audio and video. Although a little delay in the processing of text may not be noticeable but such little delay in audio or video may seriously affect the quality of service. In client-server systems, the high number of concurrent users trying to download data, sometimes in continuous streams may lead to considerable slow down. Some researchers have noted that the traditional Operating Systems as well as their extensions could not cope with these demands of multimedia applications (Plagemann et al., 2000; Yau and Lam, 1996; Neih and Lam, 1997; Goyal et al., 1996a; Lesilie et al., 1996).

## II. Review of Related Works

Scheduling algorithms is an active area of research which has received considerable attention over the years. In the literature, a number of scheduling algorithms has been proposed, for instance, in Tanenbaum (1994), a First-Come-First-Served (FCFS) algorithm which selects the task with the earliest arrival time was proposed. The system ensures that if it contains periodic tasks, their release time will be considered. The major drawback of this algorithm is that it makes no effort to consider a task's deadline. Liu and Layland (1973) proposed the Early Deadline First (EDF) algorithm which will always choose the task with the earliest deadline. The algorithm is optimal in a uni-processor system but does not consider priority and therefore cannot analyze it. The algorithm fails under overloading conditions (Thai, 2002; Tanenbaum, 1994).

A fuzzy scheduling algorithm is also proposed in (Lee et al., 1994). The algorithm uses task laxity and task criticality as system parameters. The simulation model which contains small number of tasks on a uni-processor system did not consider system overloads. All the tasks are assumed to be real-time and fairness is not considered in scheduling. In terms of real-time distributed systems, Thai (2002) developed a model in which the task with higher computation time is assigned to bottleneck processor and system's worst case processing time is computed. How the task with higher computational time is detected was not explained but the proposed algorithm has acceptable resistance to system overload especially when number of processors is increased. Also, the algorithm needs communication time between processors. Another drawback of the work is that the algorithm does not consider heterogeneous tasks and fairness.

Sabeghi et al. (2006) used fuzzy inference to schedule non-preemptive periodic tasks in soft real-time multiprocessing systems. Priority and deadline was used as tasks parameters while fuzzy inference engine was used to compute each task's priority and to select

*Aurhor α σ ρ ω : Department of Computer Science, The Federal University of Technology, P.M.B. 704, Akure, Nigeria.*
*e-mails: samoluwadare2013@gmail.com, oolabode@futa.edu.ng, biwasokun@futa.edu.ng, olufemi_akinyede@yahoo.com*

the task with maximum priority to process. All tasks are assumed to be periodic and it is not clear whether the multiprocessor system that was proposed was homogeneous or heterogeneous. Since the system does not consider task's processing time the results are more similar to EDF and therefore not suitable for multiprocessing systems. Chen et al. (2005) proposed a scheduling algorithm that is suitable for both uni-processor and multiprocessor systems. It provides a method to detect work overloading and try to balance load with task dispatching. It is however, doubtful if the proposed model could handle multimedia data efficiently. Dynamic integrated scheduling of hard real-time, soft real-time and non-real-time tasks was proposed in (Brandt et al., 2003). The model can generate feasible schedules but the model is restricted to periodic tasks and the tasks' periods are changed dynamically when overloading occurs.

Alberto et al. (1994) proposed a dynamic scheduling of computer tasks using Genetic Algorithms (GA). The scheduling algorithm which is non-preemptive hard real-time is aimed at dynamically scheduling as many tasks as possible such that each task meets its execution deadline while minimizing the total delay time of all the tasks. It implements a sequential MicroGA that uses a small population size of 10 chromosomes running for 10 trials and using a rather high mutation rate with a sliding window of 10 tasks. They also developed parallel MicroGA model for parallel processors. The performance of the sequential MicroGA model and the parallel MicroGA model were compared with other algorithms namely FIFO, EDLF and SRTF for solving similar problem. The results showed that the sequential MicroGA and the parallel MicroGA models produced superior task scheduling compared to other algorithms tested. The work is limited because it was meant to handle hard real-time task and it used a small population size.

In Stutar et al. (2006) a memetic algorithm for task scheduling in multiprocessor systems was developed. The memetic algorithm was produced by hybridizing Genetic Algorithm with Simulated Annealing (SA). SA transverses the search space by testing random mutations on an individual. The mutation that increases fitness is accepted. Tasks are distributed among the processors in such a way that the precedence constraints are preserved and total execution time is minimized. It defines an order of processing tasks that are ready to run in a given processor. The memetic algorithms represent tasks in a task graph which are then mapped onto a multiprocessor system in a way that maintains precedence relations and ensure that all tasks are completed in shortest possible time. Even though the memetic algorithms seem to offer a promise at mitigating the shortcomings of GA, it was not implemented. Hence, the efficiency of the algorithms could not be ascertained.

Hamzel et al. (2007) also proposed a soft real-time fuzzy task scheduling for multiprocessor systems. The algorithm arranges real-time periodic and non-periodic tasks in multiprocessor systems. Since most static and dynamic optimal scheduling algorithms fail with non-critical overload, the fuzzy approach attempt to balance task loads of processors successfully, prevent starvation and ensure fairness which causes higher priority tasks to have higher running probability. Experimental results show that the proposed fuzzy scheduler creates feasible schedules for homogeneous and heterogeneous tasks. It also, considers task priority which causes higher system utilization and lowers deadline misses. However, the model is deficient because it does not consider scheduler processing time.

Mahmood (2000) proposed a hybrid scheduling algorithm for task scheduling in multiprocessor real-time systems. The system recorded significant improvements in guarantee ratio of tasks that arrived in the system. The system was not however, designed to handle multimedia tasks which consists both hard real-time and soft real-time components. Seyed et al. (2014) developed a genetic algorithm for optimization of integrated scheduling of cranes, vehicles and storage platforms at automated container terminals. The proposed algorithm introduced a random string of tasks to define precedence relations between tasks. The performance of the algorithm was evaluated using 10 small size test cases. A fairly near optimal solution that is similar to the existing simulated annealing algorithm was obtained. It was also reported that the proposed GA outperforms the existing algorithm when the number of tasks to be scheduled increase from 30 to 100.

Faghihi et al. (2014) employed the use of GA to schedule construction based on building information model (BIM). The project management triangle includes time, cost and quality. The task of developing project schedules that will satisfy the constraints imposed by time, cost and quality could be troublesome. The proposed GA model was applied to 21 construction projects and stable construction schedules were successfully generated.

Chiu-Hung et al. (2015) applied greedy GA to solve the problem of teacher transferring problems (TVPs). An improved neighborhood search algorithm was introduced into mutation operator. The result produced an optimal solution which performed better than classical methods for solving such problems. A hardware-aware rate monotonic scheduling algorithm for embedded multimedia systems was proposed in (Park and Yoo, 2010). The experimental results show that the algorithm improved the responsiveness of hardware tasks with little impact on software tasks. The output jitter reduced drastically. An improved CPU scheduling algorithm based on multiprogramming environment was proposed in Arora et al. (2013). The introduction of pipelining into the CPU scheduling led to reduction in time latency. The proposed algorithm outperforms existing scheduling algorithms by 40-50%.

Notario et al. (2012) presents a multi-objective GA for task assignment on heterogeneous nodes. The assignment strategy used was based on GA to maximize task execution quality while minimizing energy bandwidth consumption. The result offered Pareto optimal solutions which were better than previous works that were reviewed. Similarly, Khan and Govil (2013) proposed a cost optimization technique of task allocation in heterogeneous distributed computing system (DCS). The proposed model considered the allocation of *m* tasks to *n* processors in a DCS using a modified tasks allocation technique which considers the processing capacity of each processor. The results show drastic reduction in processing cost.

This paper presents a hybrid genetic algorithm for scheduling high-speed multimedia systems using GA and maximum urgency first algorithm. A detailed discussion of the optimization model using mixed-integer linear programming is documented in (Oluwadare and Akinnuli, 2012).

### a) *Hybrid Genetic Algorithms for Multimedia Task Scheduling in a Multiprocessor System (HGAMTS)*

HGAMTS combined a classical algorithm, Maximum Urgency First (MUF) with the multiprocessor algorithm proposed in (Mahmood, 2000). Detailed listing of the algorithm is as follows:

*Let m = number of processors; task [i] = the initial task queue; l = length of a chromosome; pop = population size; n = number of tasks in a chromosomes which is initially set to 0.*

**While** (more task queue to be scheduled) **do**

**If** not (task queue empty) **then**

Order the tasks in the task queue in non-decreasing order of their criticality.

Select the task with highest criticality.

If tasks have same highest criticalness, select the task having the highest dynamic priority.

If tasks have same highest criticalness and equal dynamic priority then select task with highest user priority.

If tasks have common on all three above factors, execute the task based on first come, first served basis.

{Create the population as follows}

Select first *t* ($t <= l - n$) tasks from the task queue

Set $n = n + 1$

**For** $j = n + 1$ to pop **do**

**For** $i = 1$ to t **do**

Generate a random number *p* $(l \ldots m)$

Call procedure random selector

Select randomly a position *q* $(l \ldots n + 1)$ in the chromosome that has not been occupied so far.

Insert (task [*i*], *p*) at position *q* of a chromosome *j* { that is (task [*i*],*p*} is the ith locus of chromosome).

**Endfor**

**Endfor**

**Endif**

**If** $n > 1$ **then**

Evaluate each member's fitness (call procedure evaluate)

Call procedure keep the best in order to select the best fit off springs

**While** not (termination condition) **do**

Perform reproduction based on relative fitness values of chromosomes

Call procedure crossover to perform crossover

Call procedure mutation

**Endwhile**

Select the best chromosome in the population as a solution.

Newtaskset = false

**While** not (newtaskset) **do**

Update the dispatch queues, if required, by assigning first *f* feasible tasks from the best chromosome.

Find the tasks that in the best chromosome that cannot meet their deadlines by performing the feasibility check. Let *r* be the count of such tasks.

Remove the tasks that have been sent to the dispatch queues or found not to be feasible from all the chromosomes of the population {*f* + *r* tasks will be removed}

Set $n = n - f(f+ r)$

Arrange the remaining tasks in the first *n* positions of each chromosome

Set newtaskset = true

**Endif**

**Endwhile**

**Endif**

**Endwhile**

The algorithm starts by ordering the task in non-decreasing order of their criticality. Ordering the tasks in this manner is to ensure that those tasks that are more critical in terms of timeliness are assigned higher criticality values. Depending on the consequences of missing a deadline, multimedia tasks are typically classified into three categories: hard real-time systems, firm real-time systems and soft real-time systems (Ramamritham, 1996).

Based on this categorization, tasks coming into the system are assigned criticality values with hard real-time systems tasks having the highest criticality value followed by firm real-time tasks; and soft real-time tasks. After arranging the tasks on the basis of their criticality values, the algorithm then checks to see if there are two

Global Journal of Computer Science and Technology ( B ) Volume XV Issue IV Version I Year 2015

or more tasks with same criticality value. It selects the task among such category of tasks with a tie in their criticality value and orders them using dynamic priority.

Dynamic priority is imposed by the immediate conditions at the time of processing. In the design of HGAMTS, the tasks arriving are submitted dynamically at the scheduler (the central processor) which performs the schedulability check before passing the task to any of the dispatch queues associated with the processors in the multiprocessor environment.

In a situation whereby tasks have same criticality and dynamic priority another selection factor known as user priority is introduced. If tasks tie on criticality, dynamic priority and user priority the tasks are selected on first-come-first-served basis. The central goal of HGAMTS is to incorporate traditional scheduling heuristics to generate a feasible schedule by determining the processor which a task should be assigned to and the order in which tasks should be executed so as to meet their deadlines. This measure increases the guarantee ratio (percentage of scheduled tasks that meet their deadlines).

The algorithm then selects a set of tasks from the sorted list and generates the initial population. Each chromosome in the initial population is generated by assigning task in the tasks set to a randomly selected processor and inserting the pair (task, processor) in a randomly selected unoccupied locus of the chromosome. If the number of tasks is less than the chromosome size, then the first *n* loci of the chromosomes are used in solution encoding and active chromosome size is set to *n*. This ensures that genetic operators are applied only to the active part of the chromosome. The second while loop determines the best schedule by applying the genetic operators discussed earlier. The second while loop terminates, if the best chromosome has a fitness value equal to the number of tasks considered for scheduling (the size of active chromosome) or a maximum number of iterations have been completed. Once the best schedule for a set of tasks has been found, the dispatch queues are updated, if required. All the dispatched tasks along with tasks found infeasible are removed from all the chromosomes so that they are not reconsidered for scheduling. A task $T_i$ is feasible if it could be submitted at the end of any of the dispatched queues such that $r_i \leq st(T_i) \leq d_i - c_i$ and $r_i + c_i \leq ft(T_i) \leq d_i$. Any task that fails to meet this condition is not feasible. The new task set includes the newly arriving tasks along with the tasks that have not been dispatched so far.

The chromosome syntax employed is such that each gene is a pair of decimal values $(T_i, P_i)$ which indicates that task $T_i$ is assigned to processor $P_i$. The position of genes in the chromosome indicates the order in which tasks should be executed. For instance, the chromosome representation shown in Figure 1 indicates that task 1 be executed on processor 4, task 5 on processor 1, task 2 on processor 3 and task 3 on processor 1. It also indicates that if two tasks are assigned to the same processor for instance, tasks 5 and 3, task 5 is executed first followed by task 3.

| | | | |
|---|---|---|---|
| (1,4) | (5,1) | (2,3) | (3,1) |

*Figure 1 :* Chromosome representation in HGAMTS

One of the advantages of the multiprocessor system is that two tasks assigned to two different processors may execute in parallel provided they do not require the same resource in exclusive mode. Tasks assigned to the same processor must execute in the specified order. In the chromosome representation scheme, each chromosome has a fixed length/size. This means that the maximum number of tasks that may be considered for scheduling at a time is bounded by the chromosome size. The remaining tasks together with the newly arriving tasks are kept in the task queue (Mahmood, 2000). When one set of task is scheduled, a new set of tasks from the task queue is selected for scheduling. If the number of tasks in the task queue is less than the chromosome size then only part of the chromosomes is used and application of genetic operators is restricted to that part only. The part of a chromosome being used is called the active part. It should be noted that the maximum size of the active part is equal to the chromosome size.

The position of a task on the chromosome which is a greedy consideration based on the domain-specific knowledge, determines the order in which the task will be executed. The closer the task is to the front of the chromosome, the greater are the chances of being scheduled. Also, the nature of the task that precedes a particular task may impose some constraints on where it can be placed. For instance, if two tasks require a resource, and one of them is in exclusive mode, the task in exclusive mode may prevent the other from being executed. The three genetic operators employed in HGAMTS are crossover, reproduction and mutation.

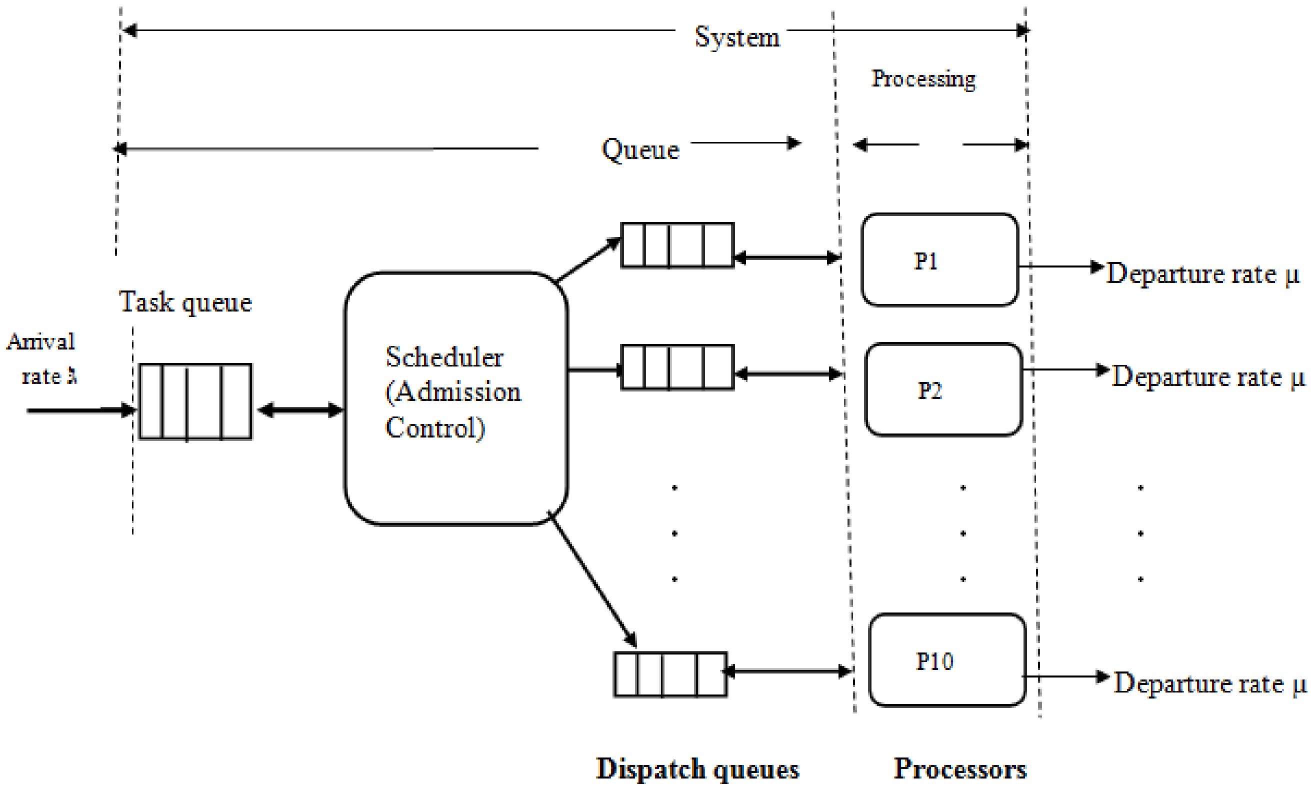



*Figure 2 :* Schematic representation of the partitioning scheme and the queuing

## III. Experimental Set-up

Extensive simulation runs were carried out. For each simulation run, 300 tasks were randomly generated. The worst case computation time $c_i$ of task $T_i$ was randomly chosen between *MIN_C and MAX_C* and were set to 30 and 60 respectively. Deadline of task $T_i$ was uniformly chosen between

$$r_i + 2 * c_i \text{ and } r_i + R * c_i$$

where $R \geq 2$

The inter arrival time of task is exponentially distributed with mean

$$1/(\lambda * m) * (MIN\_C + MAX\_C)/2$$

where $m$ is the number of processors ($5 \leq m \leq 10$).

The value of λ was varied from 0.2 to 0.6 (Mahmood, 2000). Many values of the reproduction operator $x$ (% of tasks to be killed before reproduction) were tried. Chromosome size was varied from 5 to 20 for different set of simulation runs. Also, population size was varied from 20 to 50. All the dispatched queues were of equal length for a particular simulation run. However, the length of dispatch queues was varied between 1 and 3 for different simulation runs.

## IV. Results

The values presented in the Tables 1 through Table 2 are the average of 10 simulation runs and the maximum iteration was set to 700. The results obtained were compared with Rate Monotonic (RM) and Earliest Deadline First (EDF) algorithms.

*a) Success Ratio at different Task Arrival Rates and Chromosome Sizes*

The success ratio of the three algorithms was measured at different task arrival rates and chromosome sizes. The result is presented in Table 1

*Table 1 :* Success Ratio at different Task Arrival Rates and Chromosome Sizes

| Task Arrival rate | Success Ratio | | | | | |
|---|---|---|---|---|---|---|
| | RM | EDF | HGAMTS at l = 5 | HGAMTS at l = 10 | HGAMTS at l = 15 | HGAMTS at l = 20 |
| 0.2 | 88 | 93 | 95 | 95 | 100 | 100 |
| 0.25 | 86 | 89 | 91 | 93 | 100 | 100 |
| 0.3 | 82 | 84 | 87 | 90 | 98 | 100 |
| 0.35 | 78 | 78 | 80 | 86 | 98 | 100 |
| 0.4 | 66 | 69 | 77 | 84 | 95 | 98 |
| 0.45 | 61 | 65 | 70 | 83 | 93 | 97 |
| 0.5 | 60 | 64 | 68 | 80 | 89 | 97 |
| 0.55 | 60 | 58 | 65 | 76 | 85 | 95 |
| 0.6 | 57 | 55 | 60 | 72 | 80 | 95 |

*l = Chromosome size*

*Source :* Simulation studies, 2014

Table 1 revealed that at lower task arrival rates (0.2 – 0.3) the success ratio of the three algorithms is between 82 and 100%. RM recorded the least success ratio while HGAMTS recorded the highest. The success ratio drops as the task arrival rate increases. It was also revealed that HGAMTS has higher success ratio at all task arrival rates followed by EDF and RM. The success ratio of HGAMTS increases as chromosome size increases. In fact, the success ratio of HGAMTS is 100% at task arrival rate 0.25 and below for chromosome size 15. On the other hand, the success ratio reached 100% at task arrival rate 0.35 and below for chromosome size 20. Hence, it could be inferred that the higher the chromosome size, the better the performance of HGAMTS. Also, the gap between the performance of HGAMTS and the other two algorithms (RM and EDF) increases with increase in chromosome size.

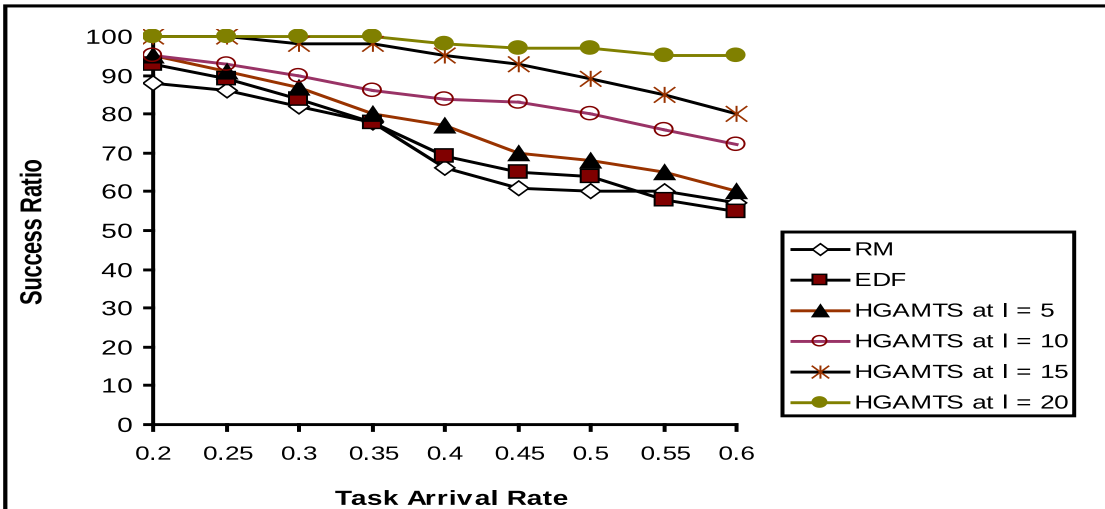



**Figure 3: Comparative analysis of success ratio of RM, EDF and HGAMTS at different task arrival rates and chromosome sizes**

*b) Success Ratio at different number of iterations and chromosome sizes*

A comparative analysis of the performance of the three algorithms was also carried out at different number of iterations. The result is presented in Table 2.

*Table 2 :* Success Ratio at different number of iterations and chromosome sizes

| Number of iterations | Success Ratio | | | | | |
|---|---|---|---|---|---|---|
| | RM | EDF | HGAMTS at l = 5 | HGAMTS at l = 10 | HGAMTS at l = 15 | HGAMTS at l = 20 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 100 | 10 | 21 | 41 | 43 | 47 | 48 |
| 200 | 22 | 24 | 46 | 47 | 58 | 59 |
| 300 | 25 | 26 | 48 | 51 | 62 | 65 |
| 400 | 28 | 29 | 52 | 58 | 69 | 72 |
| 500 | 31 | 35 | 57 | 63 | 83 | 85 |
| 600 | 36 | 43 | 60 | 66 | 89 | 96 |
| 700 | 45 | 51 | 61 | 67 | 92 | 98 |

*Population size (p) = 40, l = Chromosome size*

*Source :* Simulation studies, 2014

Table 2 revealed that success ratio increases with increase in number of iterations. RM has the least success ratio followed by EDF while HGAMTS has the highest success ratio across all iterations. It could also be observed that for HGAMTS, success ratio increases with increase in chromosome size.

c) *Performance of RM, EDF and HGAMTS at different utilization factors*

The maximum utilization factor was varied between 0.2 and 1.0 and processors were also varied between 5 and 10. The metric used is the guarantee ratio, which denotes the percentage of feasibly scheduled task sets that meet their deadline. The utilization was varied between 5 and 10. A task is schedulable on *m* processors if no task in the set misses its deadline.

*Table 3 :* Guarantee Ratio at different Utilization Factors

| Utilization factor ($\alpha$) | RM | | | | EDF | | | | HGAMTS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $m$=5 | $m$=7 | $m$=9 | $m$=10 | $m$=5 | $M$=7 | $M$=9 | $m$=10 | $m$=5 | $M$=7 | $m$=9 | $m$=10 |
| 0.2 | 85 | 87 | 88 | 89 | 91 | 93 | 95 | 97 | 97 | 98 | 100 | 100 |
| 0.5 | 81 | 83 | 85 | 87 | 89 | 91 | 94 | 96 | 94 | 96 | 99 | 100 |
| 0.8 | 72 | 78 | 81 | 83 | 85 | 88 | 92 | 95 | 91 | 95 | 99 | 99 |
| 1.0 | 68 | 75 | 76 | 79 | 79 | 85 | 90 | 92 | 86 | 94 | 98 | 98 |

*m = number of processors*

*Source :* Simulation studies, 2014

Table 3 revealed that guarantee ratio decreases with increase in utilization factor. The best performance was obtained at $\alpha = 0.2$ for all the algorithms. However, HGAMTS recorded the best performance followed by EDF while RM had the least performance. Results in Table 3 also revealed that guarantee ratio increases with increase in the number of processors (*m*).

## V. Conclusion

Multimedia files are usually large in size and must be processed within a time frame in order to guarantee quality of service. Meeting deadlines and achieving high resource utilization are the major goals of multimedia task scheduling. Multiprocessor systems offer a veritable opportunity to address some of the processing challenges presented by multimedia data. However, the complexity involved in the design of appropriate algorithms for task scheduling in multiprocessor systems is another area of challenge.

This research has shown that Hybrid Genetic Algorithm could be used to schedule multimedia tasks dynamically that arrives in the system. The algorithm used fixed size chromosome to encode the solution. However, the algorithm also allows part of the chromosome to be used whenever there are fewer tasks to occupy all the loci on the chromosome. When a part of the chromosome is used, the genetic operators are applied to the active part only. Tasks not submitted to the dispatch queues are reconsidered with newly arriving tasks. The simulation results confirm the effectiveness of the hybrid genetic algorithm for scheduling high-speed multimedia tasks in a multiprocessor system.

## References Références Referencias


1. Alberto, C., Pico, G., and Wainwright (1994). Dynamic Scheduling of Computer Tasks using Genetic Algorithms. Proc. of the first IEEE Conference on Evolutionary Computation, IEEE World Congress on Computation Intelligence, June 26 – July 2, Orlando, Florida, pp.829– 833.
2. Arora H, Arora D., Goel D.A. and Jain P. (2013). An Improved CPU Scheduling Algorithm. International Journal of Applied Information Systems, Volume 6– No. 6, pp7-9
3. Brandt, S.A., Banachowski, S., Caixue, L., and Bisson, T. (2003). Dynamic integrated scheduling of hard real-time, soft real-time and non-real-time processes, in Proc. 24th IEEE Intl. Real-Time


Global Journal of Computer Science and Technology ( B ) Volume XV Issue IV Version I Year 2015

Systems Symposium, Cancun, Mexico, pp. 396 – 407.

4. Chen, G., Ozturk, O., and Kandemir, M. (2005). An adaptive locally-conscious process scheduler for embedded systems, in Proc. 11th IEEE Real-Time and Embedded Technology and Applications Symposium, San Francisco, CA, pp. 354 – 364.
5. Chiu-Hung C., Tung-Kuan L., Jyh-Horng C., Chung-Hung T. and Hsiu W. (2015). Optimization of teacher volunteer transferring problems using greedy genetic algorithms. Expert Systems with Applications 42 (2015) 668–678, www.elsevier.com/locate/eswa, Accessed on 04/02/2015
6. Faghihi V., Reinschmidt K.F and Kang J.H. (2014). Construction scheduling using Genetic Algorithm based on Building Information Model. Expert Systems with Applications 41 (2014) 7565–7578, www.elsevier.com/locate/eswa, Accessed on 04/02/2015
7. Goyal, P., Guo, X., and Vin, H.M. (1996a). A hierarchical CPU scheduler for multimedia operating systems. Proc. of USENIX sypm. on operating systems design and implementation (OSDI'96), Seatle, WA, USA, October 1996, pp. 107-121.
8. Hamzeh, M., Fakhraie, S.M., and Lucas, C. (2007). Soft real-time fuzzy task scheduling for multiprocessor systems, Int. Journal of Intelligent Technology, vol. 2 No. 4 pp. 211 – 236.
9. Khan F.N. and Govil K. (2013). Cost Optimization Technique of Task Allocation in Heterogeneous Distributed Computing System. Int. J. Advanced Networking and Applications Volume: 05, Issue: 03, pp:1913-1916
10. Lee, J., Tiao, A., and Yen, J. (1994). A fuzzy rule-based approach to real-time scheduling, in Proc. 3rd IEEE Conf. Fuzzy Systems, IEEE World Congress Computational Intelligence, Fl, vol. 2, pp. 1394 – 1399.
11. Leslie, I., McAuley, D., Black, R., Roscoe, T., Barham, P., Evers, D., Fairbairns, and Hyden, R. (1996). The design and implementation of an operating system to support distributed multimedia applications. IEEE Journal on selected areas in communications, vol. 14. No.7, Sept. pp. 1280-1297.
12. Liu, C.L. and Layland, J.W. (1973). Scheduling Algorithms for Multiprogramming in a Hard Real Time Environment Journal of the ACM, Vol. 20, No. 1, January 1973, pp. 46 – 61.
13. Mahmood, A. (2000). A Hybrid Scheduling Algorithm for Task Scheduling in Multiprocessor Real-Time Systems. Technical Paper, Dept of Computer Science, University of Bahrain
14. Neih, J., and Lam, M.S., (1997). The design, implementation and evaluation of SMART: a scheduler for multimedia applications. Proc. of 16th ACM sypm. on operating system principles (SOSP'97), St. Malo, France, Oct. pp. 184-197.
15. Notario C.B.P, Rogier Baert R. and D'Hondt M (2012).Multi-Objective Genetic Algorithm for Task Assignment on Heterogeneous Nodes. International Journal of Digital Multimedia Broadcasting Volume 2012, Article ID 716780, 12 pages
16. Oluwadare, S.A. and Akinnuli, B.O. (2011). A Mixed Integer Linear Programming Model for Real-Time Task Scheduling in Multiprocessor Computer System. *Journal of Information and Communication Technology*, Universiti Utara, Malaysia.
17. Park J. and Yoo J. (2010). Hardware-Aware Rate Monotonic Scheduling Algorithm for Embedded Multimedia Systems. ETRI Journal, Volume 32, Number 5 pp. 657- 664
18. Plagemann, T., Goebel, V., Halvorsen, P., and Anshus, O. (2000). Operating system support for multimedia systems. The Computer Communications Journal, Elsevier, Vol. 3, No. 3, February, pp. 267-289.
19. Ramamritham, K. (1996). Dynamic Priority Scheduling, Real-time Systems Specification, Verification and Analysis, in M. Joseph (Ed.), Prentice Hall.
20. Sabeghi, M., Naghibzadeh, M., and Taghavi, T. (2006). Scheduling non-preemptive periodic tasks in soft real-time systems using fuzzy inference, in Proc. 9th IEEE Intl. Symp. Object and Component-Oriented Real-Time Distributed Computing, Gyeongju, Korea, pp. 27 – 32.
21. Seyed M.H., Said H.T. and Omid M. (2014) A genetic algorithm for optimization of integrated scheduling of cranes, vehicles, and storage platforms at automated container terminals. Journal of Computational and Applied Mathematics, 270 (2014) pp 545-556, www.elsevier.com/locate/cam, Accessed 10/01/2015
22. Sutar, S.R, Sawant, J.P and Jadhav, J.R. (2006). Task Scheduling for Multiprocessor Systems using Memetic Algorithms, p 27/1 – 27/9.
23. Tanenbaum, A.S. (1994). Distributed operating systems: Prentice Hall. pp. 250 – 275.
24. Thai, N.D. (2002). Real-time scheduling in distributed systems, in Proc. International Conference Parallel Computing in Electrical Engineering, Warsaw, Poland, pp. 165 –170.
25. Yau, D.K.Y., and Lam, S.S. (1996). Operating system techniques for distributed multimedia. Technical Report, TR-95-36 (revised), Dept., of Computer Sciences, University of Texas at Austin, TX, USA.


Global Journal of Computer Science and Technology ( B ) Volume XV Issue IV Version I Year 2015

Global Journal of Computer Science and Technology: B
Cloud and Distributed
Volume 15 Issue 4 Version 1.0 Year 2015
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals Inc. (USA)
Online ISSN: 0975-4172 & Print ISSN: 0975-4350

# A Dynamic Resource Allocation based on Multi Attributes Scoring in Collaborative Cloud Computing

By Pavan Kumar V, Anitha N & Anirban Basu
*EPCET, India*

*Abstract-* Collaborative cloud computing involves providing cloud services on globally distributed resources belonging to different organizations in a cooperative manner. Resource management and allocation in Collaborative Cloud is challenging because of the heterogeneity of the resources. The other challenge is guaranteeing the Quality of Service (QOS) and availability of these resources. Users' resource demands have to be managed properly to ensure acceptable QOS. In this paper, we propose a method for effective management and allocation of resources using machine learning and using multi attribute tuning. The method has been simulated in cloud-sim as well as implemented on Amazon work space and results show that the proposed method performs better than reputation based algorithms.

*GJCST-B Classification : C.1.4 H.3.4*

ADYNAMICRESOURCEALLOCATIONBASEDONMULTIATTRIBUTESSCORINGINCOLLABORATIVECLOUDCOMPUTING

*Strictly as per the compliance and regulations of:*

# A Dynamic Resource Allocation Based on Multi Attributes Scoring in Collaborative Cloud Computing

Pavan Kumar V [α], Anitha N [σ] & Anirban Basu [ρ]

*Abstract-* Collaborative cloud computing involves providing cloud services on globally distributed resources belonging to different organizations in a cooperative manner. Resource management and allocation in Collaborative Cloud is challenging because of the heterogeneity of the resources. The other challenge is guaranteeing the Quality of Service (QOS) and availability of these resources. Users' resource demands have to be managed properly to ensure acceptable QOS. In this paper, we propose a method for effective management and allocation of resources using machine learning and using multi attribute tuning. The method has been simulated in cloud-sim as well as implemented on Amazon work space and results show that the proposed method performs better than reputation based algorithms.

## I. Introduction

Today many organizations are moving their application to a cloud computing platform due to fluctuation in demand for resources. Sometimes the demand for the resources may be difficult to be satisfied by single cloud. If resources provided by a single cloud are not sufficient for the application then collaborative cloud is to be used. Collaborative Cloud involves distributing the application among multiple Cloud services available.

The physical resources are interconnected using the collaborative cloud computing (CCC) which allows the sharing of resources between different clouds. At the same time provides a tremendous amount of virtual resources to customers. For the cloud customers, this virtual organization is visible. When a customer's demands are not met by a single cloud, other cloud is requested to satisfy the needs of a customer. collaborative cloud computing operates in a environment where the number of resources range in thousands or millions, and the resources are spread across the world and dynamic nature is inherited into it to allow entities to leave or enter the system as the availability or utilization of the resources are changing constantly.

Some of the challenges that are faced in using the collaborative cloud computing are:

1. Trustworthy resources are not efficiently located.
2. Complexity in selecting the resources from the options located.
3. Preventing any node from being overloaded while making sure that all the resources are used to the maximum.

To address the above said challenges, reputation based algorithms are used.

The previous algorithm [1], [2], [3] have ignored heterogeneity nature of the resources, instead all the node are assigned a single reputation value. The reputation of the node should not be same and this should be different for different resources typed nodes. For instance let's consider that general physician will give good advice on health but not necessarily give good advice on finance. Similarly a single node may be good in handling the computing services but not so good when it comes to storage service. Hence the entire previous algorithms which were used for assigning the reputation for nodes are not effective in selecting the trustworthy resources by an individual.

The previous algorithm will only consider one of the QOS user demands, like the security or the efficiency. If there are a number of servers or resources available, the policy based on the efficiency will only consider the node which has the maximum resources, whereas the policy based o the security will only consider the nodes which has the highest reputation only. The security based selecting will lead to overloading o the nodes while the efficiency based selection will lead to lower success rate of the service.

Hence when the reputation based deployments are uncoordinated, it will result in a behavior which is contradictory and the effectiveness of the both are significantly affected and hence overall performance is also affected. Hence focusing on a single QOS has its own kind of challenges.

a) How the different demands of the QOS such as the availability, efficiency and reputation of resources can be considered for resources selection.
b) How a node can control actively the resource supply and reputation control while making sure that it is not being overloaded without compromising the profit and gain reputation.

*Author α σ ρ : East Point College of Engineering and Technology, Bengaluru, Karnataka, India. e-mails: pavankumar0330@gmail.com, anitha_nmurthy@yahoo.com, abasu@pqrsoftware.com.*

Power-Trust is based on the trust value, where the either initial value is same and initially allocates the job to some node. If response time is met with the execution time then reputation value is increased, if it is not met the execution time then response time is decreased. By continually choosing most reputed hubs, affecting routines neglect directed towards endeavor hub reputation within resource variety facing completely as well as moderately uses resources in effective framework as well as to reconciled clients various Quality of Service requisitions successful

A node cannot reflect its reputation properly for its individual resources type when there is a single reputation value assigned to the nodes. If nodes with the highest reputation are being selected, this will affect the way the node are utilized or the way the node are selected based on their reputation and also satisfy the different QOS needs of a customer. So we have to better understand the interdependencies among reputation management and resources management.

As there are many issues on single QOS reputation allocation for CCC, we have proposed a effective resource allocation which is based on multi QOS scoring where the resource selection is multi-faceted and also compared with power trust method.

## II. Related Work

Haiying Shen [4], have proposed a platform for efficient and trustworthy resource sharing in CCC, where an cloud resources are globally scattered that are belonging to different organization or entities that are collectively utilized in a cooperative way to offer services. For the successful deployment of the CCC, the problems of resource and reputation management must be jointly addressed. Resource and reputation management methods that are discussed earlier are not sufficiently effective or efficient. The methods fail to exploit the reputation of node by considering the highest reputation values during the resource selection and to meet the QOS demands of the clients. Hence they proposed a new CCC platform called Harmony, that integrates the reputation and resource management in an harmonious manner. It has 3 innovations: multi QOS oriented resource selection, reputation management/ integrated multi-faceted resource, reputation control/price assisted resource. The existing Resource and reputation management are showed in terms of effectiveness, efficiency and QOS in Harmony by performing simulation and trace driven experiments in the real-world Planet Lab.

J. Li, B. Li [5] has proposed a cloud virtual organization for the multiple clouds collaboration. The interest for scalable resources in a few applications has been expanding quickly. Numerous researches are going ahead to make one environment connecting various clouds for scalable computing abilities or for completely using inactive resources. By distinguishing and comprehension the interdependencies between Resources, Preference of clients and User Preference Resource Selection in Utility based, a Collaborative Cloud Computing stage has introduced, which concentrate on Cloud Resources, Cloud Service Providers SLS's, User Preferences, and use of the clients. It can accomplish improved proficient management of resources and user fulfillment between distributed resources in Collaborative Cloud Computing. This technique gives a situation to point out its required resources, Resources capability or ability, User's Requirements and also finds the available of the resources. At that time the cloud users can be capable to be familiar with each Cloud Resources and all insights regarding the Cloud capability, so that cloud users can pick viable cloud platform. Moreover, this environment is scalable to the cloud clients.

In paper [6] , as cloud computing turn out to be broadly sent, one of the difficulties confronted includes capacity through orchestra, an extremely complex arrangement of subordinate systems (storage, network resource and compute) that compass vast geographic ranges serving assorted customers. To facilitate procedure, individually prompt COPE (Cloud Orchestration Policy Engine), a circulated platform that permits cloud suppliers to behave informative robotized cloud resource orchestration has been proposed. In COPE, cloud suppliers indicate system-wide imperatives and objectives utilizing COPE log, a decisive strategy dialect adopted towards determining distributed constraint expansions. COPE catch approach details and cloud framework defines as information together with afterwards enhance network resource allocations, compute and storage inside of the cloud like supplier operational goals and client SLA's can be preferably met. Individually depict future mix with a cloud orchestration stage, and instant beginning of estimating effects that exhibit the possibility of COPE utilizing creation follows from expansive facilitating organization in US. They additional examined orchestration situation, includes topographically dispersed data centers.

In Cloud Resource Orchestration [7] the trust and security have kept organizations from completely tolerating cloud platforms. To preserve clouds, suppliers should primarily secure virtualized data-centre resources, maintain client protection, and save information uprightness. The writers propose utilizing a trust-overlay set-up in excess of numerous information centers for execution of reputation scheme for building a belief betwixt service contractors and information proprietors. Information coloring and spreadsheet watermarking procedures secure pooled information items and enormously dispersed coding modules. These approach shelter the multi-way confirmations, allow solitary sign-in cloud, as well as fix right to use manage delicate information in mutually open and confidential clouds.

F.M.Fernandez [8] proposes virtual defense and Reputation Based Trust Management for CCC. The escalating ubiquity of cloud computing as appealing distinct option through fantastic statistics handling systems have been increased significance about its right along with persistent operation even in the vicinity of deficient segments. Present an inventive framework level standard perspective making along with overseeing failure acceptance in Clouds. An exhaustive high-level access via shade the exertion information of the error acceptance methods to app designers and clients by ways of committed utility panels. Specifically, the service panels permits client to determine and apply the fancied level of error acceptance, and does not oblige learning about the error acceptance methods that are accessible in the imagined Cloud and their executions. Making and overseeing fault tolerance in Cloud environment that the user does not oblige information about the adoption of internal failure systems. The fundamental point of the fragmentation idea is decreasing time delay and giving security to cloud server.

The Reputation systems proposed in [9] known as Trust guard as became famous in evaluating the dependability and foreseeing the prospect conduct of hubs in an expansive-scale dispersed system where hubs may execute each other without former experience or knowledge. Major difficulties in distributed reputation management are to comprehend vulnerabilities and also create instruments to reduce the possible harms to a framework by vindictive nodes. In the document they recognize three susceptibility that are adverse in respect to scattered reputation management and recommend Trust Guard – a protection system for giving an exceedingly trustworthy and efficient reputation system.

To start with, a responsible trust model has been provided and an arrangement of official strategies to hold strategic malevolent hubs that consistently transforms their behavior to increase iniquitous benefits at frameworks. Next in order, an exchange based reputation system must adapt to the susceptibility that malevolent hubs may abuse the framework by overflowing inputs with false exchanges. Last, yet but not slightest, individuals analyze significance of sifting through deceitful criticisms meanwhile calculating reputation-based faith of node, comprising the inputs documented that has malevolent nodes via plot. The trials exhibits that, contrasting along with present reputation systems, the system is extremely reliable and successful in differing malevolent nodes regards to planned wavering conduct, deluging malicious inputs along forged exchanges, and exploitative criticisms.

## III. Overview of the Proposed Solution

Our solution for resource allocation is based on multi attribute based QOS scoring. In our approach we allocate QOS score to the resources based on following attributes

1. Distance to the resources from user site
2. Reputation of the resource
3. Task completion time
4. Task completion ratio
5. Load at the resource

Based on all these attributes, we train a neural network QOS scoring system and use it to score the resources and select the resources with best score for user task allocation. We refer to this algorithm as Multi Attribute QOS Scoring (MAQS).

## IV. Proposed Solution

Our proposed solution for dynamic resource allocation consists of 3 parts

1. Training
2. Data collection
3. Allocation

### a) *Training*

In Training Stage we train a multi layer feed forward neural network which takes the five attributes as input and provides QOS as output.

1. Price
2. Reputation
3. Efficiency
4. Distance

Training is periodically conducted to learn the inherent behavior in the system.

### b) *Data Collection*

In data collection stage, we collect data from all the nodes scattered across periodically.

Each node participating in Collaborative cloud have probe installed and the probe collects the statistics and reports to central manager. The central manager maintains the periodic heartbeat with the nodes in collaborative cloud to know the availability and based on it, reputation is calculated.

### c) *Allocation*

User tasks are allocated with resources based on the multi QOS parameter. Whenever user task arrives we calculate the QOS score for the node by providing the data collection from node to neural network. The best QOS score node is selected and the task is allocated.

## V. System Implementation

We implemented the system with following modular architecture as shown in figure 1.

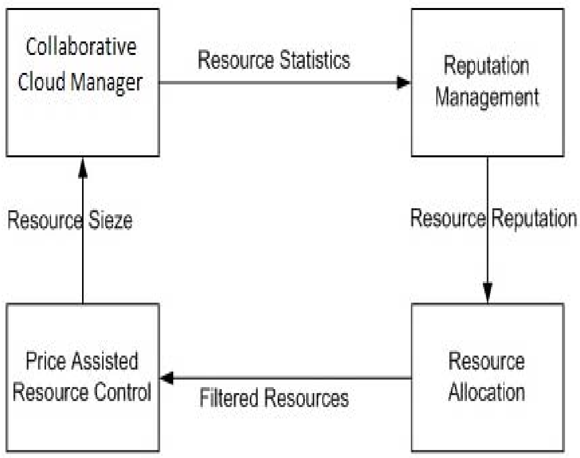



*Figure 1 :* System Architecture

Coordinated Cloud Manager: This module handles the registration / Heart beat of the coordinated clouds distributed geographically.

Reputation Manager: This module collects statistics report from the coordinated cloud and uses it to calculate the reputation score.

Resource Selection: This module selects the resources based on the reputation score and QOS required for the task to be executed.

Price Assisted Resource Control: To avoid overload at reputed nodes, pricing assisted control is done to select the non overloaded resource for job execution.

The system is implemented on the top of cloud sim simulator.

We have used 3 layer neural networks with 5 input neurons for each of five inputs {w1, w2, w3, w4, w5} as shown below:

w1: Distance to the resources from user site

w2: Reputation of the resource
w3: Task completion time
w4: Task completion ratio
w5: Load at the resource

All these parameters are normalized to the value of 0 to 1 before giving it to neural network. The neural network will have 1 output neuron for the QOS score of total 4 output neuron n1, n2, n3, n4 for each score as given below:

n1: Price
n2: Reputation
n3: Efficiency
n4: Distance

We have used back propagation algorithm with LMS (Least mean Square) at learning rate of 0.9 and error of 0.001 with maximum of 100 iterations.

This output is given to the Price Assisted Resource Control which is the next stage of the process.

## VI. Performance Analysis

We implemented the proposed algorithm for resource allocation in cloud-sim simulator.

We measured the average success rate and the average completion time between the reputation based and the proposed MAQS.

The average success rate for the varied number of requests rate is measured as shown in figure 2 and from this we see that the success rate in the proposed MAQS system is high.

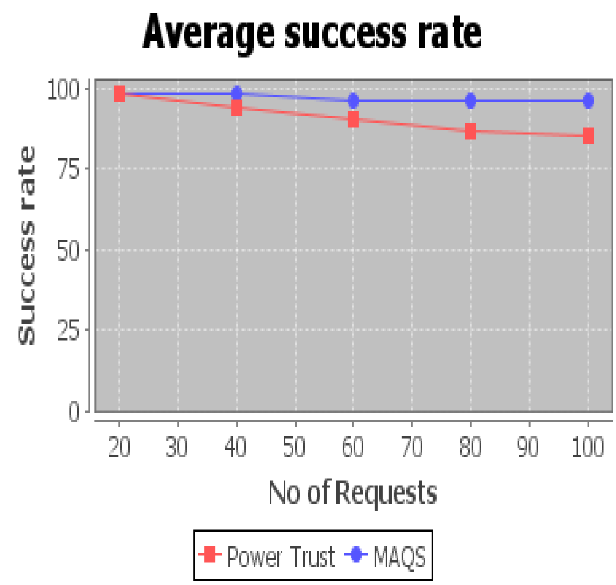



*Figure 2 :* Graph of success rate

The average completion time for the varied number of requests rate is measured as in figure 3 and from this we see that the completion time is less in proposed MAQS when compared to reputation based systems.

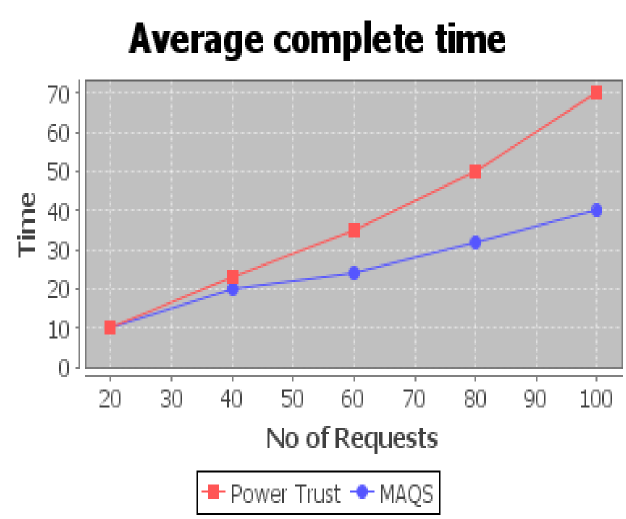



*Figure 3 :* Graph of success rate

We have also implemented on the Amazon work space and found that the simulated values are same as that of the Amazon work space. The figure 4 depicts the same.

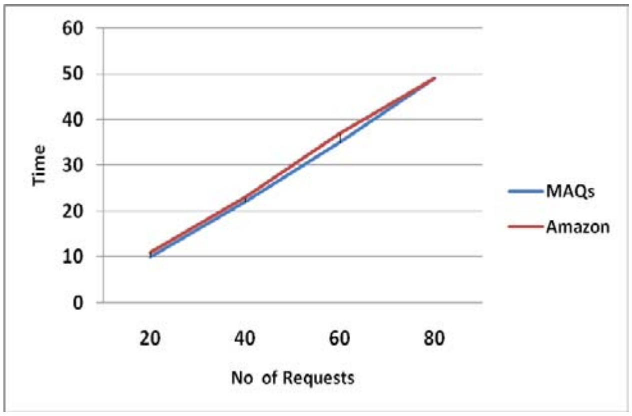



*Figure 4 :* Comparison of MAQs and Amazon

## VII. Conclusion and Enhancement

In this paper, we have detailed our proposed solution for resource allocation using MAQS for collaborative cloud computing. Our mechanism has very good task completion ratio & success ratio. Through simulation in cloud-sim we have proved that our mechanism is able to give better QOS to the service providers. In future we plan to apply speculative execution to still improve the QOS and explore the optimal time period for training neural network with calculation of load factor.

## References Références Referencias

1. L. Xiong and L. Liu, "Peertrust: Supporting Reputation-Based Trust for Peer-to-Peer Electronic Communities," IEEE Trans. Knowledge and Data Eng., vol. 16, no. 7, pp. 843-857, July 2004.
2. R. Zhou and K. Hwang, "PowerTrust: A Robust and Scalable Reputation System for Trusted Peer-to-Peer Computing," IEEE Trans. Parallel and Distributed Systems, vol. 18, no. 4, pp. 460- 473, 2008.
3. R. Zhou and K. Hwang, "Gossip-Based Reputation Management for Unstructured Peer-to-Peer Networks," IEEE Trans. Knowledge and Data Eng., 2007.
4. Haiying Shen, Senior member, IEEE, and Guoxin Liu, Student Member, IEEE, "An Efficient and Trustworthy Resource Sharing Platform for Collaborative Cloud Computing", IEEE Transactions on Parallel and distributed Systems, VOL. 25, NO. 4, April 2014.
5. J. Li, B. Li, Z. Du, and L. Meng, "CloudVO: Building a Secure Virtual Organization for Multiple Clouds Collaboration," Proc. 11th ACIS Int'l Conf. Software Eng. Artificial Intelligence Networking and Parallel/Distributed Computing (SNPD), 2010.
6. C. Liu, B.T. Loo, and Y. Mao, "Declarative Automated Cloud Resource Orchestration," Proc. Second ACM Symposium on Cloud Computing (SOCC '11), 2011.
7. K. Hwang, S. Kulkarni, and Y. Hu, "Cloud Security with Virtualized Defense and Reputation-Based Trust Management," Proc. IEEE Int'l Conf. Dependable, Autonomic and Secure Computing (DASC), 2009.
8. C. Liu, Y. Mao, J.E. Vander Merwe, and M.F. Fernandez, "Cloud Resource Orchestration: A Data Centric Approach," Proc. Conf. Innovative Data Systems Research (CIDR), 2011.
9. M. Srivatsa, L. Xiong, and L. Liu, "Trust guard: Countering Vulnerabilities in Reputation Management for Decentralized Overlay Networks," Proc. World Wide Web Conf., 2005.

This page is intentionally left blank

Global Journal of Computer Science and Technology: B
Cloud and Distributed
Volume 15 Issue 4 Version 1.0 Year 2015
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals Inc. (USA)
Online ISSN: 0975-4172 & Print ISSN: 0975-4350

# A Review on Progress and Problems of Quantum Computing as a Service (Qcaas) in the Perspective of Cloud Computing

By Mijanur Rahaman & Md. Masudul Islam
*Bangladesh University of Business and Technology (BUBT), Bangladesh*

*Abstract-* Cloud computing is a global established system. Quantum computing is hypothetical model which is still in tentative analysis. Cloud system has some weakness in security, processing, backup and vicinity. Somehow quantum computing illustrates some revolutionary solution to overcome cloud weakness. Most researchers are optimistic in quantum computing that it will improve cloud system. It is not easy to combine these two different systems along. We will show two quantum approaches; quantum cryptography and blind quantum computing to secure cloud computing. Quantum cryptography will secure the user data transmission and communication through cloud form hackers. And blind computing will secure the instant eavesdropping or accessing of data processing in cloud from any vicious cloud provider or third party. This paper's major target is to show advantages and disadvantages of quantum computing in the viewpoint to integrate it with cloud system. Also review some current improvement of quantum computing and computer.

*Keywords: cryptography, entanglement, polarization, qcaas, qubit, quantum cloud.*

GJCST-B Classification : *C.2.1 C.2.1 H.3.4*

AREVIEWONPROGRESSANDPROBLEMSOFQUANTUMCOMPUTINGASASERVICEQCAASINTHEPERSPECTIVEOFCLOUDCOMPUTING

*Strictly as per the compliance and regulations of:*

# A Review on Progress and Problems of Quantum Computing as a Service (Qcaas) in the Perspective of Cloud Computing

Mijanur Rahaman [α] & Md. Masudul Islam [σ]

*Abstract-* Cloud computing is a global established system. Quantum computing is hypothetical model which is still in tentative analysis. Cloud system has some weakness in security, processing, backup and vicinity. Somehow quantum computing illustrates some revolutionary solution to overcome cloud weakness. Most researchers are optimistic in quantum computing that it will improve cloud system. It is not easy to combine these two different systems along. We will show two quantum approaches; quantum cryptography and blind quantum computing to secure cloud computing. Quantum cryptography will secure the user data transmission and communication through cloud form hackers. And blind computing will secure the instant eavesdropping or accessing of data processing in cloud from any vicious cloud provider or third party. This paper's major target is to show advantages and disadvantages of quantum computing in the viewpoint to integrate it with cloud system. Also review some current improvement of quantum computing and computer. Also we will represent some aroused criticism of quantum cloud computation system in practical research field in recent days. This paper will help us to summarize the major issue that we should concern in quantum cloud computing for future works.

*Keywords: cryptography, entanglement, polarization, qcaas, qubit, quantum cloud.*

## I. Introduction

Cloud computing is globalization for computer and internet. When we hear "Cloud Computing" it actually means "X as a Service" such as, SaaS (Software as a Service), IaaS (Infrastructures as a Service), PaaS (Platform as a Service), DaaS (Data as a Service), NaaS (Network as a Service), StaaS (Storage as a Service) etc.[11] Different services provide different benefits but security is a big issue for cloud computing which is still a burning question. Commercial offerings of market-oriented Clouds must be able to define computational risk management tactics to identify, assess, and manage risks involved in the execution of applications with regards to service requirements and customer needs.[9]

Cloud computing is 50 year old business model, which still needs to expand and overcome limitations that prevent the full use of its potential. [10] Classical computing, cryptography and storage processing is not enough to secure the cloud. So there comes a new era of quantum computing, quantum cryptography and quantum processing. If we could just add the upcoming quantum technology as a service for cloud it will be revolutionary. This new service will be called as "QCaaS" or "Quantum Computing as a Service". Our main target is to review on some recent progress and rising problems in "Quantum Computing as a Service (QCaaS)" for cloud computing.

## II. Main Problems of Cloud Computing

Cloud computing is not totally free of access and private to customers in every aspects. There are some cloud providers such as Amazon EC2 gives customer free cloud access for a specific period but that's not applicable for all providers. Moreover, different stages of threat are there such as, data loss, user privacy issue, user data theft, user-vendor security, data locality etc. Even if we use most powerful encryption system or secured medium to pass information over cloud despite these an inside attacks such as; where cloud provider itself could overhears client's secrete information and an outside attacks such as; where intruders could eavesdrop or eliminate client's information could happen. We are not safe from cloud provider's immoral actions.

## III. Quantum Computing Basic

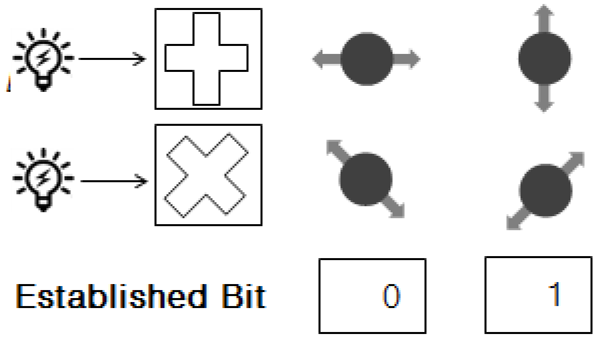
In the case of merging quantum computing with cloud system at first we must ensure about some essential terms on quantum computing.

### a) *Polarization*

Polarization is actually passing a photon through a filter to get a specific spin (vertical/horizontal/diagonal). For example, the output value of photon spins using different polarization is given below:

*Author α : Lecturer, Dept. of CSE, Bangladesh University of Business and Technology, Mirpur-2, Dhaka-1216, Bangladesh.*
*e-mail: riponcse.it@bubt.edu.bd*
*Author σ : Lecturer, Dept. of CSE, Bangladesh University of Business and Technology, Mirpur-2, Dhaka-1216, Bangladesh.*
*e-mail: masudulislam11@gmail.com*

*Fig.1.* Photon polarization using 2 different filters with their established bit values




*b) Qubit*

Classical computer uses 0 or 1 as bit system. But in quantum system the fundamental unit is known as Qubit ($|0\rangle$ or $|1\rangle$) or superposition of both 0 and 1. By analyzing Bloch sphere, if we measure 0 bit as south pole and 1 bit as north pole then a Qubit means any alternative possible state of a rectilinear combination of $|0\rangle$ and $|1\rangle$. This often referred to as a superposition: $|\psi\rangle = a|0\rangle + b|1\rangle$. [1]

*c) Quantum Entanglement*

This is a ghostly particle reaction issue. When two photons are entangled pairs it means, one photon has the opposite spin of another one without having any bodily connection among them.

*d) Qubit Measurement*

According to Heisenberg's uncertainty principle, we will never be able to measure both speed and position of any particle at a time. If we try to measure a Qubit we'll only get discreet 0 or 1. So there's no way we can tell the real-time measurement of a Qubit.

## IV. Two Different Quantum Approaches

Two different quantum approaches could solve these problems. they are, blind computing and quantum cryptography. Blind computing means, where all the data input, output, processing will become unidentified by any quantum computer. In blind computing theoretically the cloud user generates some qubit where only he knows the initial states of those qubit. After sending these qubit to the quantum computer, the computer entangles the qubit using a standard system. the actual computation is measurement-based. The user adapts measurement guidelines to the specific state of each quantum bit. and he sends them to a quantum server. after successful processing the user gets back his result and he can interpret the final result. the whole process is "blind" because even if the quantum computer or an eavesdropper tries to decipher the qubit, they will not get any beneficial information. it's because they don't know the initial states. [2] Another approach is quantum cryptography is given below in details.

*a) Quantum computation & cryptography in cloud system*

Beyond current two type classical cryptography now a day's physics has discovered new age of quantum mechanics. Using quantum physics law a quantum computer could have incredible power of compute within a shortest possible time. From earlier discussion each time a single Qubit is added to a quantum computer its computational power gets double. We can get 2128 different of I/O at a time only using 128 Qubit. A quantum algorithm called Grover's quantum algorithm $O(\sqrt{n})$ which states that, using superposition of Qubit anyone can search any data by $\sqrt{250000} = 500$ steps from 250000 data. In the case of classical computer, it need at least $n/2 = 125000$ steps. This means a perfect quantum computer can reduce any processing time of years into milliseconds. So once quantum computer is fully developed our present 128-bit cryptography system could easily be beaked by it. Also government agencies, banks, security companies, defense need to secure their information from being hacked, because one day this quantum technology might decipher their system. So we need new strong encryption and secured communication system. And there comes quantum computation for fast processing and quantum cryptography for security issues.

There is a common example where two users (Sara and Musa) in cloud sending-receiving key using quantum cryptography encryption technique and at the same time hacker are trying to eavesdrop it. Sara the sender first creates a simple Qubit and sends it to Musa. Sara is using a diagonal filter (X) and a rectilinear filter (+) to send the key. Here "/", "\" indicates $45^{\circ}$ diagonal photon spin and "-", "|" indicates $90^{\circ}$ rectilinear spin. Sara uses polarization and evaluates the value of key. Musa is waiting for incoming photons which randomly applies any rectilinear or diagonal polarization filter. He also keeps a note of used polarization, its value and spin. After successful communication, Sara and Musa interconnect over open channel. Musa gives Sara only polarization filter orders that he used. Table (i) shows Sara sends a key [01011001]. Now if Musa received an incorrect order of information shown in Table (ii) [00011001] after that, Sara will tell whether the order is exact or not. After full transmission by fixing the mistaken polarization sequence the ultimate encoded data can be sent. Eavesdropper cannot deduct all the polarization sequence exactly in this system. If Musa unable to decode the sent data he cloud notice easily the interference of communication by hacker's. Other criteria called quantum non-cloning criteria of quantum computation guarantees us not to achieve an identical copy of any quantum polarized state in the middle of calculation. This means spy will never be able to get a duplicate copy of transported quantum cryptography keys. If someone is able to clone any state then he could make many identical copies of it. At the same time he can measure each dynamic variable with random precision; that will avoid the uncertainty principle. But due to the non-cloning theorem this fear is prevented [3]. The cold true is that, there is still no completed quantum computer yet to establish system.

*Table.1.* Sara sending key

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Sara's polarization | X | X | + | + | X | + | + | + |
| Sara's spin | \ | / | – | \| | / | – | – | \| |
| Sara's value | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 1 |

*Table. 2.* Musa receiving key with error

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Sara's answers | Y | N | Y | Y | N | Y | Y | N |
| Musa's polarization | X | + | + | + | + | + | + | X |
| Musa's spin | \ | – | – | \| | \| | – | – | / |
| Musa's value | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 |

## V. Problems and Recent Progress of Quantum Cloud Computing

### a) *Raising problems of quantum cloud computing*

The burning question of Cloud computing is whether it is secured and reliable for users or not. Theoretically quantum computing can solve all the complications of cloud computing. But some key challenges arise to develop a quantum computing system. There are some uncertainties on quantum computation. It said that this quantum computer stuff may not be quantum at all as we are fascinating.[4] The newly developed D-Wave quantum computer system has some major concerns. In quantum computation system question arises that, is the d-wave really a quantum computer? Also we need to build a physical logic gate to control Qubit. Even if we build a gate how we will prevent noise effect on photon? If a little noise disentangles the Qubit then the whole quantum computer will be a classical computer type. Because we still cannot control the subatomic level of any system. Another key paradox is that even we effectively run a calculation or process we will never be able to find every single phase of it. We can only get only single state of all possible superposition of photon. So error checking is tough. This makes the quantum computation ambiguous and the quantum cloud computing too. But we must aware that, we can't fully prevent an inside unethical attack in cloud system. According to Seth Lloyd, an expert in quantum computation at the Massachusetts institutes of technology "treachery is the primary way, "there's nothing quantum mechanics can do about that". [5]

### b) *Recent improvement of quantum cloud computing*

Quantum computer development is still ongoing. There are so many research, methods, architectures and approaches to achieve quantum computer and cloud system integration. Google has already declared their first quantum computer will build on d-wave's approaches. They are going to design Qubit in different way by improving d-wave's hardware. [6] Recently in 2012, s. Barz, e. Kashefi, a. Broadbent, j. F. Fitzsimons, a. Zeilinger and p. Walther demonstrate an experimental blind quantum computing for secured cloud computing. They completed the theoretical framework of measurement-based quantum computation that allows a user to represent a computation to a quantum server. [7] Also a quantum-cloud system in 27 September 2013 has been confirmed by a group of scientist of Bristol University in UK. It is named as Qcloud. The Qcloud quantum computer placed at the center for quantum photonics in the Bristol University. The idea is to establish a practical aspect of quantum computing as a service (QCaaS). This quantum processor would be remotely accessed and controlled by anyone in the world. It would allow people to run an experiment, and test the real experimental data against their simulations. However, they are only using two Qubit. This shows a practical example of application of the quantum computing-cloud computing in recent time. [8]

## VI. Conclusion

We are showing summery review of how effectively quantum based computation could improve our classical computations and communication in cloud our classical computations and communication in cloud computing system. We also try to show all possible area of major problems in quantum computing for further analysis and future works. This new service we called "Quantum Computing as a service or QCaaS" is still under development. Until the quantum computer attains its final state we should try to improve our present classical system and deprive their limitations. We expect in near future quantum cloud computing will bring revolutionary change in cloud system.

## References Références Referencias


1. Wikimedia Foundation (2001), Qubit. 17 March, 2015. Retrieve from: https://en.wikipedia.org/wiki /Qubit
2. PhysOrg (2012). Quantum mechanics enables perfectly secure cloud computing, 19 January 2012. Retrieve from: http://phys.org/news/2012-01-quan tum- mechanics-enables-perfectly-cloud.html
3. Quantiki (2010), the Non-Cloning Theorem. 9 June, 2010. Retrieve from: http://www. quantiki. org/wiki/ The_nocloning theorem
4. Wired Magazine (2014), The Revolutionary Quantum Computer That May Not Be Quantum at All, 20 May 2014. Retrieve from: http://www.wired.Com/2014 /05/quantum-computing/
5. Stix, Gary (2004). Best-Kept Secrets. Scientific American.
6. Simonite, Tom (2014). Google Launches Effort to Build Its Own Quantum Computer. 17 September, 2014. Retrieve from: http://www.Technologyre view. com/news/530516/google-launches-effort-to-build-its-own-quantum-computer/
7. S. Barz, E. Kashefi, A. Broadbent, J. F. Fitzsimons, A. Zeilinger And P. Walther (2012). Demonstration of Blind Quantum Computing. Science Journal Vol. 335 No. 6066, pp: 303-308
8. Harpreet Singh, Abha Sachdev (2014). The Quantum Way Of Cloud Computing, Optimization, Reliabilty, and Information Technology (ICROIT). pp: 397 – 400.dx.doi.org/10.1109/ICROIT.2014.6798362
9. R. Buyya, C. S. Yeo, S. Venugopal, J. Broberg and I. Brandic, "Cloud Computing and Emerging IT Platforms: Vision, Hype and Reality for Delivering Computing as the 5th Utility", Future Generation Computer Systems, Elsevier, Vol. 25, pp. 599-616, 2009.
10. F. Durao, J. F. S. Carvalho, A. Fonseka and V. C. Garcia, "A Systematic Review on Cloud Computing", The Journal of Supercomputing, Vol. 68, Issue 3, pp. 1321-1346, 2014.
11. B. P. Rimal, E. Choi and I. Lumb, "A Taxonomy and Survey of Cloud Computing Systems", Fifth International Joint Conference on INC, IMS and IDC, pp. 44-51, 2009.

Global Journals Inc. (US) Guidelines Handbook 2015

www.GlobalJournals.org

## FELLOW OF ASSOCIATION OF RESEARCH SOCIETY IN COMPUTING (FARSC)

Global Journals Incorporate (USA) is accredited by Open Association of Research Society (OARS), U.S.A and in turn, awards “FARSC” title to individuals. The 'FARSC' title is accorded to a selected professional after the approval of the Editor-in-Chief/Editorial Board Members/Dean.

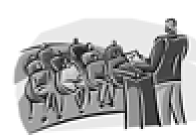
> The “FARSC” is a dignified title which is accorded to a person’s name viz. Dr. John E. Hall, Ph.D., FARSC or William Walldroff, M.S., FARSC.

FARSC accrediting is an honor. It authenticates your research activities. After recognition as FARSC, you can add 'FARSC' title with your name as you use this recognition as additional suffix to your status. This will definitely enhance and add more value and repute to your name. You may use it on your professional Counseling Materials such as CV, Resume, and Visiting Card etc.

*The following benefits can be availed by you only for next three years from the date of certification:*

FARSC designated members are entitled to avail a 40% discount while publishing their research papers (of a single author) with Global Journals Incorporation (USA), if the same is accepted by Editorial Board/Peer Reviewers. If you are a main author or co-author in case of multiple authors, you will be entitled to avail discount of 10%.

Once FARSC title is accorded, the Fellow is authorized to organize a symposium/seminar/conference on behalf of Global Journal Incorporation (USA).The Fellow can also participate in conference/seminar/symposium organized by another institution as representative of Global Journal. In both the cases, it is mandatory for him to discuss with us and obtain our consent.

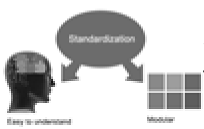


You may join as member of the Editorial Board of Global Journals Incorporation (USA) after successful completion of three years as Fellow and as Peer Reviewer. In addition, it is also desirable that you should organize seminar/symposium/conference at least once.

We shall provide you intimation regarding launching of e-version of journal of your stream time to time. This may be utilized in your library for the enrichment of knowledge of your students as well as it can also be helpful for the concerned faculty members.

The FARSC can go through standards of OARS. You can also play vital role if you have any suggestions so that proper amendment can take place to improve the same for the benefit of entire research community.

As FARSC, you will be given a renowned, secure and free professional email address with 100 GB of space e.g. johnhall@globaljournals.org. This will include Webmail, Spam Assassin, Email Forwarders, Auto-Responders, Email Delivery Route tracing, etc.




The FARSC will be eligible for a free application of standardization of their researches. Standardization of research will be subject to acceptability within stipulated norms as the next step after publishing in a journal. We shall depute a team of specialized research professionals who will render their services for elevating your researches to next higher level, which is worldwide open standardization.

The FARSC member can apply for grading and certification of standards of their educational and Institutional Degrees to Open Association of Research, Society U.S.A. Once you are designated as FARSC, you may send us a scanned copy of all of your credentials. OARS will verify, grade and certify them. This will be based on your academic records, quality of research papers published by you, and some more criteria. After certification of all your credentials by OARS, they will be published on your Fellow Profile link on website https://associationofresearch.org which will be helpful to upgrade the dignity.


The FARSC members can avail the benefits of free research podcasting in Global Research Radio with their research documents. After publishing the work, (including published elsewhere worldwide with proper authorization) you can upload your research paper with your recorded voice or you can utilize chargeable services of our professional RJs to record your paper in their voice on request.

The FARSC member also entitled to get the benefits of free research podcasting of their research documents through video clips. We can also streamline your conference videos and display your slides/ online slides and online research video clips at reasonable charges, on request.

The FARSC is eligible to earn from sales proceeds of his/her researches/reference/review Books or literature, while publishing with Global Journals. The FARSC can decide whether he/she would like to publish his/her research in a closed manner. In this case, whenever readers purchase that individual research paper for reading, maximum 60% of its profit earned as royalty by Global Journals, will be credited to his/her bank account. The entire entitled amount will be credited to his/her bank account exceeding limit of minimum fixed balance. There is no minimum time limit for collection. The FARSC member can decide its price and we can help in making the right decision.

The FARSC member is eligible to join as a paid peer reviewer at Global Journals Incorporation (USA) and can get remuneration of 15% of author fees, taken from the author of a respective paper. After reviewing 5 or more papers you can request to transfer the amount to your bank account.

## MEMBER OF ASSOCIATION OF RESEARCH SOCIETY IN COMPUTING (MARSC)

The ' MARSC ' title is accorded to a selected professional after the approval of the Editor-in-Chief / Editorial Board Members/Dean.
The “MARSC” is a dignified ornament which is accorded to a person’s name viz. Dr. John E. Hall, Ph.D., MARSC or William Walldroff, M.S., MARSC.

MARSC accrediting is an honor. It authenticates your research activities. After becoming MARSC, you can add 'MARSC' title with your name as you use this recognition as additional suffix to your status. This will definitely enhance and add more value and repute to your name. You may use it on your professional Counseling Materials such as CV, Resume, Visiting Card and Name Plate etc.

*The following benefitscan be availed by you only for next three years from the date of certification.*

MARSC designated members are entitled to avail a 25% discount while publishing their research papers (of a single author) in Global Journals Inc., if the same is accepted by our Editorial Board and Peer Reviewers. If you are a main author or co-author of a group of authors, you will get discount of 10%.

As MARSC, you will be given a renowned, secure and free professional email address with 30 GB of space e.g. johnhall@globaljournals.org. This will include Webmail, Spam Assassin, Email Forwarders, Auto-Responders, Email Delivery Route tracing, etc.


We shall provide you intimation regarding launching of e-version of journal of your stream time to time. This may be utilized in your library for the enrichment of knowledge of your students as well as it can also be helpful for the concerned faculty members.

The MARSC member can apply for approval, grading and certification of standards of their educational and Institutional Degrees to Open Association of Research, Society U.S.A.


Once you are designated as MARSC, you may send us a scanned copy of all of your credentials. OARS will verify, grade and certify them. This will be based on your academic records, quality of research papers published by you, and some more criteria.

It is mandatory to read all terms and conditions carefully.

# Auxiliary Memberships

## Institutional Fellow of Open Association of Research Society (USA)-OARS (USA)

Global Journals Incorporation (USA) is accredited by Open Association of Research Society, U.S.A (OARS) and in turn, affiliates research institutions as “Institutional Fellow of Open Association of Research Society” (IFOARS).

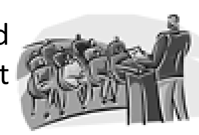
The “FARSC” is a dignified title which is accorded to a person’s name viz. Dr. John E. Hall, Ph.D., FARSC or William Walldroff, M.S., FARSC.

The IFOARS institution is entitled to form a Board comprised of one Chairperson and three to five board members preferably from different streams. The Board will be recognized as “Institutional Board of Open Association of Research Society”-(IBOARS).

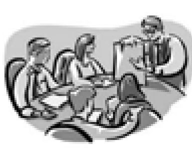
*The Institute will be entitled to following benefits:*

The IBOARS can initially review research papers of their institute and recommend them to publish with respective journal of Global Journals. It can also review the papers of other institutions after obtaining our consent. The second review will be done by peer reviewer of Global Journals Incorporation (USA) The Board is at liberty to appoint a peer reviewer with the approval of chairperson after consulting us.

The author fees of such paper may be waived off up to 40%.



The Global Journals Incorporation (USA) at its discretion can also refer double blind peer reviewed paper at their end to the board for the verification and to get recommendation for final stage of acceptance of publication.

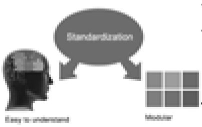


The IBOARS can organize symposium/seminar/conference in their country on behalf of Global Journals Incorporation (USA)-OARS (USA). The terms and conditions can be discussed separately.


The Board can also play vital role by exploring and giving valuable suggestions regarding the Standards of “Open Association of Research Society, U.S.A (OARS)” so that proper amendment can take place for the benefit of entire research community. We shall provide details of particular standard only on receipt of request from the Board.

The board members can also join us as Individual Fellow with 40% discount on total fees applicable to Individual Fellow. They will be entitled to avail all the benefits as declared. Please visit Individual Fellow-sub menu of GlobalJournals.org to have more relevant details.

We shall provide you intimation regarding launching of e-version of journal of your stream time to time. This may be utilized in your library for the enrichment of knowledge of your students as well as it can also be helpful for the concerned faculty members.




After nomination of your institution as "Institutional Fellow" and constantly functioning successfully for one year, we can consider giving recognition to your institute to function as Regional/Zonal office on our behalf.
The board can also take up the additional allied activities for betterment after our consultation.

**The following entitlements are applicable to individual Fellows:**

Open Association of Research Society, U.S.A (OARS) By-laws states that an individual Fellow may use the designations as applicable, or the corresponding initials. The Credentials of individual Fellow and Associate designations signify that the individual has gained knowledge of the fundamental concepts. One is magnanimous and proficient in an expertise course covering the professional code of conduct, and follows recognized standards of practice.


Open Association of Research Society (US)/ Global Journals Incorporation (USA), as described in Corporate Statements, are educational, research publishing and professional membership organizations. Achieving our individual Fellow or Associate status is based mainly on meeting stated educational research requirements.

Disbursement of 40% Royalty earned through Global Journals : Researcher = 50%, Peer Reviewer = 37.50%, Institution = 12.50% E.g. Out of 40%, the 20% benefit should be passed on to researcher, 15 % benefit towards remuneration should be given to a reviewer and remaining 5% is to be retained by the institution.

We shall provide print version of 12 issues of any three journals [as per your requirement] out of our 38 journals worth $ 2376 USD.

**Other:**

**The individual Fellow and Associate designations accredited by Open Association of Research Society (US) credentials signify guarantees following achievements:**

- The professional accredited with Fellow honor, is entitled to various benefits viz. name, fame, honor, regular flow of income, secured bright future, social status etc.

- In addition to above, if one is single author, then entitled to 40% discount on publishing research paper and can get 10%discount if one is co-author or main author among group of authors.
- The Fellow can organize symposium/seminar/conference on behalf of Global Journals Incorporation (USA) and he/she can also attend the same organized by other institutes on behalf of Global Journals.
- The Fellow can become member of Editorial Board Member after completing 3yrs.
- The Fellow can earn 60% of sales proceeds from the sale of reference/review books/literature/publishing of research paper.
- Fellow can also join as paid peer reviewer and earn 15% remuneration of author charges and can also get an opportunity to join as member of the Editorial Board of Global Journals Incorporation (USA)
- • This individual has learned the basic methods of applying those concepts and techniques to common challenging situations. This individual has further demonstrated an in–depth understanding of the application of suitable techniques to a particular area of research practice.

**Note :**

"

- In future, if the board feels the necessity to change any board member, the same can be done with the consent of the chairperson along with anyone board member without our approval.
- In case, the chairperson needs to be replaced then consent of 2/3rd board members are required and they are also required to jointly pass the resolution copy of which should be sent to us. In such case, it will be compulsory to obtain our approval before replacement.
- In case of "Difference of Opinion [if any]" among the Board members, our decision will be final and binding to everyone. "

# Process of submission of Research Paper

The Area or field of specialization may or may not be of any category as mentioned in 'Scope of Journal' menu of the GlobalJournals.org website. There are 37 Research Journal categorized with Six parental Journals GJCST, GJMR, GJRE, GJMBR, GJSFR, GJHSS. For Authors should prefer the mentioned categories. There are three widely used systems UDC, DDC and LCC. The details are available as 'Knowledge Abstract' at Home page. The major advantage of this coding is that, the research work will be exposed to and shared with all over the world as we are being abstracted and indexed worldwide.

The paper should be in proper format. The format can be downloaded from first page of 'Author Guideline' Menu. The Author is expected to follow the general rules as mentioned in this menu. The paper should be written in MS-Word Format (*.DOC,*.DOCX).

The Author can submit the paper either online or offline. The authors should prefer online submission.Online Submission: There are three ways to submit your paper:

**(A) (I) First, register yourself using top right corner of Home page then Login. If you are already registered, then login using your username and password.**

**(II) Choose corresponding Journal.**

**(III) Click 'Submit Manuscript'. Fill required information and Upload the paper.**

**(B) If you are using Internet Explorer, then Direct Submission through Homepage is also available.**

**(C) If these two are not convenient, and then email the paper directly to dean@globaljournals.org.**

Offline Submission: Author can send the typed form of paper by Post. However, online submission should be preferred.

# Preferred Author Guidelines

**MANUSCRIPT STYLE INSTRUCTION** **(Must be strictly followed)**

Page Size: 8.27" X 11'"

- Left Margin: 0.65
- Right Margin: 0.65
- Top Margin: 0.75
- Bottom Margin: 0.75
- Font type of all text should be Swis 721 Lt BT.
- Paper Title should be of Font Size 24 with one Column section.
- Author Name in Font Size of 11 with one column as of Title.
- Abstract Font size of 9 Bold, "Abstract" word in Italic Bold.
- Main Text: Font size 10 with justified two columns section
- Two Column with Equal Column with of 3.38 and Gaping of .2
- First Character must be three lines Drop capped.
- Paragraph before Spacing of 1 pt and After of 0 pt.
- Line Spacing of 1 pt
- Large Images must be in One Column
- Numbering of First Main Headings (Heading 1) must be in Roman Letters, Capital Letter, and Font Size of 10.
- Numbering of Second Main Headings (Heading 2) must be in Alphabets, Italic, and Font Size of 10.

**You can use your own standard format also.**
**Author Guidelines:**

1. General,

2. Ethical Guidelines,

3. Submission of Manuscripts,

4. Manuscript's Category,

5. Structure and Format of Manuscript,

6. After Acceptance.

**1. GENERAL**

Before submitting your research paper, one is advised to go through the details as mentioned in following heads. It will be beneficial, while peer reviewer justify your paper for publication.

**Scope**

The Global Journals Inc. (US) welcome the submission of original paper, review paper, survey article relevant to the all the streams of Philosophy and knowledge. The Global Journals Inc. (US) is parental platform for Global Journal of Computer Science and Technology, Researches in Engineering, Medical Research, Science Frontier Research, Human Social Science, Management, and Business organization. The choice of specific field can be done otherwise as following in Abstracting and Indexing Page on this Website. As the all Global

Journals Inc. (US) are being abstracted and indexed (in process) by most of the reputed organizations. Topics of only narrow interest will not be accepted unless they have wider potential or consequences.

**2. ETHICAL GUIDELINES**

Authors should follow the ethical guidelines as mentioned below for publication of research paper and research activities.

Papers are accepted on strict understanding that the material in whole or in part has not been, nor is being, considered for publication elsewhere. If the paper once accepted by Global Journals Inc. (US) and Editorial Board, will become the copyright of the Global Journals Inc. (US).

**Authorship: The authors and coauthors should have active contribution to conception design, analysis and interpretation of findings. They should critically review the contents and drafting of the paper. All should approve the final version of the paper before submission**

The Global Journals Inc. (US) follows the definition of authorship set up by the Global Academy of Research and Development. According to the Global Academy of R&D authorship, criteria must be based on:

1) Substantial contributions to conception and acquisition of data, analysis and interpretation of the findings.

2) Drafting the paper and revising it critically regarding important academic content.

3) Final approval of the version of the paper to be published.

All authors should have been credited according to their appropriate contribution in research activity and preparing paper. Contributors who do not match the criteria as authors may be mentioned under Acknowledgement.

Acknowledgements: Contributors to the research other than authors credited should be mentioned under acknowledgement. The specifications of the source of funding for the research if appropriate can be included. Suppliers of resources may be mentioned along with address.

**Appeal of Decision: The Editorial Board's decision on publication of the paper is final and cannot be appealed elsewhere.**

**Permissions: It is the author's responsibility to have prior permission if all or parts of earlier published illustrations are used in this paper.**

Please mention proper reference and appropriate acknowledgements wherever expected.

If all or parts of previously published illustrations are used, permission must be taken from the copyright holder concerned. It is the author's responsibility to take these in writing.

Approval for reproduction/modification of any information (including figures and tables) published elsewhere must be obtained by the authors/copyright holders before submission of the manuscript. Contributors (Authors) are responsible for any copyright fee involved.

**3. SUBMISSION OF MANUSCRIPTS**

Manuscripts should be uploaded via this online submission page. The online submission is most efficient method for submission of papers, as it enables rapid distribution of manuscripts and consequently speeds up the review procedure. It also enables authors to know the status of their own manuscripts by emailing us. Complete instructions for submitting a paper is available below.

Manuscript submission is a systematic procedure and little preparation is required beyond having all parts of your manuscript in a given format and a computer with an Internet connection and a Web browser. Full help and instructions are provided on-screen. As an author, you will be prompted for login and manuscript details as Field of Paper and then to upload your manuscript file(s) according to the instructions.

To avoid postal delays, all transaction is preferred by e-mail. A finished manuscript submission is confirmed by e-mail immediately and your paper enters the editorial process with no postal delays. When a conclusion is made about the publication of your paper by our Editorial Board, revisions can be submitted online with the same procedure, with an occasion to view and respond to all comments.

Complete support for both authors and co-author is provided.

**4. MANUSCRIPT'S CATEGORY**

Based on potential and nature, the manuscript can be categorized under the following heads:

Original research paper: Such papers are reports of high-level significant original research work.

Review papers: These are concise, significant but helpful and decisive topics for young researchers.

Research articles: These are handled with small investigation and applications.

Research letters: The letters are small and concise comments on previously published matters.

**5. STRUCTURE AND FORMAT OF MANUSCRIPT**

The recommended size of original research paper is less than seven thousand words, review papers fewer than seven thousands words also.Preparation of research paper or how to write research paper, are major hurdle, while writing manuscript. The research articles and research letters should be fewer than three thousand words, the structure original research paper; sometime review paper should be as follows:

**Papers**: These are reports of significant research (typically less than 7000 words equivalent, including tables, figures, references), and comprise:

(a)Title should be relevant and commensurate with the theme of the paper.

(b) A brief Summary, "Abstract" (less than 150 words) containing the major results and conclusions.

(c) Up to ten keywords, that precisely identifies the paper's subject, purpose, and focus.

(d) An Introduction, giving necessary background excluding subheadings; objectives must be clearly declared.

(e) Resources and techniques with sufficient complete experimental details (wherever possible by reference) to permit repetition; sources of information must be given and numerical methods must be specified by reference, unless non-standard.

(f) Results should be presented concisely, by well-designed tables and/or figures; the same data may not be used in both; suitable statistical data should be given. All data must be obtained with attention to numerical detail in the planning stage. As reproduced design has been recognized to be important to experiments for a considerable time, the Editor has decided that any paper that appears not to have adequate numerical treatments of the data will be returned un-refereed;

(g) Discussion should cover the implications and consequences, not just recapitulating the results; conclusions should be summarizing.

(h) Brief Acknowledgements.

(i) References in the proper form.

Authors should very cautiously consider the preparation of papers to ensure that they communicate efficiently. Papers are much more likely to be accepted, if they are cautiously designed and laid out, contain few or no errors, are summarizing, and be conventional to the approach and instructions. They will in addition, be published with much less delays than those that require much technical and editorial correction.

The Editorial Board reserves the right to make literary corrections and to make suggestions to improve briefness.

It is vital, that authors take care in submitting a manuscript that is written in simple language and adheres to published guidelines.

**Format**

*Language: The language of publication is UK English. Authors, for whom English is a second language, must have their manuscript efficiently edited by an English-speaking person before submission to make sure that, the English is of high excellence. It is preferable, that manuscripts should be professionally edited.*

Standard Usage, Abbreviations, and Units: Spelling and hyphenation should be conventional to The Concise Oxford English Dictionary. Statistics and measurements should at all times be given in figures, e.g. 16 min, except for when the number begins a sentence. When the number does not refer to a unit of measurement it should be spelt in full unless, it is 160 or greater.

Abbreviations supposed to be used carefully. The abbreviated name or expression is supposed to be cited in full at first usage, followed by the conventional abbreviation in parentheses.

Metric SI units are supposed to generally be used excluding where they conflict with current practice or are confusing. For illustration, 1.4 l rather than 1.4 × 10-3 m3, or 4 mm somewhat than 4 × 10-3 m. Chemical formula and solutions must identify the form used, e.g. anhydrous or hydrated, and the concentration must be in clearly defined units. Common species names should be followed by underlines at the first mention. For following use the generic name should be constricted to a single letter, if it is clear.

**Structure**

All manuscripts submitted to Global Journals Inc. (US), ought to include:

Title: The title page must carry an instructive title that reflects the content, a running title (less than 45 characters together with spaces), names of the authors and co-authors, and the place(s) wherever the work was carried out. The full postal address in addition with the e-mail address of related author must be given. Up to eleven keywords or very brief phrases have to be given to help data retrieval, mining and indexing.

*Abstract, used in Original Papers and Reviews:*

Optimizing Abstract for Search Engines

Many researchers searching for information online will use search engines such as Google, Yahoo or similar. By optimizing your paper for search engines, you will amplify the chance of someone finding it. This in turn will make it more likely to be viewed and/or cited in a further work. Global Journals Inc. (US) have compiled these guidelines to facilitate you to maximize the web-friendliness of the most public part of your paper.

Key Words

A major linchpin in research work for the writing research paper is the keyword search, which one will employ to find both library and Internet resources.

One must be persistent and creative in using keywords. An effective keyword search requires a strategy and planning a list of possible keywords and phrases to try.

Search engines for most searches, use Boolean searching, which is somewhat different from Internet searches. The Boolean search uses "operators," words (and, or, not, and near) that enable you to expand or narrow your affords. Tips for research paper while preparing research paper are very helpful guideline of research paper.

Choice of key words is first tool of tips to write research paper. Research paper writing is an art.A few tips for deciding as strategically as possible about keyword search:

- One should start brainstorming lists of possible keywords before even begin searching. Think about the most important concepts related to research work. Ask, "What words would a source have to include to be truly valuable in research paper?" Then consider synonyms for the important words.
- It may take the discovery of only one relevant paper to let steer in the right keyword direction because in most databases, the keywords under which a research paper is abstracted are listed with the paper.
- One should avoid outdated words.

Keywords are the key that opens a door to research work sources. Keyword searching is an art in which researcher's skills are bound to improve with experience and time.

Numerical Methods: Numerical methods used should be clear and, where appropriate, supported by references.

*Acknowledgements: Please make these as concise as possible.*

References

References follow the Harvard scheme of referencing. References in the text should cite the authors' names followed by the time of their publication, unless there are three or more authors when simply the first author's name is quoted followed by et al. unpublished work has to only be cited where necessary, and only in the text. Copies of references in press in other journals have to be supplied with submitted typescripts. It is necessary that all citations and references be carefully checked before submission, as mistakes or omissions will cause delays.

References to information on the World Wide Web can be given, but only if the information is available without charge to readers on an official site. Wikipedia and Similar websites are not allowed where anyone can change the information. Authors will be asked to make available electronic copies of the cited information for inclusion on the Global Journals Inc. (US) homepage at the judgment of the Editorial Board.

The Editorial Board and Global Journals Inc. (US) recommend that, citation of online-published papers and other material should be done via a DOI (digital object identifier). If an author cites anything, which does not have a DOI, they run the risk of the cited material not being noticeable.

The Editorial Board and Global Journals Inc. (US) recommend the use of a tool such as Reference Manager for reference management and formatting.

Tables, Figures and Figure Legends

*Tables: Tables should be few in number, cautiously designed, uncrowned, and include only essential data. Each must have an Arabic number, e.g. Table 4, a self-explanatory caption and be on a separate sheet. Vertical lines should not be used.*

*Figures: Figures are supposed to be submitted as separate files. Always take in a citation in the text for each figure using Arabic numbers, e.g. Fig. 4. Artwork must be submitted online in electronic form by e-mailing them.*

Preparation of Electronic Figures for Publication

Even though low quality images are sufficient for review purposes, print publication requires high quality images to prevent the final product being blurred or fuzzy. Submit (or e-mail) EPS (line art) or TIFF (halftone/photographs) files only. MS PowerPoint and Word Graphics are unsuitable for printed pictures. Do not use pixel-oriented software. Scans (TIFF only) should have a resolution of at least 350 dpi (halftone) or 700 to 1100 dpi (line drawings) in relation to the imitation size. Please give the data for figures in black and white or submit a Color Work Agreement Form. EPS files must be saved with fonts embedded (and with a TIFF preview, if possible).

For scanned images, the scanning resolution (at final image size) ought to be as follows to ensure good reproduction: line art: >650 dpi; halftones (including gel photographs) : >350 dpi; figures containing both halftone and line images: >650 dpi.

Color Charges: It is the rule of the Global Journals Inc. (US) for authors to pay the full cost for the reproduction of their color artwork. Hence, please note that, if there is color artwork in your manuscript when it is accepted for publication, we would require you to complete and return a color work agreement form before your paper can be published.

*Figure Legends: Self-explanatory legends of all figures should be incorporated separately under the heading 'Legends to Figures'. In the full-text online edition of the journal, figure legends may possibly be truncated in abbreviated links to the full screen version. Therefore, the first 100 characters of any legend should notify the reader, about the key aspects of the figure.*

**6. AFTER ACCEPTANCE**

Upon approval of a paper for publication, the manuscript will be forwarded to the dean, who is responsible for the publication of the Global Journals Inc. (US).

**6.1 Proof Corrections**

The corresponding author will receive an e-mail alert containing a link to a website or will be attached. A working e-mail address must therefore be provided for the related author.

Acrobat Reader will be required in order to read this file. This software can be downloaded

(Free of charge) from the following website:

www.adobe.com/products/acrobat/readstep2.html. This will facilitate the file to be opened, read on screen, and printed out in order for any corrections to be added. Further instructions will be sent with the proof.

Proofs must be returned to the dean at dean@globaljournals.org within three days of receipt.

As changes to proofs are costly, we inquire that you only correct typesetting errors. All illustrations are retained by the publisher. Please note that the authors are responsible for all statements made in their work, including changes made by the copy editor.

**6.2 Early View of Global Journals Inc. (US) (Publication Prior to Print)**

The Global Journals Inc. (US) are enclosed by our publishing's Early View service. Early View articles are complete full-text articles sent in advance of their publication. Early View articles are absolute and final. They have been completely reviewed, revised and edited for publication, and the authors' final corrections have been incorporated. Because they are in final form, no changes can be made after sending them. The nature of Early View articles means that they do not yet have volume, issue or page numbers, so Early View articles cannot be cited in the conventional way.

**6.3 Author Services**

Online production tracking is available for your article through Author Services. Author Services enables authors to track their article - once it has been accepted - through the production process to publication online and in print. Authors can check the status of their articles online and choose to receive automated e-mails at key stages of production. The authors will receive an e-mail with a unique link that enables them to register and have their article automatically added to the system. Please ensure that a complete e-mail address is provided when submitting the manuscript.

**6.4 Author Material Archive Policy**

Please note that if not specifically requested, publisher will dispose off hardcopy & electronic information submitted, after the two months of publication. If you require the return of any information submitted, please inform the Editorial Board or dean as soon as possible.

**6.5 Offprint and Extra Copies**

A PDF offprint of the online-published article will be provided free of charge to the related author, and may be distributed according to the Publisher's terms and conditions. Additional paper offprint may be ordered by emailing us at: editor@globaljournals.org .

You must strictly follow above Author Guidelines before submitting your paper or else we will not at all be responsible for any corrections in future in any of the way.

Before start writing a good quality Computer Science Research Paper, let us first understand what is Computer Science Research Paper? So, Computer Science Research Paper is the paper which is written by professionals or scientists who are associated to Computer Science and Information Technology, or doing research study in these areas. If you are novel to this field then you can consult about this field from your supervisor or guide.

## TECHNIQUES FOR WRITING A GOOD QUALITY RESEARCH PAPER:

**1. Choosing the topic:** In most cases, the topic is searched by the interest of author but it can be also suggested by the guides. You can have several topics and then you can judge that in which topic or subject you are finding yourself most comfortable. This can be done by asking several questions to yourself, like Will I be able to carry our search in this area? Will I find all necessary recourses to accomplish the search? Will I be able to find all information in this field area? If the answer of these types of questions will be "Yes" then you can choose that topic. In most of the cases, you may have to conduct the surveys and have to visit several places because this field is related to Computer Science and Information Technology. Also, you may have to do a lot of work to find all rise and falls regarding the various data of that subject. Sometimes, detailed information plays a vital role, instead of short information.

**2. Evaluators are human:** First thing to remember that evaluators are also human being. They are not only meant for rejecting a paper. They are here to evaluate your paper. So, present your Best.

**3. Think Like Evaluators:** If you are in a confusion or getting demotivated that your paper will be accepted by evaluators or not, then think and try to evaluate your paper like an Evaluator. Try to understand that what an evaluator wants in your research paper and automatically you will have your answer.

**4. Make blueprints of paper:** The outline is the plan or framework that will help you to arrange your thoughts. It will make your paper logical. But remember that all points of your outline must be related to the topic you have chosen.

**5. Ask your Guides:** If you are having any difficulty in your research, then do not hesitate to share your difficulty to your guide (if you have any). They will surely help you out and resolve your doubts. If you can't clarify what exactly you require for your work then ask the supervisor to help you with the alternative. He might also provide you the list of essential readings.

**6. Use of computer is recommended:** As you are doing research in the field of Computer Science, then this point is quite obvious.

**7. Use right software:** Always use good quality software packages. If you are not capable to judge good software then you can lose quality of your paper unknowingly. There are various software programs available to help you, which you can get through Internet.

**8. Use the Internet for help:** An excellent start for your paper can be by using the Google. It is an excellent search engine, where you can have your doubts resolved. You may also read some answers for the frequent question how to write my research paper or find model research paper. From the internet library you can download books. If you have all required books make important reading selecting and analyzing the specified information. Then put together research paper sketch out.

**9. Use and get big pictures:** Always use encyclopedias, Wikipedia to get pictures so that you can go into the depth.

**10. Bookmarks are useful:** When you read any book or magazine, you generally use bookmarks, right! It is a good habit, which helps to not to lose your continuity. You should always use bookmarks while searching on Internet also, which will make your search easier.

**11. Revise what you wrote:** When you write anything, always read it, summarize it and then finalize it.

**12. Make all efforts:** Make all efforts to mention what you are going to write in your paper. That means always have a good start. Try to mention everything in introduction, that what is the need of a particular research paper. Polish your work by good skill of writing and always give an evaluator, what he wants.

**13. Have backups:** When you are going to do any important thing like making research paper, you should always have backup copies of it either in your computer or in paper. This will help you to not to lose any of your important.

**14. Produce good diagrams of your own:** Always try to include good charts or diagrams in your paper to improve quality. Using several and unnecessary diagrams will degrade the quality of your paper by creating "hotchpotch." So always, try to make and include those diagrams, which are made by your own to improve readability and understandability of your paper.

**15. Use of direct quotes:** When you do research relevant to literature, history or current affairs then use of quotes become essential but if study is relevant to science then use of quotes is not preferable.

**16. Use proper verb tense:** Use proper verb tenses in your paper. Use past tense, to present those events that happened. Use present tense to indicate events that are going on. Use future tense to indicate future happening events. Use of improper and wrong tenses will confuse the evaluator. Avoid the sentences that are incomplete.

**17. Never use online paper:** If you are getting any paper on Internet, then never use it as your research paper because it might be possible that evaluator has already seen it or maybe it is outdated version.

**18. Pick a good study spot:** To do your research studies always try to pick a spot, which is quiet. Every spot is not for studies. Spot that suits you choose it and proceed further.

**19. Know what you know:** Always try to know, what you know by making objectives. Else, you will be confused and cannot achieve your target.

**20. Use good quality grammar:** Always use a good quality grammar and use words that will throw positive impact on evaluator. Use of good quality grammar does not mean to use tough words, that for each word the evaluator has to go through dictionary. Do not start sentence with a conjunction. Do not fragment sentences. Eliminate one-word sentences. Ignore passive voice. Do not ever use a big word when a diminutive one would suffice. Verbs have to be in agreement with their subjects. Prepositions are not expressions to finish sentences with. It is incorrect to ever divide an infinitive. Avoid clichés like the disease. Also, always shun irritating alliteration. Use language that is simple and straight forward. put together a neat summary.

**21. Arrangement of information:** Each section of the main body should start with an opening sentence and there should be a changeover at the end of the section. Give only valid and powerful arguments to your topic. You may also maintain your arguments with records.

**22. Never start in last minute:** Always start at right time and give enough time to research work. Leaving everything to the last minute will degrade your paper and spoil your work.

**23. Multitasking in research is not good:** Doing several things at the same time proves bad habit in case of research activity. Research is an area, where everything has a particular time slot. Divide your research work in parts and do particular part in particular time slot.

**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 though which your research is going to be in print to the rest of the crowd. Care should be taken to categorize your thoughts well and present them in a logical and neat manner. A good quality research paper format is essential because it serves to highlight your research paper and bring to light all necessary aspects in your research.

## Informal Guidelines of Research Paper Writing

**Key points to remember:**

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

**Final Points:**

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

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

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

**General style:**

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

To make a paper clear

· Adhere to recommended page limits

Mistakes to evade

- Insertion a title at the foot of a page with the subsequent text on the next page
- Separating a table/chart or figure - impound each figure/table to a single page
- Submitting a manuscript with pages out of sequence

In every sections of your document

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

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

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

· Align the primary line of each section

· Present your points in sound order

· Use present tense to report well accepted

· Use past tense to describe specific results

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

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

**Title Page:**

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

**Abstract:**

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

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

Write your summary when your paper is completed because how can you write the summary of anything which is not yet written? Wealth of terminology is very essential in abstract. Yet, use comprehensive sentences and do not let go readability for briefness. You can maintain it succinct by phrasing sentences so that they provide more than lone rationale. The author can at this moment go straight to shortening the outcome. Sum up the study, with the subsequent elements in any summary. Try to maintain the initial two items to no more than one ruling each.

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

**Introduction:**

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

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

Approach:

- Use past tense except for when referring to recognized facts. After all, the manuscript will be submitted after the entire job is done.
- Sort out your thoughts; manufacture one key point with every section. If you make the four points listed above, you will need a least of four paragraphs.

- Present surroundings information only as desirable in order hold up a situation. The reviewer does not desire to read the whole thing you know about a topic.
- Shape the theory/purpose specifically - do not take a broad view.
- As always, give awareness to spelling, simplicity and correctness of sentences and phrases.

**Procedures (Methods and Materials):**

This part is supposed to be the easiest to carve if you have good skills. A sound written Procedures segment allows a capable scientist to replacement your results. Present precise information about your supplies. The suppliers and clarity of reagents can be helpful bits of information. Present methods in sequential order but linked methodologies can be grouped as a segment. Be concise when relating the protocols. Attempt for the least amount of information that would permit another capable scientist to spare your outcome but be cautious that vital information is integrated. The use of subheadings is suggested and ought to be synchronized with the results section. When a technique is used that has been well described in another object, mention the specific item describing a way but draw the basic principle while stating the situation. The purpose is to text all particular resources and broad procedures, so that another person may use some or all of the methods in one more study or referee the scientific value of your work. It is not to be a step by step report of the whole thing you did, nor is a methods section a set of orders.

Materials:

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

Methods:

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

Approach:

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

What to keep away from

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

**Results:**

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

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

Content

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

What to stay away from

- Do not discuss or infer your outcome, report surroundings information, or try to explain anything.
- Not at all, take in raw data or intermediate calculations in a research manuscript.
- Do not present the similar data more than once.
- Manuscript should complement any figures or tables, not duplicate the identical information.
- Never confuse figures with tables - there is a difference.

Approach

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

Figures and tables

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

**Discussion:**

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

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

Approach:

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

Please carefully note down following rules and regulation before submitting your Research Paper to Global Journals Inc. (US):

**Segment Draft and Final Research Paper:** You have to strictly follow the template of research paper. If it is not done your paper may get rejected.

- The **major constraint** is that you must independently make all content, tables, graphs, and facts that are offered in the paper. You must write each part of the paper wholly on your own. The Peer-reviewers need to identify your own perceptive of the concepts in your own terms. NEVER extract straight from any foundation, and never rephrase someone else's analysis.

- Do not give permission to anyone else to "PROOFREAD" your manuscript.

- Methods to avoid Plagiarism is applied by us on every paper, if found guilty, you will be blacklisted by all of our collaborated research groups, your institution will be informed for this and strict legal actions will be taken immediately.)
- To guard yourself and others from possible illegal use please do not permit anyone right to use to your paper and files.

## Criterion for Grading a Research Paper (Compilation) by Global Journals Inc. (US)

**Please note that following table is only a Grading of "Paper Compilation" and not on "Performed/Stated Research" whose grading solely depends on Individual Assigned Peer Reviewer and Editorial Board Member. These can be available only on request and after decision of Paper. This report will be the property of Global Journals Inc. (US).**

| Topics | Grades | | |
|---|---|---|---|
| | **A-B** | **C-D** | **E-F** |
| ***Abstract*** | Clear and concise with appropriate content, Correct format. 200 words or below | Unclear summary and no specific data, Incorrect form<br><br>Above 200 words | No specific data with ambiguous information<br><br>Above 250 words |
| ***Introduction*** | Containing all background details with clear goal and appropriate details, flow specification, no grammar and spelling mistake, well organized sentence and paragraph, reference cited | Unclear and confusing data, appropriate format, grammar and spelling errors with unorganized matter | Out of place depth and content, hazy format |
| ***Methods and Procedures*** | Clear and to the point with well arranged paragraph, precision and accuracy of facts and figures, well organized subheads | Difficult to comprehend with embarrassed text, too much explanation but completed | Incorrect and unorganized structure with hazy meaning |
| ***Result*** | Well organized, Clear and specific, Correct units with precision, correct data, well structuring of paragraph, no grammar and spelling mistake | Complete and embarrassed text, difficult to comprehend | Irregular format with wrong facts and figures |
| ***Discussion*** | Well organized, meaningful specification, sound conclusion, logical and concise explanation, highly structured paragraph reference cited | Wordy, unclear conclusion, spurious | Conclusion is not cited, unorganized, difficult to comprehend |
| ***References*** | Complete and correct format, well organized | Beside the point, Incomplete | Wrong format and structuring |

# Index

save our planet

# Global Journal of Computer Science and Technology

Visit us on the Web at www.GlobalJournals.org | www.ComputerResearch.org
or email us at helpdesk@globaljournals.org

ISSN 9754350