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Developing an Integrated Model Based on Genetic Algorithm to Affect the Migration of Virtual Machine in Cloud Computing

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ABSTRACT

Cloud computing nature is distributable. Due to this nature, it is mandatory to manage the load, which is very challenging to do. Our primary focus on this research is on load balancing in the cloud network. In Earlier research genetic algorithm is proposed, which is found to be very complicated in terms of resource consumption and high execution time. In our research, we have introduced an enhanced Genetic algorithm that consumes fewer resources than the previous one. To implement this technique, we have used MATLAB. The output of simulation shows that the proposed method is more efficient than the previous one.

I. INTRODUCTION

Distributed computing, in a nutshell, is set or a subset of service allowing an individual or association access to processing assets like you would on your work area, such assets could be applied in a remote area, its repository and everything you could in an ordinary exhibit yet as they may exist on a remote area, basic route for you to get to them is utilizing cloud services. The user extracts and improves data in this system. The storing of data is done in a centralized structure known as a cloud [1]. Cloud is a framework. The service provider offers services to subscribers when they demand those services. This essential aspect is called CSP. CSP is known as "Cloud Service Provider." This implies that the user pays for the services that he/she use. Cloud computing is a technology that provides a complex number of applications in various topologies. Every system provides a particular service. It is not required to get information about the service providing system such as locality or pattern. Cloud computing has some fundamental characteristics. These characteristics include virtualization, homogeneity, modern security, demand scale, minimal cost software, and geological distribution service orientation [2]. In cloud computing, it is possible to use an application without installing it. After getting the network access, the client can handle his private files with the help of this technology. To provide more competent computing, resource distribution, bandwidth, and memory, this technology uses features of centralized storage. Infrastructure as a Service or IaaS is a cloud computing model. Basic storage and computing potentials are provided in the form of consistent services on the network using this model. This model combines servers, storage systems, networking devices, data centre space, etc. These tools are used to manage workloads. The client can install his/her software on the system. Amazon, GoGrid, 3 Tera, and so on are some popular examples of infrastructure as a Service model. Platform as a Service or PaaS gives access to computational resources. This model can be used to host and design applications and resources [3]. As the name implies, this type of cloud computing provider provides the development environment as a service where users can write applications and develop software. Software as a Service (SaaS) model provides a complete application to the client as a service on demand. A particular example of the service runs on the cloud. This provides service to numerous end customers. Users should have access to the internet connection to utilize services. Some specified business threads providing particular cloud services can be implemented using this type of cloud model [4]. In cloud computing, this is the most common service model for all users. This model provides cloud services to clients through a dynamic environment. To develop this environment, polled shared physical resources are used. These resources are shared on a public network using the internet. Numerous users share similar

infrastructure. Operations in the cloud are carried out in an optimal manner using this model. On-demand of some particular business, designing and developing of this cloud is performed. A private cloud service provider offers the authorization of its network to the client in a more safe manner. During this process, service providers ensure that the user outside of the network cannot access the network. Therefore, in contrast to the public cloud, the private cloud provides more security but less flexibility. The compilation of numerous clouds, such as private clouds and public clouds, is called a Hybrid cloud [5]. Every cloud has its own distinctive identity. However, all are clouds are determined as a unit. This cloud provides information and application in standard form. At times, some more storage space is required during working with private clouds; in this case, some public clouds are used. This phenomenon is called cloud bursting. In this scenario, the business only has to pay for the consumption of additional space. The technique that uses different methodologies to share the entire load of the network between many nodes to make resource use competent and increase the response time of the task is known as load balancing. Meanwhile, a state containing some under loaded hubs and overloaded hubs are removed. The deployed virtual machine behaves as a single object to cater to requests and provide services as a physical medium. A virtual machine behaves as a complete system despite being virtual in a host. In general, a virtual machine is developed in a larger environment called host. Numerous virtual machines can be included within a host. These virtual machines behave as an autonomous object. Genetic algorithm is developed from the research of cellular automata. John Holland and his colleagues developed this algorithm. Genetic algorithm is a major research field. This algorithm is a branch of computer science. Solutions related to various optimization problems can be obtained using this algorithm. These algorithms are also called evolutionary algorithms [7]. Developmental science involves various features in this approach. These are inheritance, change, feature determining, and recombination.

II. LITERATURE REVIEW

Sheetal Karki et al. in 2018 [8] stated that the cloud had been identified as the data stored in the merged virtual machine. An end-user could manage this data with the help of offered services. Cloud Service Providers gave access to services to the users as per their demand. The users had been charged for the subscribed services. Task migration had been considered in this work. In task mitigation, the virtual machine got overloaded during the implementation of cloudlets. It was the responsibility of cloud service providers to assign duties to the most suitable virtual machine. The task was mitigated from one virtual machine to another virtual machine in case of the virtual machine's overloading. The job could remain in the queue as well. To determine this, the threshold and checkpointing algorithm could be used. For this purpose, the processing time, power, and resource expenditure were minimized.

WANG Bei et al. in 2016 [10] used the Multi-Population Genetic Algorithm (MPGA) for load balancing. This algorithm's primary purpose was to provide a solution of task scheduling issues in the cloud system. This algorithm was also employed to prevent premature convergence. The proposed algorithm used the min-min and max-min algorithm to initialize the populace for improving the boost research effectiveness. The achieved simulation outcomes revealed that the proposed approach performed better than the traditional genetic algorithm in less computational time, less processing costs, and load balancing. These results proved that the proposed algorithm efficiently performed task scheduling. In contrast to the adaptive genetic algorithm, this approach managed various tasks appropriately.

Mahalingam et al. in 2015 [11] proposed an optimized load balancing algorithm based on weight. The main aim of this algorithm was to distribute the approaching task among virtual machines evenly. Moreover, a tool named Cloud simulator was used to analyze the performance of the suggested algorithm. A comparison of the proposed algorithm with accessible Round Robin and EIPR algorithms was performed in this work. The achieved simulation outcomes revealed that the suggested algorithm evenly allotted the load amid virtual machines. In the future, the focus would be on removing the issues of deadlocks and virtual machine overloading. A novel rule break strategy could also be implemented within the simulator for developing unique load balancing algorithms.

Mr Mayur S. Pilavare et al. in 2015 [13] stated that the main issue in cloud computing was Load balancing. In the field of cloud computing, a lot of approaches were

proposed for improving load balancing. The genetic algorithm showed better performance as compared to other algorithms. The genetic algorithm selects virtual machines as input in a random manner. Later, processing was performed. Initially, the priority algorithm was implemented on the input processors for improving the effectiveness of GA. The first algorithm was called Logarithmic Least Square Matrix. The proposed algorithm provided the solution to some issues related to being idle and starvation.

III. RESEARCH METHODOLOGY

The proposed algorithm is the updated variant of the traditional genetic algorithm. In distributed computing, reducing execution time for task movement is the fundamental purpose of this computation. Modification in the transformation estimation focuses was made to lessen the measure of relief. This wonder diminishes execution time and makes the proposed algorithm progressively predictable when contrasted with the open calculation. The GA works in three stages; the principal stage is the underlying populace where execution and failure pace of each virtual machine is taken as info. In the subsequent step, the hybrid worth is determined, and in the latter approach, the ideal value is looked over the various qualities which have the least odds of failure. In this work, the upgrade in the improved GA is proposed to decrease execution time. In the upgraded improved GA following advances are there:

1. Initial Population: The starting populace is the execution time and failure pace of each virtual machine which is used for the job execution. The assets of the virtual machine are known as underlying people. These assets are utilized to complete the errand.

2. Cross over value calculation: Under the populace, each chromosome x fitness value gets investigated. As indicated by their fitness esteem, we pick two parent chromosomes from a populace, and when all is said in done greater the masses greater is the fitness value with a hybrid chance surpasses the guardians to frame another posterity. If none of the hybrids is done, posterity turns into a perfect imitation of guardians. With a posterity, probability reproduces new posterity at each locus.

3. Best value Calculation: The best value is determined from the crossover value determined. Use the recently produced masses for a farther run of the calculation.

Following are the steps implemented in this procedure:

Step 1: Initially, the fixed amount of virtual machines is deployed within the network.

Step 2: The cloudlets are assigned to most capable virtual machines. The virtual machines are selected which has least probabilities of failure and execution time.

Step 3: when fault occurs, then the proposed enhanced improved genetic algorithm plays an important role in the selection of most appropriate virtual machine.

Step 4: The cloudlet is migrated to other virtual machine. The virtual machine implements next cloudlet.

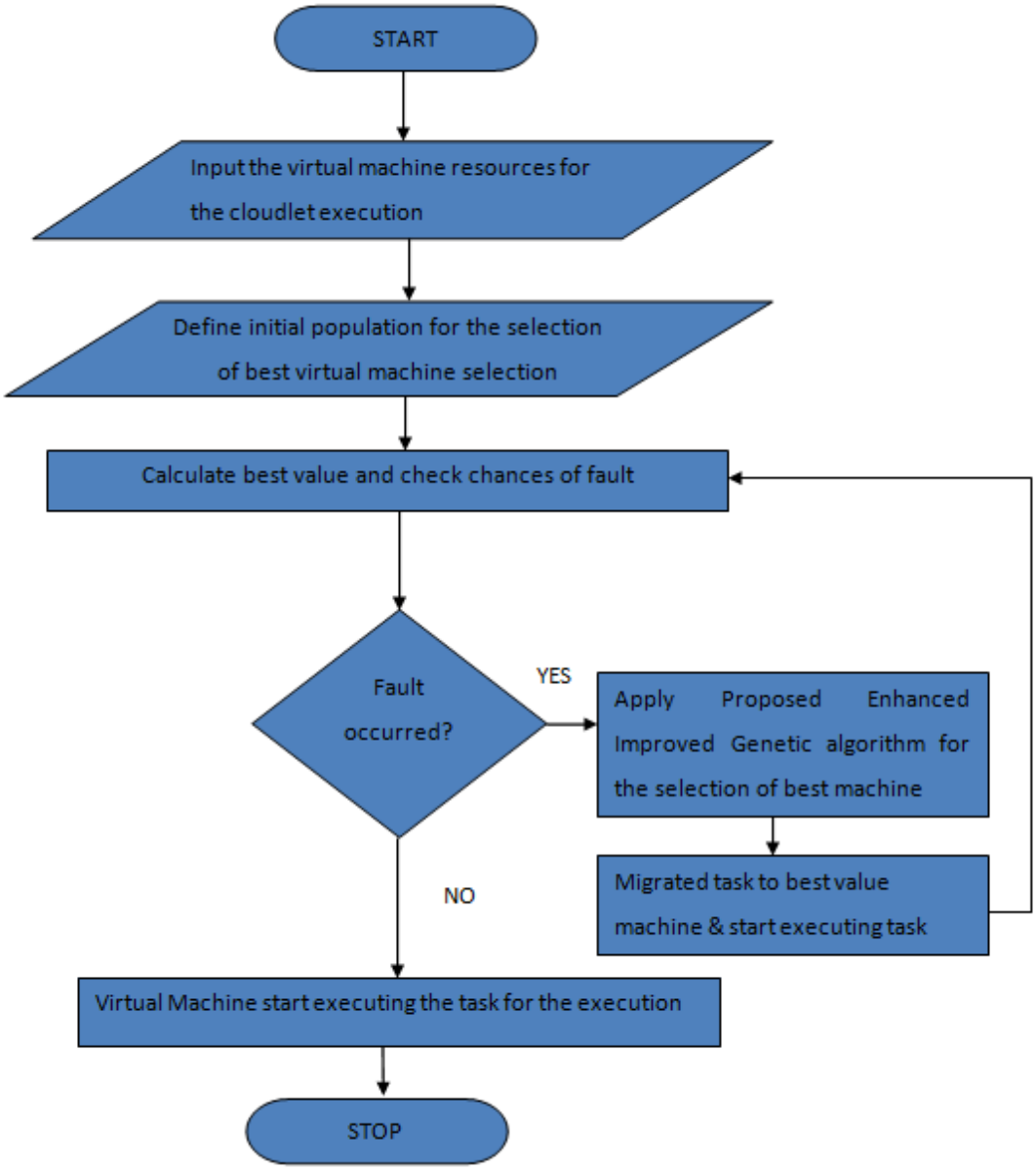

Fig 1: Flowchart of Improved GA

IV. EXPERIMENTAL RESULTS

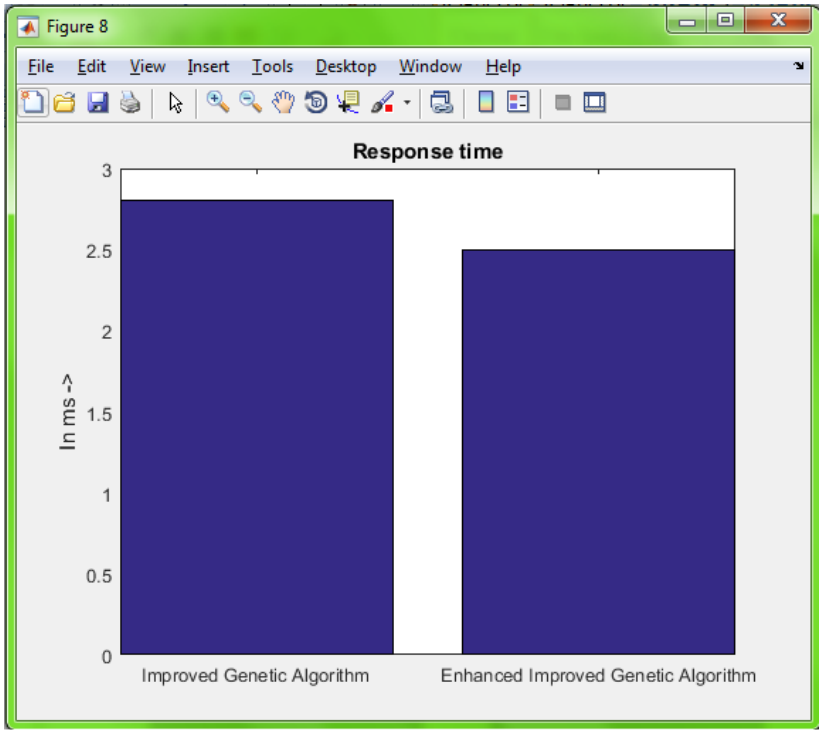

Fig 2: Comparison graph of Response Time

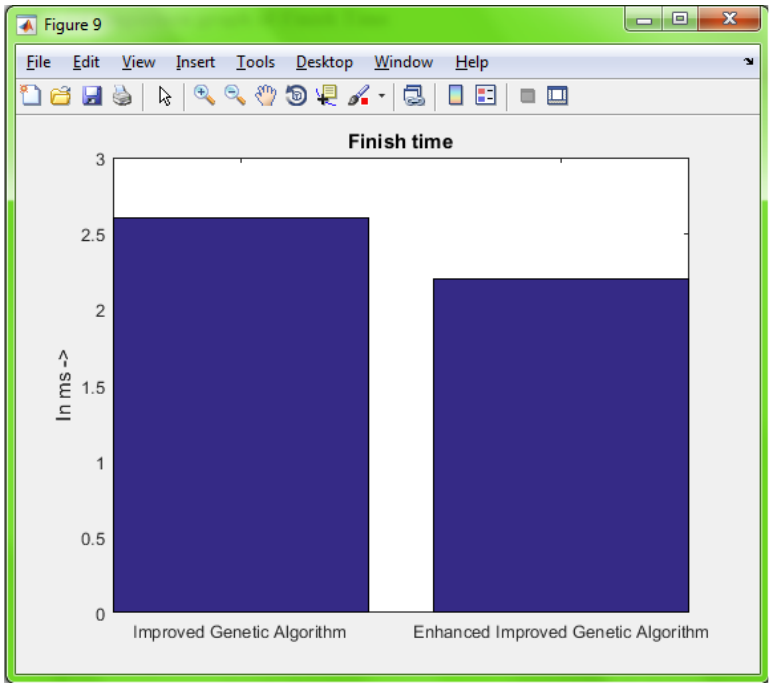

Fig 3: Comparison graph of Finish Time

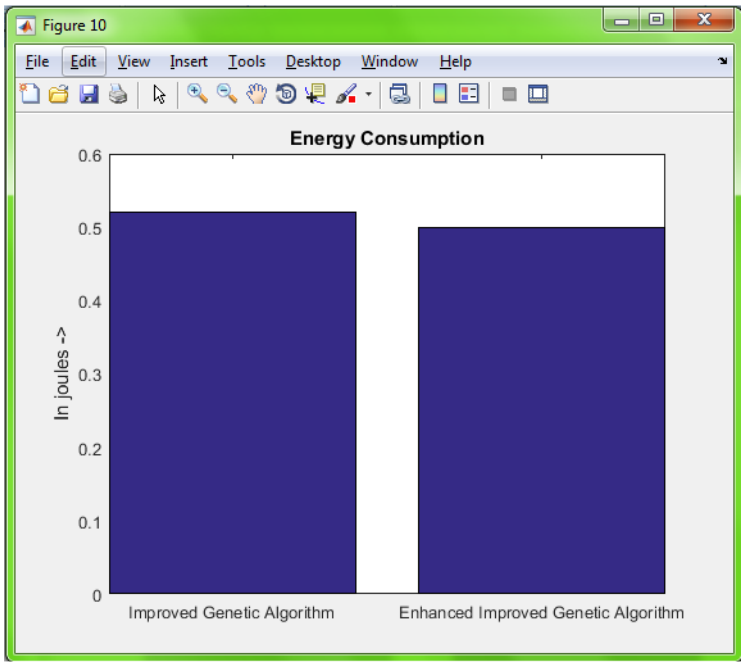

Fig 4: Comparison graph of Energy Consumption

A tool named MATLAB is used for the implementation of the proposed approach. The achieved outcomes have been assessed in terms of several parameters.

V. CONCLUSION

The Nature of Cloud Computing is dynamic. The Cloud network faces several problems due to its dynamicity. The main problem of cloud computing is load balancing. This issue decreases the efficiency of cloud computing. In this research, the algorithm proposed for fault recognition that completes virtual machine relocation is called an enhanced genetic algorithm. The improved genetic algorithm performing virtual machine movement is increasingly unpredictable and takes more execution time. Here, an improvement is shown in the enhanced genetic algorithm. This is done to minimize the execution time. The proposed approach is faster and reliable; this reduces the chances of fault occurrence. MATLAB tool is used for the proposed and existing algorithms. These algorithms are compared for evaluating their performances. For this purpose, various metrics have been considered. These measurements incorporate reaction time, finish time, vitality utilization, cost, and no relocations. For virtual machine movement, the proposed upgraded improved GA performs better than existing improved GA according to the end.