



# Study of Election Algorithm in Anonymous System and Improvements in Ring Election Algorithm

S. G. Shikalpure<sup>1</sup>, Priyanka D. Bhute<sup>2</sup>

Assistant Professor, CSE, Govt. College of Engineering, Aurangabad, India<sup>1</sup>

Research Student, CSE, Govt. College of Engineering, Aurangabad, India<sup>2</sup>

**Abstract:** In distributed system (DS), election algorithm plays an important role which helps to elect the coordinate among various processes. It has been studied that there is no any election algorithm to elect the coordinate in the anonymous system. In this paper author will propose an election algorithm for an anonymous system which is based on probabilistic model and bully election algorithm. Along with this, authors will propose bidirectional ring election algorithm with proper performance parameter.

**Keywords:** Bidirectional Ring Election, Bully Election, Anonymous System, Proper Performance Parameter, Probabilistic Model.

## I. INTRODUCTION

The Field of Computer Science and Technology that deals with the study of DS is known as Distributed Computing. This Distributed Computing uses DS to solve the computational problems. To solve these problems, problems are divided into many tasks and each of these tasks made to execute on one or more computer systems from DS. DS is a computer system in which various components are located on computers which are in the network and these components communicated and coordinate with each other passing messages. These components interact with each other in order to perform certain task or in order to solve any computational problem. There are two types of the DS, one is Synchronous DS and another is Asynchronous DS. In case of Synchronous DS, all the systems or may say that all the components which communicate with each other are synchronized with each other. While in asynchronous system we required to synchronize the communicating components with each other. It is very hard to handle this problem. There are two models of the DS first is anonymous system in which all processes have unique and similar characteristics. And in second i.e. non-anonymous system individual process gets identified with process unique identifier.

The reasons of using DS may include:

1) Application may require communicating with other computers which are there on network.

E.g.an application at one location that wants to access data produced at another location.

2) DS is cost efficient.

3) DS provides more reliability than non-DS.

DS needs to solve the computational problem. Problem gets divided into many tasks. Each task executes on one or more computers. As DS require maintaining the coordination among the various tasks or the computers on which tasks going to be executed a central approach has been introduced in the form of coordinator or generally said as leader. Leader Election (LE) is the process in DS to choose one process among all processes (task said as process) running on different computers connected via network to act as a coordinator.

There are various LE algorithms in the DS, for example Bully Election and Ring Election algorithms. The main objective of the project is that, here we are going to propose the LE algorithm for anonymous system. Author will try to introduce the bully election algorithm in anonymous system with probabilistic model. Author is also going to improve the bidirectional ring algorithm by simulating it with the performance parameters and will try to reduce the number of messages and will try to minimize the time required for election of coordinator.

Section 2 gives what the previous work has been done with the LE i.e. Literature Survey. Section 3 gives information about System Development.

## II. LITERATURE SURVEY

In A Bi-directional Election Algorithm Based on Ring Topology, authors had suggested bidirectional election algorithm based on ring topology. After analysing a classical distributed election algorithm, this algorithm had been put forward by the authors. In this algorithm, authors had



assumed that processes are logically as well as physically ordered. In this bidirectional election algorithm, the process of electing the co-ordinator maps between two phases:-

- (1) Election Phase
- (2) Announcement Phase

In the Election phase, the process with the highest ID is selected as the co-ordinator while, in second phase, other process will get the information about the new coordinator. Compare to Unidirectional ring election algorithm, Bidirectional ring election algorithm passes the message in both directions. Basic Unidirectional election ring election algorithm took less number of messages while electing a coordinator than that of Bidirectional ring election algorithm. The advantage of the Bidirectional ring Election algorithm over unidirectional ring election algorithm is that it requires less time to elect the new coordinator. The author had suggested that the efficiency of the system should be evaluated with the proper performance parameter which will reduce the time and the frequency taken by the election [1]. Authors in Improved Bully Election Algorithm in Distributed Systems had given a new approach for electing a new coordinator in a system by improving the original bully election algorithm. In the basic algorithm, when a process wants to enter into the critical section and for that when it tries to ask for permission for the same and finds that the coordinator is crashed, then it starts the bully election algorithm for electing a new coordinator. In this process, the number of messages required is more. In the improved algorithm, author tries to minimize the number the messages required for the election. In the improved algorithm, the messages that exchanged between coordinator and other processes are used by the coordinator for assuming next future coordinator of the system when it fails. The coordinator collects the process ID's from the messages that were send by the processes to the coordinator. Then it forms a list of process ID's of the processes those are there in system. From this list the process with largest process ID is assumed to be the next new coordinator of the system. The coordinator periodically exchange this information about the largest process ID with the other processes so that when any process identifies that coordinator is crashed, that process directly communicate with the process with largest process ID. The process with largest process ID initiates an election. When it finds that there is no any other process in the system with the process ID larger than its, it declares itself as a coordinator. And when it finds the process with process ID larger than its, it gives the control of election to that process. In this algorithm, the main disadvantage is that the coordinator contains the list of only those processes IDs which communicates with it. The list of process ID changes over time and it requires a large amount of time to make this list stable [2].

In Enhanced Bully Algorithm for Leader Node Election in Synchronous Distributed Systems, a new approach had been

given for improving the basic bully election algorithm in synchronous DS. In this approach, set theory is used in which the processes that are present in the system are classified into two subsets. The first subset is known as candidate set and the second as ordinary set. If in the system, there are  $n$  process, then according to this approach,  $n/2$  processes with largest process ID are placed in candidate set while remaining are kept in ordinary set. When a process finds a current coordinator is not working then it sends an ELECTION messages to the processes which belongs to candidate set. According to this approach, the coordinator is always selected from the candidate set. This approach makes the election process efficient and fast to elect a leader in synchronous DS. Author had suggested that this approach may be used for asynchronous system as well as non-synchronous system [3].

Another novel approach was given by authors in Modified Bully Algorithm using Election Commission. This approach is used to improve the performance of the bully election algorithm. In this approach, a new term called Election Commission was introduced which helps to minimize the total number of messages required for the election. Election Commission is electoral administrative body that deals with LE mechanism. This Election Commission holds the information about all the processes and their process ID's those present in the system. Whenever a process recognizes that current coordinator is not in the working state, it sends an ELECTION message to the Election Commission in reply to this EC verifies the failure of coordinator and if it is true, it sends alive message to the process which has largest process ID in the system at the current time. If that process is alive, it replies to EC and then EC declares that process as coordinator and informs to the remaining process about it [4].

### III. PROPOSED SYSTEM

DS is divided in two:-

- (1) Anonymous DS
- (2) Non-anonymous DS

Anonymous DS is the system in which every process has same ID. In non-anonymous DS, every process has its own unique ID's.

In case of non-anonymous system there are various LE algorithms have been proposed. As every process has its own identity, at the end only one process is elected as coordinator or say as leader. The problem arises in case of anonymous system. As every process has same identity, so whenever an election held in this system at the end all processes in the system will declare itself as coordinator. Hence till today there is no any election algorithm for the anonymous system. Here for the anonymous system, an approach will be suggested which will be based on probabilistic model. In this the concept of EC will be introduced. All the processes in the system will calculate its



own importance factor based on the probabilistic model, i.e. Bayes' theorem. Then at the beginning all the processes will communicate with EC and they will inform EC about their importance factor. This importance factor is known as Process Important Factor (PIF). The process with highest PIF will be selected as coordinator by EC and EC will inform other process about it. All the processes in anonymous system will get an identity i.e. they will be identified by PIF in the system. This is as shown in figure 1.

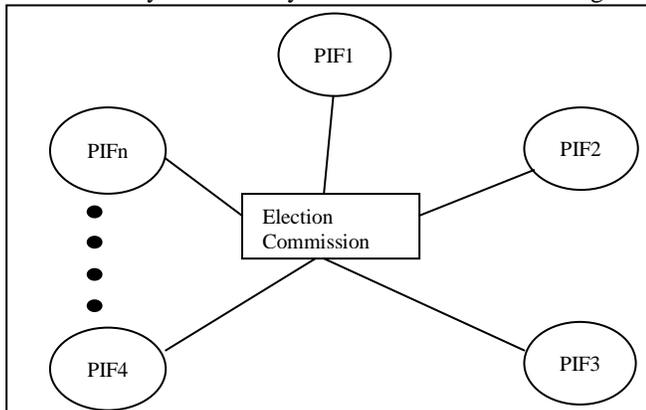


Figure 1: Bully Election algorithm in anonymous DS system based on Probabilistic model

In Basic Ring Election algorithm, when an election held, it require more time but the advantage is that it requires less number of messages. While in case of Bi-directional Ring Election algorithm, time required is less where number of messages is more. Here by using the proper performance parameter, like idle CPU time, the time required for election in ring will get reduce as well as focus will be used to reduce the number of messages in bidirectional ring. Here, to reduce the number of messages in bi-directional ring, it will be combined with Chang-Roberts algorithm, in which node or a process forwards message it received from its neighbour to next only if its process ID is less than that of received one in message. Otherwise it forward its own only.

#### IV. CONCLUSION

In this paper, approaches are suggested for LE algorithms in DS for non anonymous system as well as for anonymous system. This will help to find the coordinate efficiently. Bi-directional Ring algorithm helps to elect the coordinator in short period of time, but it takes more messages. So our proposed model will helps to minimize the number of messages in this Bid-directional ring. This will be carried out as future scope and results for our proposed algorithms will be evaluated.

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#### BIOGRAPHIES



**Prof. S. G. Shikalpure** received the B.E. degree in Computer Science and Engineering from M. B. E. Society's College of Engineering, Ambejogai in 1999 and M.Tech. Degree in Computer Science and Engineering from Dr. Babasaheb Ambedkar Technological University, Lonere in 2009. He is currently working as Assistant Professor in Government College of Engineering, Aurangabad.



**Priyanka D. Bhute** received the B.E. degree in Computer Technology from KITs Ramtek, Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur in 2011 and currently pursuing the M.E. degree in Computer Science and Engineering at Government College of Engineering, Aurangabad.