International Journal of Advance Engineering and Research Development (IJAERD)
Volume 1,Issue 6,June 2014, e-ISSN: 2348 - 4470 , print-ISSN:2348-6406

Routing in MANET using Object Neural Approach

Miss. Neha P.Bhakare[1], Dr. M. S. Ali[2]

[1]*Department of Computer Science and Engineering Prof. Ram Meghe College of Engineering and Management, Badnera, Amravati University, India. neha.bhakre2009@gmail.com*
[2]*Department of Computer Science and Engineering Prof. Ram Meghe College of Engineering and Management, Badnera, Amravati University, India, softalis@hotmail.com*

Abstract - The field of Mobile Ad hoc Networks (MANETs) has gained an important part of the interest of researchers and become very popular in last few years. MANETs can operate without fixed infrastructure and can survive rapid changes in the network topology. They can be studied formally as graphs in which the set of edges varies in time. The main method for evaluating the performance of MANETs is simulation. The aim of this dissertation is to develop an object oriented neural network. In this, we are superimposing dynamic neural network onto MANET, where each node will become an object neuron. In normal neural network we need to generate all the components of neural network manually, but in object neural network, we need to use the neural network objects defined in Matlab. In this dissertation we proposed the second order algorithm to train the neural network and object neural approach which gives faster performance than the traditional approaches. It would give us a distance value which we need to optimize.

Keywords: Mobile Ad-hoc network, Object-oriented neural network, routing protocol

I. INTRODUCTION

New implementations of wireless networking are increasing drastically in the modern society[9]. In modern communication networks, particularly in packet switched networks, routing is an important process that has a significant impact on the network's performance. Enabling Internet connection in rural area, or anywhere else where some physical obstacles exist, signal degradation, multiple fading effect, low coverage of mobile base station, poor infrastructure or similar, can be potentially solved by specific ad hoc networks implementations[22]. One of the most used one is a mobile ad-hoc network (MANET).

The integration of an ad-hoc network with a bigger network- such as the Internet-or a wireless infrastructure network increases the coverage area and application domain of the ad-hoc network. Mobile ad-hoc sensor networks are very beneficial in different scenarios. Wireless Ad Hoc Networks (MANETs for short) are characterized by their mobility, ease of deployment, self-configuration without a centralized administration and ability of nodes to communicate with each other even in out-of-range conditions with intermediate nodes performing the routing functions. MANETs are also flexible enough to get connected to cellular as well as wired networks.

Although there are several object-oriented neural network systems available, only a few presents their design by using a consistent and uniform object-oriented methodology. The explanation of important aspects of the physiology of neurons set the stage for the formulation of artificial neural network models which do not operate sequentially, as Turing machines do. Neural networks have a hierarchical multilayered structure, so that information is transmitted not only to the immediate neighbors but also to more distant units. In artificial neural networks one can connect each unit to any other. MANETs are peer-to-peer wireless networks that rely upon the presence of other network nodes in a limited geographical proximity to communicate in an ad hoc manner. Unlike other wireless network architectures a MANET does not reply upon static wireless access points or dedicated servers. Instead, individual components rely upon the establishment of dynamic connections with other MANET nodes based on proximity at each point in time.

To provide better QOS and other parameters there are various routing algorithms and various soft computing techniques are used:

1. Neural Network
2. Wireless Mesh Network
3. Fuzzy based Genetic approach

Above three soft computing techniques uses different soft computing technique protocols for establishing the link between the nodes in minimum time and to improve QOS.

The efficiency of a routing protocol [1] (at the outermost level) is directly related to numerous factors such as node mobility, dynamic topology, the communication capabilities of the nodes, power consumption issues, bandwidth constraints, traffic congestion, security and a host of other related parameters, all of which have to be well orchestrated to achieve an optimal performance that is adequate at the minimum level. There are other various approaches and various soft computing approaches for routing in MANET. In these approaches, various routing algorithms, protocols have been used to send packets to every node and o improve QOS. Section II, introduces related work done on Routing in MANET using soft computing approaches. Section III, illustrates the formulation of problem. Section IV discusses the proposed work of object neural approach. Section V focuses on the experimental results carried out in proposed work. And finally section VI and VII concludes the this paper with some suggestions for further improvement.

II. RELATED WORK

Many proposals and models addressed quality of service (QOS) among mobile nodes of the wireless networks and considered the link quality in their designs and architectures. There are various soft computing approaches which are proposed by authors on the basis of routing protocols and routing algorithms.

In 2012, author Parimal Kumar Giri[1] has proposed the neural network based approach for MANET. He found a number of attempts using neural networks, namely Hopfield Neural Networks(HNNs), were made to solve or provide an approximate solution to the Shortest Path problem faster than would be possible with any algorithmic solution, relying on the Neural Networks(NNs) parallel architecture.

In 2011, authors Siddesh.G.K et al. [2] have proposed routing in ad-hoc wireless network using soft computing techniques like neural networks, fuzzylogic and genetic algorithm. In this work, they have performed simulation using hypernet simulator for various existing protocols like proactive routing, reactive routing, power aware routing protocol, hybrid routing .Authors have concluded that it appears reasonable to assume that the essential ingredients of artificial neural network with Fuzzy Logic and Genetic Algorithms go a long way in improving the performance of protocol in very dramatic terms.

In 1989, authors Park and Choi[3][4] have also proposed one algorithm but it has limitation that algorithm fails to coverage too many times. It has poorer behavior with increasing no. of graph nodes.

In 2010, authors Nenad S. Kojić et al. [5] have proposed neural network based approach to routing protocol for wireless mesh networks. In this work, authors have presented new algorithm for wireless network. Starting from characteristic of MANETs and especially based on WMNs, routing algorithm offers the new way of protocol organization and metric in use. In this paper, authors have realized routing protocol through two independent procedures. They have done lot of simulations for different types of network topology and network's parameters.

In 2005, Rauch and Winarske authors [6][1] have proposed an algorithm in the year 2005, but it has limitation that it needs to know the number of hops required for shortest path in advance.

In 2013, authors Sharad Sharma et al. [4] have presented routing in wireless mesh networks using two soft computing based approaches like *Biogeography Based Optimization (BBO) approach and Big Bang Big Crunch (BB-BC) approach*. They have proposed routing algorithms which find the optimal shortest path taking into account three most important parameters of network dynamics. They have also further observed that for the shortest path

problem BB-BC outperforms BBO in terms of speed and percent error between the evaluated minimal path and the actual shortest path. Authors have established the superiority of BB-BC over BBO for finding the optimal path in a WMN.

Authors G. Ilanchezhiapandian et al. [7] have proposed one protocol to improve quality of service .They have proposed cross layer approach using AODV protocol. The proposed cross-layer mechanism utilizes Signal to Noise Ratio (SNR) measurements along the routing path and selects the path with high quality of service rather than the path with minimum number of hops. In this paper, authors have presented cross- layer Ad-hoc on-demand Distance Vector Routing protocol (CLAODV) to improve the performance of MANET routing protocol. They have modified the protocol to choose route according to the signal to noise ratio and eliminate the routes with the bad link which has the very low signal to noise ratio .Also they have concluded that (CLAODV) gives increased performance in terms of delivery ratio, delay and packet drop when compared to the existing AODV protocol

In 2013 Authors Jaspal Jindal et al. [8] have proposed another soft computing approach i.e. Fuzzy Improved Genetic Approach for Route Optimization in MANET. In this work, the proposed routing algorithm was inspired from the genetic approach. Instead of using the shortest path authors have selected a genetic inspired path to avoid congestion over the network. In this work, the selection of the next cross over child path have identified on the basis of cyclic fuzzy logic. Authors have observed that the results obtained from genetic based approach in which fuzzy is applied at the crossover show better path optimization. The fuzzy improved genetic approach provides energy efficient path which is needed for route optimization in MANET.

2.1 Soft Computing Approaches

In this, comprehensive review of three soft computing approaches to improve quality of service and route optimization in MANET is discuss as follows :

2.1.1 Neural Network

An Artificial neural network is akin to a biological network, capable of thinking, reasoning, decision making and a high degree of parallelism. It draws inferences from a vast storehouse of knowledge and experience gained over a period of time in solving problems. It can work with imprecise and ill-defined parameters in arriving at solutions. Fuzzy Logic and Genetic Algorithms are additional ingredients that can make an ANN more powerful and aggressive in solving unsolvable problems by analytical methods [2].

Basically, the most significant characteristic of NEURAL is the uniform distribution of the information around the node's location based on the current changes in its neighborhood. Inspired by the biological nervous system, Artificial Neural System (ANS) and neural networks are being applied to study a wide variety of problems in the areas of engineering and business [9][10][11].In a ANS system, the information is propagated between neurons using electrical stimulation along dendrites. High stimulation signal produces an output to the other neighbor neurons and so the information takes the right way to the destination, where a reaction will occur. In this approach, [12] authors have proposed Kohonen Model [13] for Self-Organizing Systems.

In this way, authors have designed architecture for NEURAL.In this paper, the design of a self-organizing routing algorithmcalled NEURAL is achieved using classification, adaptive and learning algorithms from the Artificial Neural System.

2.1.2 Wireless Mesh Network

Specific modifications of MANET created a possibility to implement several new wireless networks. One of them is a wireless mesh network (WMN). Wireless Mesh Networks are rapidly deployable, dynamically self organizing; self configuring, self healing, self balancing and self aware multi hop networks. Over the last ten years, WMNs have gained more and more attention and are now considered as a convincing solution for providing better Internet access services for end users. In these networks each node (stationary or mobile) has the capability to join and create a network automatically by sensing nodes with a similar capability within its radio range.

In a WMN the performance parameters can be categorized as per flow; per node; per link; inter flow and network wide parameters.WMN is an emerging technology that offers a cost-effective and scalable method

to connect wireless devices. In this paper [4], authors have proposed two soft computing based approaches in wireless mesh networks:
1. BIG BANG BIG CRUNCH (BB-BC) approach
2. BIOGEOGRAPHY BASEDOPTIMIZATION (BBO) approach
Wireless Mesh Network (WMN) is a specific type of MANET.As in MANET, each node operates not only as a host but also as a router, forwarding packets on behalf of other nodes that may not be within direct wireless transmission range of their destinations. In this way wireless mesh technology is used to build cost-effective outdoor wireless networks for private or public use.WMN technology ensure secure, high-bandwidth, scalable access to fixed and mobile applications across metropolitan areas. Primary goal of every new user connected to wireless network is to make Internet connection.

2.1.3 Fuzzy Based Genetic Approach

This is also another soft computing technique for route optimization in MANET. In this work, [9] authors have proposed the selection of the next cross over child path will be identified based on cyclic fuzzy logic. The whole process will optimize the routing algorithm to improve the QOS. Authors have proposed genetic based approach to build the network path for the route construction in an optimize way. Finally mutation will be performed. . In this work, the selection of the next cross over child path will be identified based on fuzzy logic. The fuzzy logic will be implemented under the parameters of energy and the distance specification.

In this work, authors have concluded that fuzzy improved genetic approach gives better result in term of distance and path optimization which can be summarized as an efficient energy form.

2.2 Routing Algorithms

There are different algorithms used in **Neural Network** approach proposed by different authors. Following table 1 illustrates the comparative study of different algorithms based on Neural Network.

AUTHORS OF ALGORITHM	LIMITATIONS OF ALGORITHM PROPOSED	ADVANTAGE OF ALGORITHM PROPSED
Rauch and Winarske [6]	Need to know the number of hops required for shortest path in advance.	First development towards the field of NN based routing solutions.
Park and Choi [3] .	Fails to coverage too many times. Poorer behavior with increasing no. of graph nodes	Multi Destination routing problem. Single Destination routing version – Here extends the range of operation of former method.
Zhang and Thomopoulos [14]	Not adaptable to external conditions	Finds a path with as many as N hops

Table 2.1: Comparative study of different algorithms based on Neural Network.

Above table illustrates the advantages and limitations of algorithm proposed by authors in neural network approach. This paper, highlight the different methods based on GA for solving the SP routing problem. One of the earliest GA-based shortest path routing algorithms. Fuzzy Logic and Genetic Algorithms are additional

ingredients that can make an ANN more powerful and aggressive in solving unsolvable problems by analytical methods. Fuzzy Logic helps us to work with ill-defined parameters and Genetic Algorithms represent a powerful paradigm in searching for optimal solutions in a solution space.

In **wireless mesh network**, authors have proposed algorithm for packet routing based on the Hopfield neural network and with primary goal to find optimal path through dynamic network topology [12].This information is used for routing packets into the WMN. For this purpose authors have used **mobile agent technique** in wireless mesh network technique. Mobile agent logic is realized by the Hopfield neural network, too. In this way updated messages are broadcasted all over the network via optimized flooding technique. In the algorithm proposed in this work, the procedure starts with the connection of a new user to a network. The WMN router detects the new device. (Three phases and two procedures):

First: Finding the shortest WMN routes (should be realized by software in mobile device),

Second: Enabling the physical connection with WMN router (which requires changing of the routing table data in the WMN router),

Third: Enabling the logical connection with one of the gateways for providing the connectivity to the distribution system over the end WMN router. In this way, algorithm based on the Hopfield neural network is used in WMNs for route optimization in MANET. In the paper [4], authors have also proposed BIG BANG BIG CRUNCH (BB-BC) AND BIOGEOGRAPHY BASEDOPTIMIZATION (BBO) algorithms. The BB-BC theory believes that energy discharged by the initial explosion i.e., kinetic energy, is counterbalanced by the energy of bodies attraction known as gravitational pull. In the Big Bang phase, energy dissipation produces disorder and randomness as the main feature of this phase. In the BigCrunch phase, randomly distributed particles are drawn into an order. This theory of repeated bigbang followed by big crunch phases forms the basis of an optimization algorithm called the BigBang-Big Crunch optimization algorithm[15][16].BBO is the study of how species are articulated on the landscape in space and time. Based upon the dynamical equilibrium theory Dan Simon proposed BBO algorithm. Since its first application, this meta-heuristic approach has been applied successfully to some engineering applications. Authors have applied this algorithm to evaluate minimal cost path.

In **Fuzzy improved genetic approach**, routing algorithm has used in which the selection of the next cross over child path will be identified based on cyclic fuzzy logic. In this work, the fuzzy-improved Genetic algorithm has been implemented for the route generation. In this work, while generating the path, the mobility of the node has also considered. The analysis has been driven in the form of energy consumed as well as the total path length. This work was about to perform the optimize path generation. The fuzzy improved genetic approach provides energy efficient path which is needed for route optimization in MANET. And authors have proposed that this algorithm is better than previous one.

2.3 Routing Protocols

There are various routing protocols used in **Neural network** like proactive routing, reactive routing, power aware routing protocol, hybrid routing. Using these protocols authors have observed Link establishment time for a maximum of 200nodes using hyper net simulator and NS2 simulator. Also, in the paper [6] authors have proposed a routing protocol which is inspired by the synapses in the brain, in which neighbors neurons compete to propagate the signal. Authors have contributed with the design of a modular architecture for the NEURAL protocol. It is essential to develop efficient broadcast protocols that are optimized for energy consumption and low control overhead. Thus, the “Post-synapse” algorithm was introduced in this paper as a query mechanism to avoid flooding due to useless broadcast packets in the NEURAL protocol.

In **wireless mesh network**,[5]authors have used link quality source routing **(LQSR)** protocol. One of the routing protocols with various performance metrics which aims to select a routing path according to link quality metrics. Three performance metrics, i.e., the expected transmission count (ETX), per-hop RTT, and per-hop packet pair are implemented separately in LQSR. In this way, authors have used a link quality source routing protocol in WMNS for route optimization in MANET. In this work, they have selected a routing path according to link quality metrics. In this work, a new performance metric, called the weighted cumulative expected transmission time (WCETT) was proposed for the routing protocol. WCETT takes into account both link quality metric and the minimum hop-count. It can achieve good tradeoff

between delay and throughput because it considers channels with good quality and channel diversity in the same routing protocol.

In 2006, authors Filipe Ara_ujo et.al.[17] proposed new neural network to solve the shortest path problem for internetwork routing. The proposed solution extends the traditional single-layer recurrent Hopfield architecture introducing a two-layer architecture that automatically guarantees an entire set of constraints held by any valid solution to the shortest path problem. This new method addresses some of the limitations of previous solutions, in particular the lack of reliability in what concerns succeeded and valid convergence. A new method to solve the shortest path problem was proposed using a two-layer Hopfield Neural Network. This solution aims to achieve an increased number of succeeded and valid convergences, which is one of the main limitations of previous solutions based on Neural Networks. Additionally, in general, it requires less neuron.

In 2011, authors Yanfang Deng, Hengqing Tong [18] analyses the The shortest path planning issure is critical for dynamic traffic assignment and route guidance in intelligent transportation systems. In this paper, a Particle Swarm Optimization (PSO) algorithm with priority-based encoding scheme based on fluid neural network (FNN) to search for the shortest path in stochastic traffic networks is introduced. The proposed algorithm overcomes the weight coefficient symmetry restrictions of the traditional FNN and disadvantage of easily getting into a local optimum for PSO. Simulation experiments have been carried out on different traffic network topologies consisting of 15-65 nodes and the results showed that the proposed approach can find the optimal path and closer sub-optimal paths with good success ratio. At the same time, the algorithms greatly improve the convergence efficiency of fluid neuron network.

In 2012, Gajendra Singh Chandel et.al.[19] developed a Genetic algorithm to find the optimal path. This paper work presents a genetic algorithmic approach to the shortest path routing problem. Variable-length chromosomes and their genes have been used for encoding the problem. The crossover operation exchanges partial chromosomes at positionally independent crossing sites and the mutation operation maintains the genetic diversity of the population. The proposed algorithm can cure all the infeasible chromosomes with a repair function. Crossover and mutation together provide a search capability that results in improved quality of solution and enhanced rate of convergence. Even though shortest path routing algorithms are already well established, there are researchers who are trying to find alternative methods to find shortest paths through a network. One such alternative is to use genetic algorithm. They have analyzed that Genetic Algorithm provides a useful problem solving technique. This technique can be very useful to evaluate the shortest path in various networks. This research work presented a genetic algorithm for solving the SP routing problem. The crossover and the mutation operations work on variable-length chromosomes. The crossover is simple and independent of the location of crossing site. Consequently, the algorithm can search the solution space in a very effective manner. The mutation introduces, in part, a new alternative route. In essence, it maintains the diversity of population thereby avoiding local traps. A treatment for infeasible solutions (chromosomes) has also been investigated without unduly com-promising on computational requirements.

III.PROBLEM FORMULATION

Initially this section will be describing how mobile ad hoc networks in the recent past has gained lot of attention from the research fraternity and after that the process through which we have tried to achieve the defined problems will be specified.

➢ Problem Analysis

There are many ways for routing in MANET using soft computing approaches. In other soft computing approaches, there are some limitations that it requires to know the number of hopes required for routing in advance. Also some soft computing approaches are not adaptable to external conditions. There are many limitations such that sometimes network fails to coverage too many times. Some approaches have limitation that there is a problem with increasing number of nodes.

In normal neural network there is need to generate all the components of neural network manually. Wireless Ad Hoc Networks (MANETs for short) are characterized by their mobility, ease of deployment, self-configuration without a centralized administration and ability of nodes to communicate with each other even in out-of-range conditions with intermediate nodes performing the routing functions. Although there are several object-

oriented neural network systems available, only a few presents their design by using a consistent and uniform object-oriented methodology. Neural networks have a hierarchical multilayered structure, so that information is transmitted not only to the immediate neighbors but also to more distant units. In artificial neural networks one can connect each unit to any other. Some soft computing approaches have poorer behavior with increasing number of graph nodes. To address all these needs present work is proposed. The contribution of present work is as follows.

- **Contribution of Present work**

Traditional approaches for routing in MANET cannot be applied, since they require number of nodes known in advance. Traditional approaches give slower performance. The work presented in this report aims at developing the technique for routing in MANET by using the object neural network. More specifically, the goal of this report is to develop object neural network.

As it is object neural network it would take epochs and stopping condition by itself. For training the neural network, we have taken 20objects each having 500 different connection distance samples. The training set‘t’ has minimum values of each of the connection distance. The connection feedforward network is used to train the neural network with 10 neurons. In that there is one hidden layer. And we are training the number of nodes with 500 samples per node object. The feedforward neural network is an artificial neural network between the units does not form a directed cycle. In this network, the information moves in only one direction, forward from the input nodes, through the hidden nodes(if any)and to the output nodes. In this way, routing in MANET is to be done using object neural approach.

The present work focuses on object neural network. For routing purpose, it is using shortest path to reach from the source to destination by using Euclidean distance formula. And for training the neural network, supervised learning has been used. Thus, the results are obtained with minimum distance between the nodes. And finally the results are obtained in graphical format by locating number of connections on X-axis and distance needed on Y-axis. There are various parameter on the basis of which neural network has trained. The present work take epoch and stopping condition by itself s it is object neural network. There is no need to generate all the components of network manually. In present work, there is requirement of neural network objects in MATLAB.

IV. PROPOSED WORK

The proposed system uses object neural network. The input to the system is number of nodes trained with 500 numbers of samples in input layer. Then in hidden layer by summing up weights and biases and by calculating threshold it will give output. The output is in the form of graphical format. The following figure4.1 illustrates the system block diagram of proposed work.

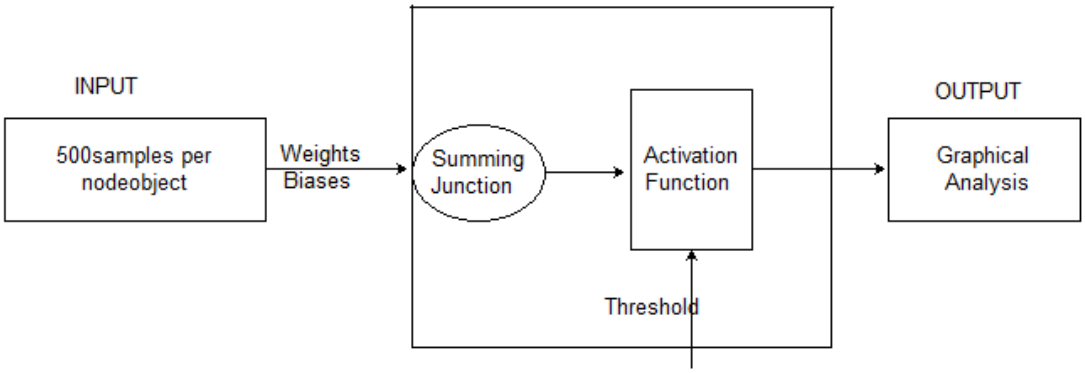


Figure 4.1: The System block Diagram

In the above block diagram, nodes are trained with the number of samples. Input is the nodes with its weights and biases. Then they are given to summing junction. Using neuron activation function and by calculating threshold output is given in the form of graphical format.

4.1.1 Detail Design

The detail internal working of the system has been explained using the following flow diagram of the proposed system and using the implementation steps.

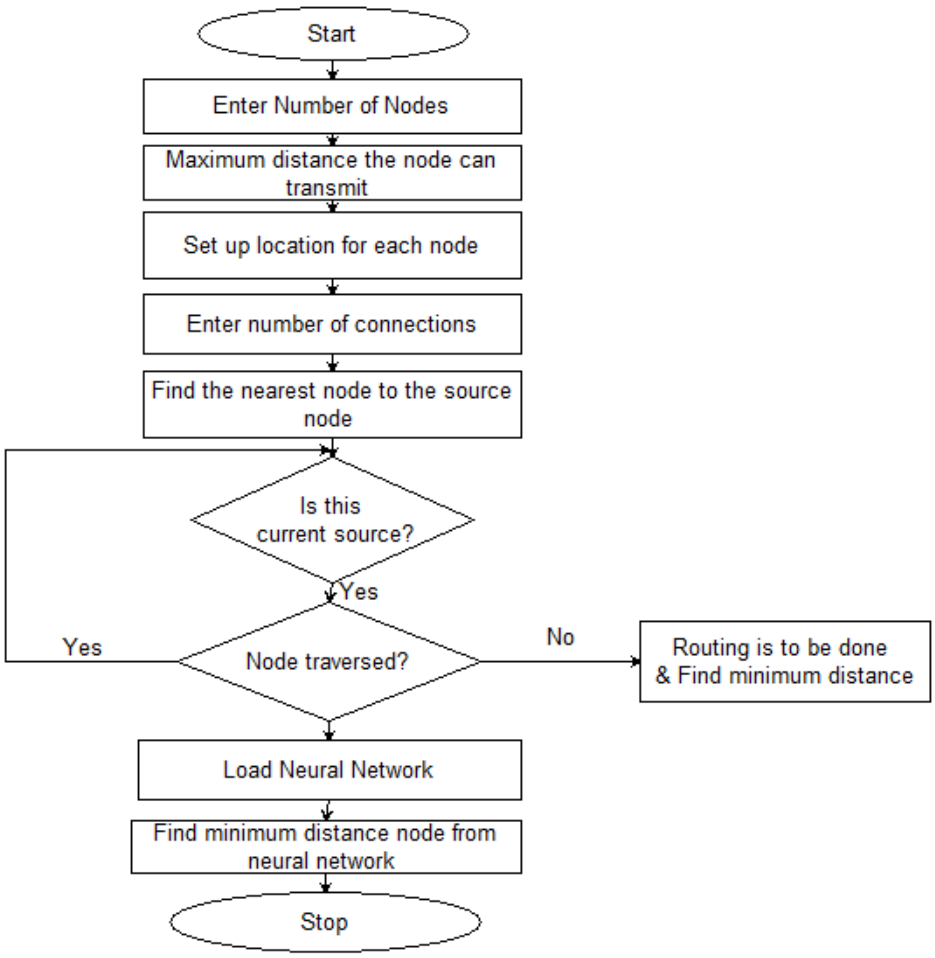


Figure 4.2: Detail Flow Diagram

Steps of Proposed system design:

Input: Number of nodes trained with 500number of samples

Output: Routing Path

1. Enter number of nodes.
2. Set up the maximum distance the node can transmit.
3. Setup the location for each node
4. Now, ask the user about the connections which are needed.
5. Find the nearest node to the source node
6. Check if this current source.
7. Also, check if this node has been traversed.

8. Node has not been traversed and can be used for routing purpose.
9. Load neural network
10. Find minimum distance node from the neural network.

Following figure 3.3 illustrates the process for training the neural network.

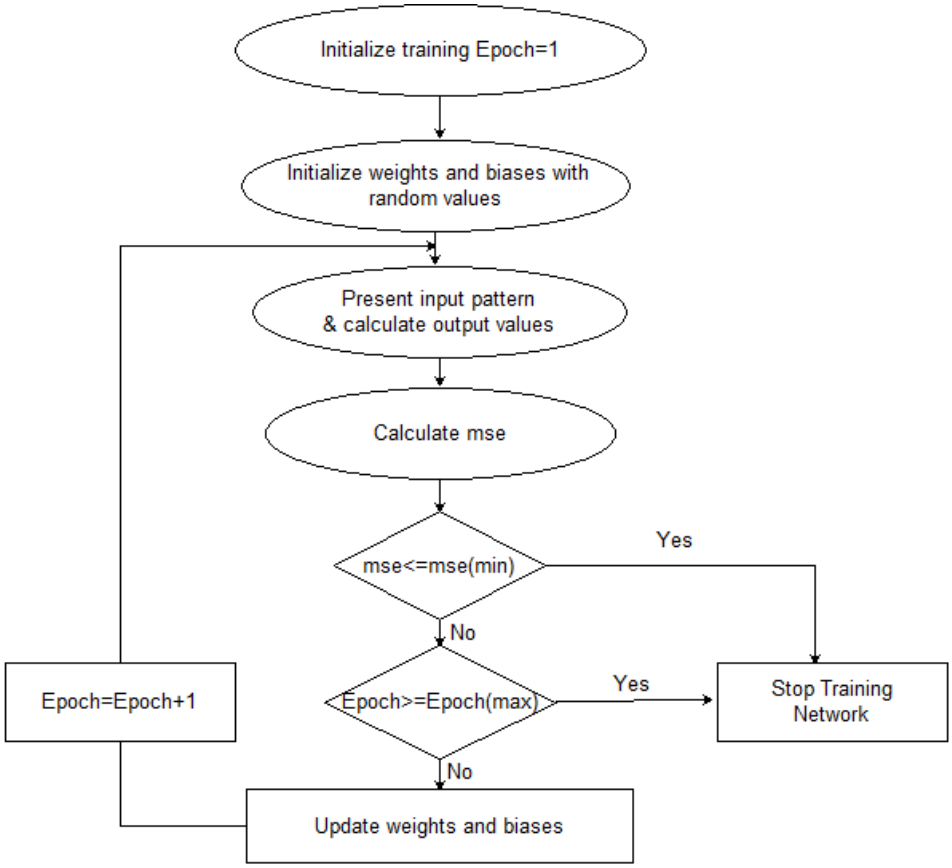


Figure 4.3: Flowdiagram for the process of Training Neural Network

Steps for Training Neural Network:

1. Loading data source.
2. Selecting attributes required.
3. Decide training, validation, and testing data.
4. Data manipulations and Target generation.

(For supervised learning)

5. Neural Network creation (selection of network architecture) and initialisation.
6. Network Training and Testing.
7. Performance evaluation

- **Finding the Minimum Distance**

A multi-hop network topology can be described by the directed graph G= (N, E), where N is a set of nodes (vertices) and E is a set of edges (arcs or links). A cost Cij is associated with the edge (i, j) in the graph G. In communication networks, the transmission time and the link capacity between nodes can be used to determine the cost of the edge. The costs for various links are specified by the cost coefficient matrix C= [Cij]. In dynamic multi-hop networks for some nodes the links may not exist. The cost values for nonexistent links are taken as infinity. Highest cost values represent more loss and lowest values represent more gain. Source and destination nodes are

named by 'S' and 'D' respectively. Here the Shortest Path problem is considered as a minimization problem, to minimize the sum of the costs on links in the shortest path

For routing purpose, first it will enter the number of nodes in the network. Then it will set the maximum distance up to which the node can transmit. After that it will set the location for each node. For setting the location for each node there are two points: source point and destination point. Then these source point and destination point will be placed at X, Y co-ordinates respectively. By using shortest path and applying normal Euclidean distance formula we can calculate the minimum distance between the nodes. It is represented by:

FindEuclideanDistance (Point1, Point2)

Point 1-source point placed at X, Y Co-ordinates

Point2-destination point placed at X, Y Co-ordinates

In this way, nodes will be placed at X, Y co-ordinates. Now, ask the user about the connections which are needed. After that find the nearest node to the source node. It will check if this is current source. It will also check if this node has been traversed. If node has not been traversed then it will use for further routing purpose. After all this, it will check for minimum distance. By using the normal Euclidean distance formula it will calculate:

The Euclidean distance between the nodes can be calculated by using the normal Euclidean distance formula as follows:

$$\textbf{Distance} = \sqrt{(X_1 - X_2)^2 + (Y_1 - Y_2)^2}$$

In this way, it will calculate the minimum distance between the nodes.

- **Training Neural Network**

After all this has been performed it will load the neural network. For loading the neural network, first it will load data from disk in .mat format. And saves variables in MATLAB environment in .mat format. After that network will be created using following syntax:

>>net = newff(PR,[S1 S2...SNl],{TF1 TF2...TFNl},BTF,BLF,PF)

- PR - Rx2 matrix of min and max values for R input elements.
- Si - Size of ith layer, for Nl layers.
- TFi - Transfer function of ith layer, default = 'tansig'.
- BTF - Backprop network training function,
  - default = 'trainlm'.
- BLF - Backprop weight/bias learning function,
  - default = 'learngdm'.
- PF - Performance function,
  - default = 'mse'
- newff: create and returns "net" = a feed-forward backpropagation network.

After that it will initialize the network

- Initialise the net's weighting and biases
- **>> net = init(net);** % init is called after newff

Then, It will activate the neurons using following syntax:

>> net = newff([-1 1; -1 1; -1 1; -1 1], [4,1], {'logsig' 'logsig'});

Network Training would be done by:

- The overall architecture of your neural network is store in the variable **net**;
- variable can be reset.
- net.trainParam.epochs =1000; (Max no. of epochs to train) [100]
- net.trainParam.goal =0.01 (stop training if the error goal hit) [0]
- net.trainParam.lr =0.001; (learning rate, not default trainlm) [0.01]

Levenberg-Marquardt this second order algorithm is used for trainig the neural network. TRAIN trains a network NET according to NET.trainFcn and maraPniart.TEN.

>> **TRAIN (NET,P,T,Pi,Ai)**

- NET - Network.
- P - Network inputs.
- T - Network targets, default = zeros.
- Pi - Initial input delay conditions, default = zeros.

.After all this, performance evaluation of neural network is to be done. In performance evaluations following parameters are considered:

- Comparison between target and network's output in testing set.
- Comparison between target and network's output in training set.
- Design a metric to measure the distance/similarity of the target and output, or simply use *mse*.

As it is object neural network it would take epochs and stopping condition by itself. For training the neural network, we have taken 20objects each having 5oo different connection distance samples. The training set't' has minimum values of each of the connection distance. The connection feedforward network is used to train the neural network with 10 neurons. In that there is one hidden layer. And we are training the number of nodes with 500 samples per node object. In this way, this chapter discusses about the proposed work carried out using object neural approach.

V. EXPERIMENTAL RESULTS

This section describes experimental results carried out in proposed work. The discussion section focuses on analysis done from experimental results.

First, there are 30number of nodes.5number of connections are entered.6thnode is the source point and 11th node is the destination point which are located at X, Y co-ordinates respectively . In above figure, message 'hi' is sent to all nodes which are present between source and destination. And then it will give minimum distance between the nodes. It shows the results in graphical format along with communication number on X-axis and distance needed on Y-axis. Following figure shows routing done with distance with the five numbers of connections.

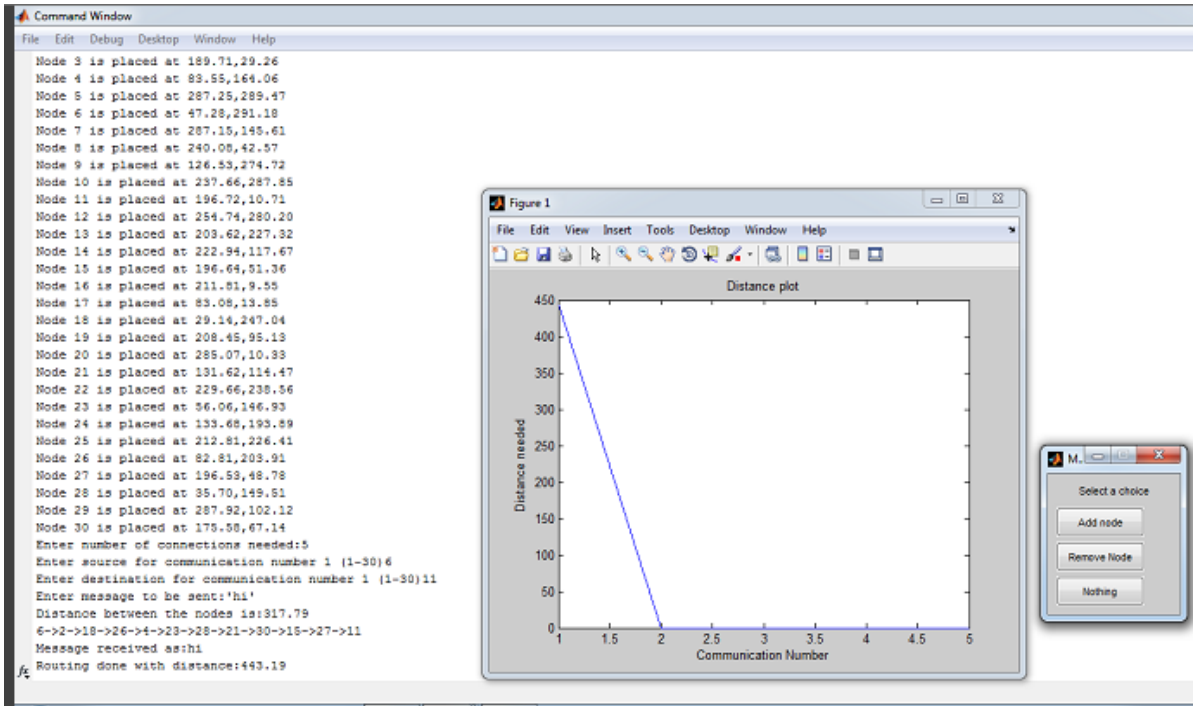


Figure 5.1: Routing Path and Distance window

Now we can add the nodes in the network. By clicking on add node button number of nodes can be added in the network. Then it gives the routing path after adding the three nodes. After adding three nodes it will send hello

message to nodes present in between the source and destination for communication number2 respectively. Then we can remove the nodes. After clicking on remove node button nodes can be removed from the network. Also, neural network has trained with 10neurons using feedforward neural network. In training process, number of nodes has trained with 500numberof samples per node object.

Following figure 5.2 illustrates about the performance evaluation in neural network. In performance evaluation, it will compare the target with output in testing and training state.

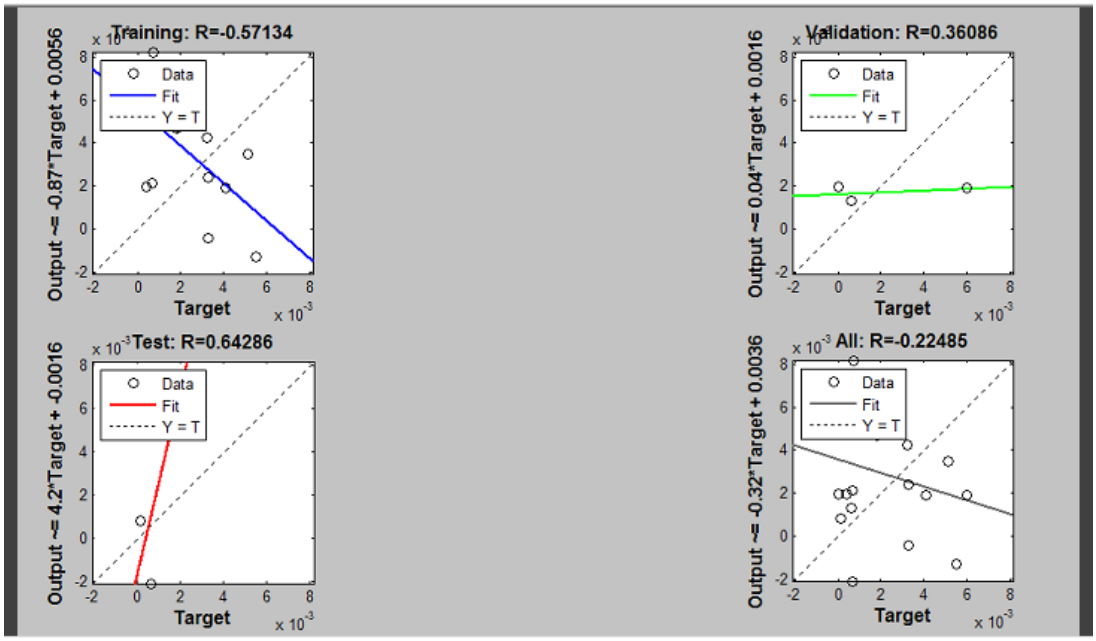


Figure 5.2:Regression Plot Window

5.1 Discussion

This section focuses on experimentation carried out in proposed work.

- **Result Analysis**

Nodes	Number Of Connections	Arc(S,D)	Cost(Euclidean Distance)
30	06	(4,10)	197.67
100	10	(20,30)	123.35
150	10	(40,50)	185.79
150	30	(60,90)	170.89

Table 5.1 Experimental Results

From above result analysis, it is seen that if there are minimum number of nodes then the Euclidean distance will be maximum. Compare the distance for thirty number of nodes and hundred nodes. For hundred number of nodes distance calculated is minimum than the distance needed for thirty number of nodes.

It is also seen that, depending on the number of connections needed it is comparing the distance between the nodes. For one-fifty numbers of nodes ten connections are taken for that it requires maximum distance than the thirty numbers of connections. It is clear that, for same number of nodes if numbers of connections are different then it will affect the Euclidean distance between the nodes.

VI. CONCLUSION

As a special type of network, Mobile Ad hoc Networks (MANETs) have received increasing research attention in recent years. There are many active research projects concerned with MANETs. Mobile ad hoc networks are

wireless networks that use multi-hop routing instead of static networks infrastructure to provide network connectivity. Researchers are designing new MANETs routing protocols, comparing and improving existing MANETs routing protocols before any routing protocols are standardized using simulations.

From the above experimental results it concludes following points:

- Distance calculated on the basis of number of nodes
- Distance calculated on the basis of number of connections needed.
- Results are shown in graphical format, it is seen that number of connections needed are located on X-axis and distance on Y-axis.So, it is concluded that if there are maximum number of connections then the distance between the nodes will be minimum.
- In training process of neural network,

Train -> Maximum number of connections -> Minimum datapath show

VII. FUTURE SCOPE

The network topology in MANETs usually changes with time. Therefore, there are new challenges for routing protocols in MANETs since traditional routing protocols may not be suitable for MANETs.

- A particular concern here is the integration of traditional approaches with object neural search technology.
- In the future, the operation of proposed neural network algorithm can be studied under different metrics at each node in the network.
- Further the project can be modified to examine how the minimum distance between the nodes can be calculated using other algorithms which gives faster performance than traditional approaches.

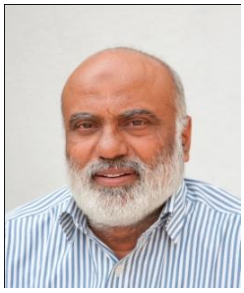
REFERENCES

1. Parimal Kumar Giri, Member, 2012.” A Survey on Soft Computing Techniques for Multi-Constrained QoS Routing in MANET” IJCIT, ISSN 2078-5828 (PRINT), and ISSN 2218-5224 (ONLINE), Vol.03, Issue.02, MANUSCRIPT CODE: 130103
2. Siddesh.G.K, K.N.Muralidhara, Manjula.N.Harihar, July 2011. ”Routing in Ad Hoc Wireless Networks using Soft Computing techniques and performance evaluation using Hypernet simulator” International Journal of Soft Computing and Engineering (IJSCE)ISSN: 2231-2307, Vol.1, Issue.3.
3. L. Zhang and S. C. Thomopoulos, 1989.”Neural Network implementation of the shortest path algorithm for traffic routing in communication networks”.International Conference Neural Networks, 591
4. Sharad Sharma, Shakti Kumar and Brahmjit Singh, June 2013. Deptt. of Electronics & Communication Engineering, National Institute of Technology,Kurukshetra, India 2Computational Intelligence (CI) Lab, IST Klawad, Yamunanagar, India2013. “Routing in Wireless Mesh Networks: Two Soft Computing Based Approaches”. International Journal of Mobile Network Communications & Telematics (IJMNCT) Vol. 3, DOI : 10.5121/ijmnct.2013.3304 29
5. Nenad S. Kojić, Marija B. Zajeganović Ivančić, Irini S. Reljin and Branimir D. Reljin2, 2010.”New algorithm for packet routing in mobile ad-hoc” JOURNAL OF AUTOMATIC CONTROL, UNIVERSITY OF BELGRADE, Vol. 20,pp-9-16
6. L. Khoukhi and S. Cherkaoui, 2009. “A Quality of Service Approach Based on Neural Networks for MANETs”, IEEE.
7. G. Ilanchezhiapandian Research Scholar Sathyabama, February 2013. University P. Sheik Abdul Khader Professor and Head, Dept of CA B.S.A University, 2013. “Quality of Service (QoS) Routing in Mobile Ad-hoc Network (MANET) using AODV protocol: Cross-Layer Approach”,International Journal of Computer Applications (0975 – 8887) 2nd National Conference on Future Computing
8. Jaspal Jindal Vishal Gupta Associate Professor in ECE Deptt. M.Tech(ECE) Student P.I.E.T College Smalkha(Panipat) P.I.E.T College Smalkha(Panipat) ,2013. International Journal of Advanced Research in Computer Science and Software Engineering Volume 3, Issue 6, June 2013 ISSN: 2277 128X

9. A.Skabar and I. Cloete, 2001. "Discovery of financial trading rules". In Proc. Artificial Intelligence and Applications (AIA2001), pp 121–125, Marbella, Spain.
10. Cloete and A. Skabar, 2001. Feature selection for financial trading rules. In Proceedings of 13th.EuropeanSimulation Symposium:Simulation in Industry, pp 713–717, Marseille,France,
11. P. Lednicky and A. Meszaros, 1998. "Neural network modeling optimisation of continuous fermentation processes". Bioprocess Engineering, 18, pp 427–432.
12. VicenteE.Mujica V., Dorgham Sisalem and Radu Popescu-Zeletin FraunhoferFOKUSInstitute.Berlin,Germany.{mujica,sisalem,zeletin}@fokus.fraunhofer.".NEURAL: A Self-organizing Routing Algorithm for Ad Hoc networks"
13. T. Kohonen, 1982. "Self-organized formation of topologically correct feature maps". Biological Cybernetics, 43, pp 59–69.
14. Khatib, 1986."Real time obstacle avoidance for manipulators and mobile robots". Int. Rob. Res, pp 90-98,
15. O.K.Erol and I.Eksin, 2006." A new optimization method: Big Bang-Big Crunch"Advances in EngineeringSoftware", 37, pp 106-111.
16. T. Kumbasar**,** E. Yesil, I.Eksin and M. Guzelkaya, 2008. "Inverse fuzzy model control with online adaptation via Big Bang-Big Crunch optimization," ISCCSP 2008, Malta, 12-14, pp. 697-702.
17. Filipe Ara_ujo, Bernardete Ribeiro, Lus Rodrigues, April2006." A Neural Network for Shortest Path Computation"
18. Yanfang Deng, Hengqing Tong, 2011." Dynamic Shortest Path Algorithm in Stochastic Traffic Networks Using PSO Based on Fluid Neural Network**"** Journal of Intelligent Learning Systems and Applications, 3, pp 11-16
19. Jzau-Sheng Lin, Mingshou Liu, Nen-Fu Huang," The shortest path computation in MOSPF protocol using an annealed Hopfield neural network with a new cooling schedule" Information Sciences 129 (2000) pp 17-30
20. Gajendra Singh Chandel, Ravindra Gupta Arvinda Kushwaha, February 2012. "Implementation of Shortest Path in Packet Switching Network Using Genetic Algorithm" International Journal of Advanced Research in Computer Science and Software Engineering. Vol. 2, Issue. 2.
21. Wen Liu and Lipo Wang,"Solving the Shortest Path Routing Problem Using Noisy Hopfield Neural Networks".
22. C.K.Toh,2001 Ad Hoc Mobile Wireless Network: Protocols and Systems,Prentice Hall.

Author Profile

Miss. Neha P. Bhakare received the B.E. degree in Computer Science and Engineering from P.R.Patil College of Engineering at Sant Gadge Baba Amravati University, Amravati, Maharashtra, India in 2012. She is pursuing her M.E. degree in Computer Science and Engineering from Prof. Ram Meghe College of Engineering & Management, Badnera at Sant Gadge Baba Amravati University, Amravati, Maharashtra, India



DR. M. S. ALI completed his B.E. (Electronics & Power) from Govt. College of Engineering, Amravati, and Nagpur University in 1981 with First Division. He completed his Masters' degree M.Tech. in Power Electronics from I.I.T. Powai, Mumbai in the year 1984. He obtained his Ph.D. in Electronics Engineering from Sant Gadge Baba Amravati University, Amravati in the year 2006. His main areas of interest are Operating Systems, Intelligent Systems and Java Technology. He is a recognized Ph.D. guide in Computer Science & Engineering in the Faculty of Engineering & Technology at Sant Gadge Baba Amravati University. He is the founder Principal at Prof Ram Meghe College of Engineering & Management, Badnera-Amravati since 2009.

