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INTELLIGENT ADHOC NETWORK USING NEURAL NETWORK

Madhusudan G[1] & Kumar TNR[2]

[1]Assistant professor, Department of Computer Science and Engineering, Sri Jayachamarajendra College of Engineering, Mysore, Karnataka, India

[2]Assistant Professor, Ramaiah Institute of Technology, Bangalore, Karnataka, India

ABSTRACT

An adhoc network is a network that is comprised of individual devices communicating each other directly or indirectly. The networks often bypass the gatekeeping hardware or central access point such as a router. An ad hoc mobile network is a collection of mobile nodes that are dynamically and arbitrarily located in such a manner that the interconnections between nodes are capable of changing on a continual basis.

A Neural Network is a series of algorithms that attempt to identify underlying relationships in a set off data by using a process that mimics the way the human brain operates. The key element of the paradigm is the novel structure of the information processing system. It is composed of a large number of highly inter connected processing elements (neurons) working in unison to solve specific problems or the general problem.

Instead of using the shortest distance path algorithm to find the distance between device and router, we are using neural networks for finding short distance through a trained approach. Using Pygame, implemented an intelligent ad-hoc system for Mobile Adhoc Network.

KEYWORDS: *MANET, ANN, RREQ*

Article History

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1. INTRODUCTION

Wireless networking is a technology that enables two or more computers to communicate using standard network protocols, but without network cabling. We can categorize wireless network in primarily following two categories. Two types of wireless networks [8]: Infrastructured network: A network with fixed and wired gateways. Infrastructure less (ad hoc) network: All nodes of these networks behave as routers and take part in discovery and maintenance of routes to other nodes.

An ad hoc network is a network that is composed of individual devices communicating with each other directly. Unlike conventional network, a MANET is characterized by having a high dynamic nature, continuously changing network topology due to the mobility of nodes [1]. These networks have the ability to be set up and deployed quickly because it has a simple infrastructure set-up and no central administration [2]. Basically, Ad-hoc networks are the decentralized type of wireless networks [3]. Ad Hoc networks are instantly formed to serve a specific purpose and cease to exist after the

network fulfills its purpose. Direct communication is possible for nodes that are within the range of each other. Indirect communication is done in cases where the nodes are very far from each other and cannot communicate with each other [4]. The communication is done here with the help of any wireless link such as radio waves [5]. There is [6] two sorts of system wired and wireless system. The wired systems are for the most part associated with the assistance of wires and links. In this, the association is build up with the assistance of physical gadgets like routers and center points. Routing protocols define a set of rules which governs the strategy of message packets transfer from source to destination in a network [7]

A MANET can be constructed quickly at a low cost. Due to the mobility of nodes, it becomes difficult to perform routing in a MANET as compared to a conventional wired network [7]. MANET used routing protocols for sending data source to destination [9] [10] [11]. In order to facilitate communication within the network, a routing protocol is used to discover routes between nodes. The primary goal of such an ad hoc network routing protocol is correct and efficient route establishment between a pair of nodes so that messages may be delivered in a timely manner. Route construction should be done with a minimum of overhead and bandwidth consumption. In a MANET, [12] each node can take responsibility for a router as well as take a role as a host.

Each device in a MANET is free to move independently in any direction, and will ,therefore, change its links to other devices frequently. Each must forward traffic unrelated to its own use, and therefore be a router. The primary challenge in building a MANET is equipping each device to continuously maintain the information required to properly route traffic. Such networks may operate by themselves or may be connected to the larger Internet. They may contain one or multiple and different transceivers between nodes. This results in a highly dynamic, autonomous topology. MANETs have many characteristics that make them different from other wireless and wired networks that are widely recognized [13, 14, 15, 16, and 17]:

A mobile ad-hoc network (MANET) is a self-configuring infrastructure less network of mobile devices connected by wireless links. No base stations are supported in such an environment of the mobile ad-hoc network. Due to considerations such as radio power limitation, channel utilization, and power-saving concerns, a mobile host may not be able to communicate directly with other hosts in a single- hop fashion. In this case, a multi-hop scenario occurs, where the packets sent by the source host are relayed by several intermediate hosts before reaching the destination. However, due to node mobility in MANETs, frequent link breakages may lead to frequent path failures and route discoveries. It increases the overhead of routing protocols which reduces the packet delivery ratio and also increases the end-to-end delay. Thus, reducing the routing overhead in route discovery is an essential problem. The conventional on-demand routing protocols use flooding to discover a route. They broadcast a Route Request (RREQ) packet to the networks, and the broadcasting induces excessive redundant retransmissions of RREQ packet.

It causes the broadcast storm problem, which leads to a considerable number of packet collisions, especially in dense networks. More sophisticated solutions such as probability-based, counter-based, distance based, location-based and neighbor knowledge-based approaches have been proposed to overcome the drawbacks of flooding. Limiting the number of rebroadcasts can effectively optimize the broadcasting. In order to effectively exploit the neighbor coverage knowledge, we need a novel rebroadcast delay to determine the rebroadcast order. A probability-based approach is another simple one. It depends upon pre-defined fixed probability to determine whether it rebroadcast the packets or not and then a more accurate additional coverage ratio can be obtained.

The coverage area concept can be used to adjust the rebroadcast probability of a node.

If a mobile node is located in the area close to the sender, which means it has small additional coverage area and its neighbors may receive the same broadcasting message from others, so its rebroadcast probability will be set lower. On the contrary, if a mobile node is located in the area far from a sender, which means its additional coverage area is large. Then its rebroadcast probability will be set higher. The coverage area can be estimated from the distance between sender and receiver node, and the distance can be estimated by signal strength or global positional system (GPS).

2. RELATED WORK

Inspired by the biological nervous system, Arti ficial Neural System (ANS) and neural networks are being applied to study a wide variety of problems in the areas of engineering and business [18, 19]. A neuron is the individual computational element that makes up most artificial neural system models [11]. A neuron presents three major parts called dendrites, the cell body and a single axon. Dendrites are nerve fibers that are connected to the cell body or soma, where the nucleus is located.

A **neural network** is a series of algorithms that attempt to identify underlying relationships in a set off data by using a process that mimics the way the human brain operates. A neutral network is also called as artificial neural networks. An ANN is based on a collection of connected units called (artificial neuronsanalogous to biological neurons in an animal). Each connection (synapse) between neurons can transmit a signal to another neuron. The receiving (postsynaptic) neuron can process the signal(s) and then signal downstream neurons connected to it.

The original goal of the neural network approach is to solve problems in the same way that a human brain would. Over time, attention focused on matching specific mental abilities, leading to deviations from biology such as, back propagation or passing information in the reverse direction and adjusting the network to reflect that information. Neurons and synapses may also have a weight that varies at different levels of learning proceeds, which can increase or decrease the strength of the signal that it sends downstream. Further, they may have a threshold such that only if the aggregate signal is below (or above) that level is the downstream signal sent. Typically, neurons are organized in layers. Different layers may perform different kinds of transformations on their inputs. Signals travel from the first (input), to the last (output) layer, possibly after traversing the layers multiple times.

Neural networks have been used on a variety of tasks, including, social network filtering, playing board, video games, medical diagnosis and in many other domains of interest.

Here we are using neural networks to identify the shortest distance between the mobile device and the router instead of calculating shortest path individual between every pair of networks. The Neural network algorithm calculates the distance between the devices will be connected to the different routers by learning method.

3. IMPLEMENTATION

The implementation steps consist of two phases namely, Train phase and use model phase.

#train phase

Step 1: Generate the Data Set (x_cor and y_cor) of Size 100000 using Random Generator that should be given as Input to Neural Network

The example of data set is as follows:

[777 234]->1

[152 563]->3

[869 264]->1

[112 138]->0

[369 239]->0

[624 563]->1

[705 503]->1

[1051 416]->1

[200 491]->3

[1061 352]->1

[778 485]->1

[445 490]->3

[530 353]->3

[514 426]->3

[957 133]->4

[688 398]->1

[1218 226]->4

[531 479]->3

[173 40]->0

[1151 588]->1

[516 320]->2

[105 632]->3

[899 512]->1

[82 291]->0

[120 384]->3

[147 516]->3

[1236 97]->4

[88 422]->3

[184 506]->3

[265 647]->3

[399 139]->2

[369 536]->3

[1049 260]->4

[565 90]->2

[895 589]->1

[1024 385]->1

[841 182]->1

[1027 51]->4

[209 194]->0

[949 128]->4

[589 324]->1

[169 493]->3

[0 415]->0

[475 600]->3

[834 636]->1

[379 327]->3

[421 296]->3

[36 227]->0

[638 364]->1

[616 254]->1

[232 402]->3

Step 2: Determine the expected nearest router (0,1,2,3,4) from distance formula = sqrt (x_cor^2-y_cor^2) that should be given as output to neural network (0 means routerA, 1 means routerB, 2 means routerC, 3 means routerD, 4 means routerE)

Step 3: Give input and output to the neural network and train it so that it adjusts the weights

#Use the model

Step 1: When the user clicks somewhere in the window, get the coordinates of it

Step 2: Give the obtained coordinates to the neural network and get the output (0,1,2,3,4)

Step 3: Predict the nearest router using the neural network (0 means routerA, 1 means routerB, 2 means routerC, 3 means routerD, 4 means routerE)

Pygame (the library) is a Free and Open Source python programming language library for making multimedia applications like games built on top of the excellent SDL library. Like SDL, pygame is highly portable and runs on nearly every platform and operating system. Millions of people have downloaded pygame itself, which is a whole lot of bits flying across the interwebs.

Here we are using pygame for implementation of the intelligent ad hoc network.

IMPLEMETATION OUTPUT

Initial Position of Nodes

First, the Initial Position of the different routers are displayed, which are having Five different Base stations. The distance between two different base station is also specified.

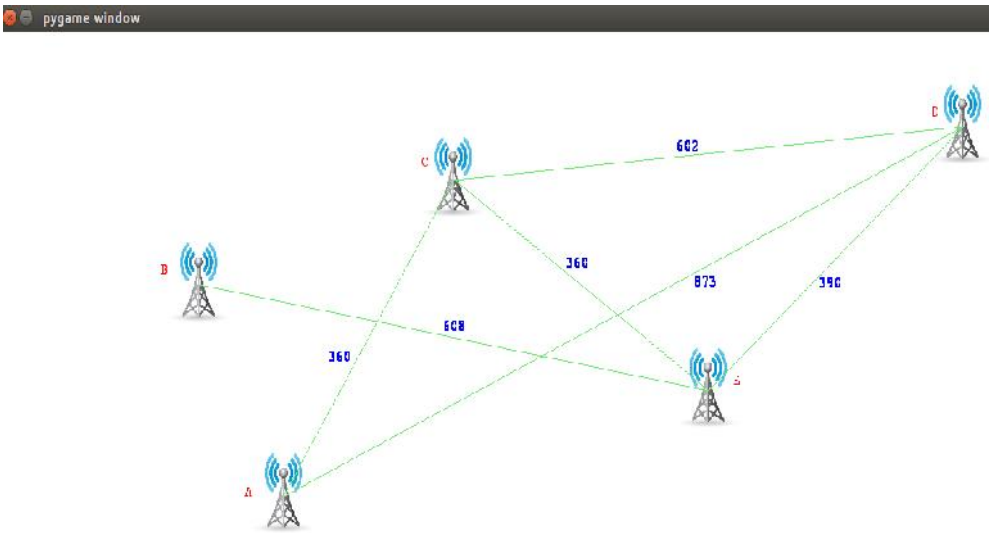

Figure 1

Finding Shortest Path Network

Now the Mobile Hosts namely Source and Destination have placed anywhere in the Mobile ad-hoc network in which the Neural network algorithm finds the shortest path between the source and a destination through a yellow Dotted line. The Algorithm finds the shortest distance between the source and a destination is shown in two cases:

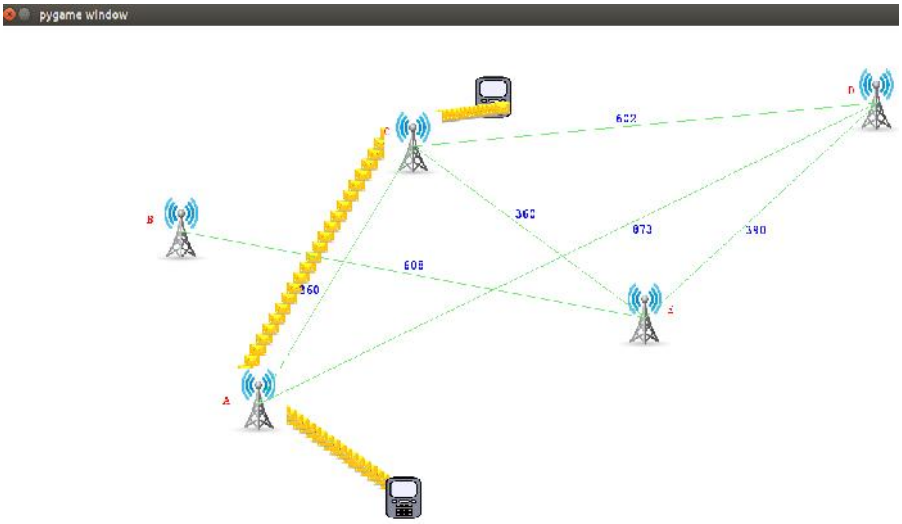

Figure 2

Case 1: Finding the shortest distance between the source and a Destination.

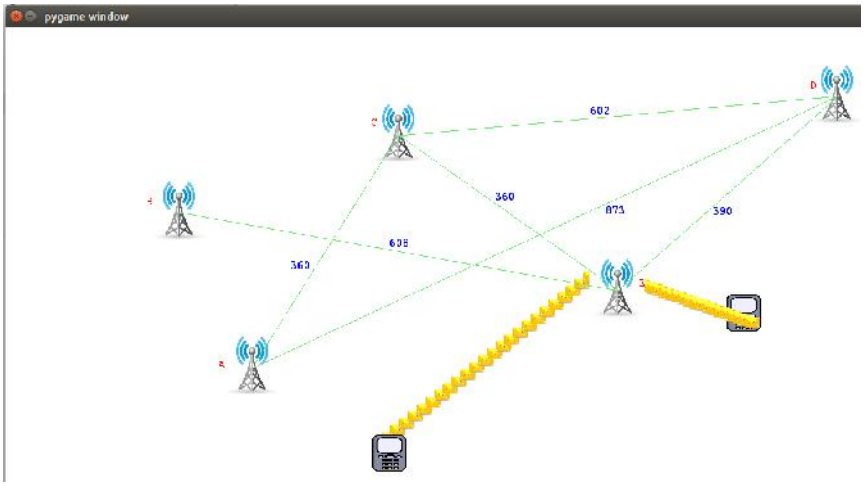

Figure 3

Case 2: Finding another path between the source and a destination.

Communication after Obtaining the Shortest Path Connection

Once the shortest path is to find out, it starts exchanging the message through different base station using multi- hop network concept.

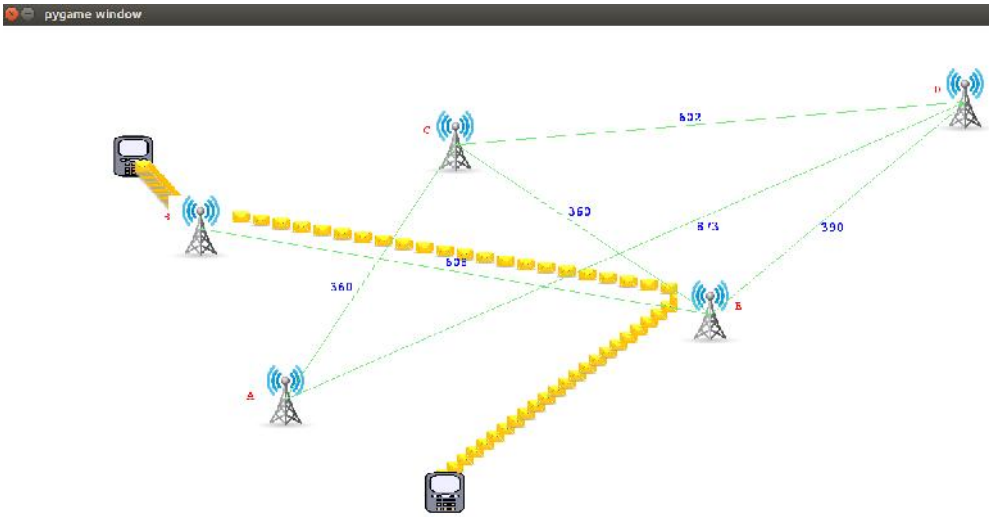

Figure 4

Error in Connection when Device is in between Two Network Stations

If in case two nodes does not exchange the information between the two nodes, then a suitable error message will be displayed in the host through different base stations.

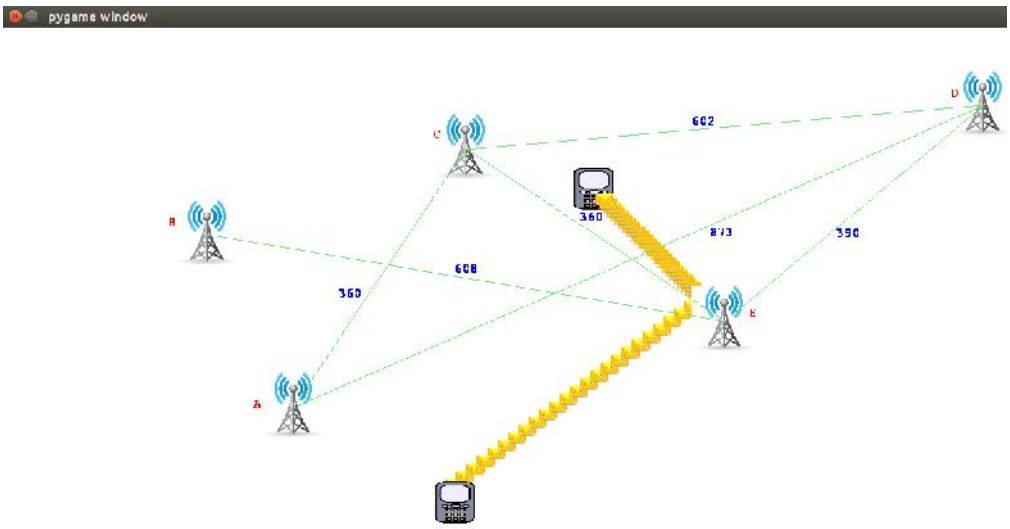

Figure 5

4. GRAPH PLOTTING

The accuracy is obtained is 97% after training the different datasets. The test data graph is also plotted before the final accuracy. It provides the efficiency after several training of the datasets. The graph is plotted considering the time in X axis and accuracy in the Y axis.

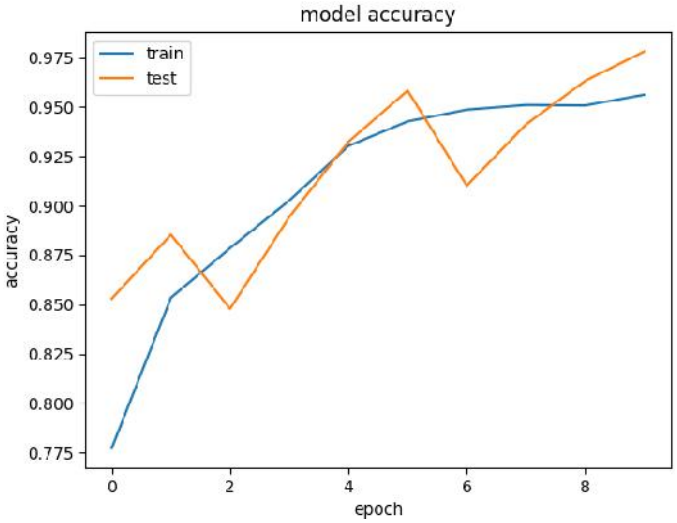

Figure 6

CONCLUSIONS

In the mobile ad-hoc network, for different mobiles distance between the mobile and the router will be calculated first. Later mobile will get connected to the nearest router. Instead of calculating the distance, using the neural networks, we can connect the mobile to the router efficiently.

From the implementation of intelligent Mobile ad hoc network using the neural network technology, it is observed that the method has 98% of accuracy compared to the one using distance calculation formula between the two nodes. From the above observation it can be concluded that for Mobile ad-hoc network, the neural network can be used efficiently which provide a better result compared to the distance Calculation Formula between the two end to end nodes.

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