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Performance Analysis and Estimation of Naive Bayes Algorithm in Zone Routing Protocol

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Abstract: ***In Mobile Ad-hoc Network zone routing protocol uses the analysis of Naive Bayes algorithm. While transmitting data with in the network the hybrid ZRP uses both proactive and reactive routing algorithm. Internet of things and wireless sensors networks has a bulk amount of data and technology which challenges in the view of energy resources, limitations and estimation and transmission. Trace analyzer and cooja simulator will find communication of routing nodes and creations of zones. Naive Bayes is a robust algorithm for the classification task and straight forward. This paper examines the Gaussian model, multi nominal and Bernoulli naive Bayes analysis cooja simulator.***

Index Terms: ZRP, Naive Bayes, IARP, IERP, Network routing overhead, cooja simulator.

I. INTRODUCTION

A mobile ad hoc network could be a combination of mobile nodes forming an ad hoc network without the help of any centralized structures. These networks introduce a new art of network establishment [Das 2000, Jinyang2000] and can be well suited for an environment where either the infrastructure is lost or where an infrastructure is not very cost effective. The whole life-cycle of ad hoc networks could be categorized into the first, second, and the third generation ad hoc network systems. Present ad hoc network systems are considered to be the third generation.

They were several issues that are linked with WSNs include battery timing because to have a constant connection to the internet a node using certain protocols must be on a regular basis, but the advantages a WSN can provide cannot be excluded, which can play an impressive role in the development of IOT

MANETs have such as distributed structure, changing topology and battery life at each node. The nodes of a MANET inter-communicate through the single-hop and multi-hop paths are in a Peer-to-Peer (P2P) form. Between the median nodes the two pairs of communication nodes which act as hosts and routers. The path between a source and destination they undergo in multiple hops separately to establish by using a routing protocol.

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In reactive routing, routes are locate only when needed and hence receive from the initial route discovery delay while in proactive routing routes are maintained nevertheless of the structure of the topology but faces extreme routing overhead depending on the node density. Thus Hybrid routing protocols involve the best features of both protocols. The basic idea of hybrid routing protocols such as Zone Routing Protocol (ZRP) [1] is to minimize route discovery delay and high overhead, which are drawbacks of reactive and proactive approaches respectively. Whenever, we switch the reactive and proactive routing components of the ZRP and analysis the of network decreases jitter and delay. Here reactive is used inside the zone and proactive routing between the zones are outside the zone. Feasibility of our approach [3].naive classifier is applied to the raw data, and also analyzed the models of the classifiers. However an optimized protocol for all environments does not exist because the network conditions are changed by network structure, scale and so on. Among these protocols, the ZRP contains a wide area of applications. when these protocol searches for a new route, it sends many hopeless control data packets, which increases the network load and decreases the network performance and it becomes less stable [2].

II. ZONE ROUTING PROTOCOL

In hybrid wireless which uses each pro-active and reactive routing protocols in zone routing protocol when transmitting the data through the network, ZRP is developed by Zygmunt Haas of Cornell University. The zone is depend up on the radius r which indicated in hops., where the zone is separately defined for each node, Routing protocol is based on the abstraction of zones[4. Zones have two types of node namely Peripheral node, Interior node. The nodes, which is at perimeter of the zone and is at distance of radius zone from central nodes are known as the peripheral nodes. Whereas, the nodes which are inside the perimeter of the zone and have less distance than zone radius from the center node are known as Interior node [5]. We can change the zone radius according to the network size. ZRP has two parts namely they are intra zone routing and inter zone routing the data packet is Transmitted within the routing zone which is initiated from source node to receive at the peripheral nodes is known as intra zone, whereas inter zone is the data packet is Transmitted from the peripheral nodes to destination node which in another zone. Both routing protocols are not specific protocols, where IARP is a group of narrow depth proactive link-position protocols.

IERP uses the routing table of IARP
To respond the route queries in the zone [6]. ZRP components are IERP, IARP and BRP

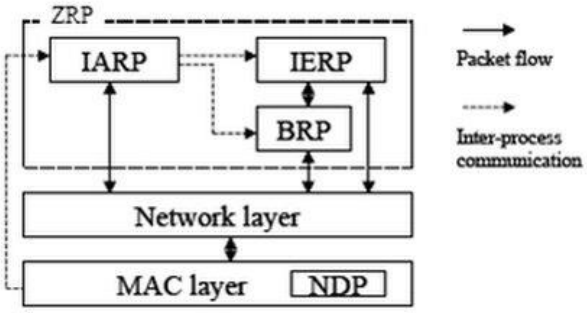


Figure 1: Block Diagram of ZRP

A. INTRA ZONE ROUTING PROTOCOL

It is a proactive routing protocol. As this protocol communicates with the interior nodes of the zone. The first protocol in ZRP is the Intrazone Routing Protocol It is defined by zone radius, is constrain the number of hops to its peripheral nodes .In order to support the discovery and maintenance of the network connectivity route the IARP proactive tracking is needed. First, it is to its local neighbours, they are rapidly available, avoiding the traffic overhead and latency of track discovery. Once the routes have been found, IARP's routing zone offers built up, real-time, route maintenance. Intra zone helps in removal of node redundant along with tacking to link-fails. Link states can be bypassed by multiple hop paths within the zone. Similarly, minimal route segments can be identified, enabling traffic to be repathed along with constrains paths.

The Supply node sends new routing information if

(i) There is an amendment which occurs in web topology or whenever there is a link collapse,
(ii) When there is a variation in zone networking of the node
(iii) The node hasn't transferred the network packet in the before interval.

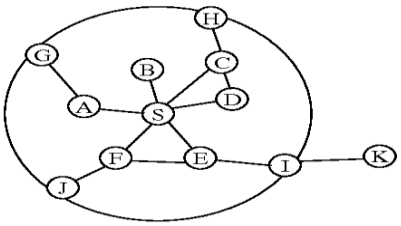


Figure 2: **Example routing zone**

In the above figure, source node is S having the radius of two hops.

Consider the following cases as:

1) When hop count is < zone radius then A, B, C, D, E, F are said to be interior nodes.

2) When hop count ≤ then G, H, I, J are Said to be peripheral nodes

3) When hop count = zone radius then K is said to be Unknown node

If we require the hop count ≥ 2 hops, then the proof is needed...

B. INTER ZONE ROUTING PROTOCOL

This is reactive routing protocol of ZRP. It is used between routing zones IERP is responsible for acquiring route to the destination that are located beyond the routing zone. According to knowledge gained about local topology, which are equal in the zone from supply to the terminal node, the data packet can be delivered immediately. IERP perform the on-demand routing mechanism. When a node has sent a packet and there is no route to the destination, a route request packet is broadcast using BRP. If there is no route to the terminal , but node has a packet to send, it will request the broadcast Whenever it will receives a route for its destination, but it has no path it will add its link metrics and IP address, to the request with BRP, on the other side , it has path[7] to the terminal , it will attach the route to path in the request , and built a reply packet , and route reply is forwarded back to the query source node, along with the reserved accumulated route.

C. BORDERCAST RESOLUTION PROTOCOL (BRP)

Whenever a zone is requested with the Inter zone protocol technique, BRP is recycled without break it and maximizes its performances. IARP information is used by BRP. IERP the peripheral nodes, by eliminating unwanted queries and increasing the efficiency. IARP it is easy to construct a Border cast tree. Individually IARP and IERP, it is not so much a routing protocol, as it is packet delivery maintenance. The BRP keeps a record of which node a query packet is sent in order to reduce duplication. [8] Selective broadcasting is done in BRP in order to eliminate redundant broadcasting. Similar to ZRP, BRP also takes the advantage of both proactive and reactive.

Basically two models of BRP are

1 Root Directed Broadcast: In this source node and peripheral nodes are built their casting trees to the forwarding instructions to route request data packet are padded, verify further route overhead is increment along with the zone radius increase.

2 Distributed Broadcast: In this, zone is implemented and maintained by one of the each node which increases the local routing data exchanges, leading to reduction of the route discovery demand

III. NAIVE BAYES ALGORITHM

It is a robust algorithm for the classification of task and it is straight forward which gives the results when we use for analysis textual data. It is based on Bayes theorem by assuming medium independence. It works on conditional probability.

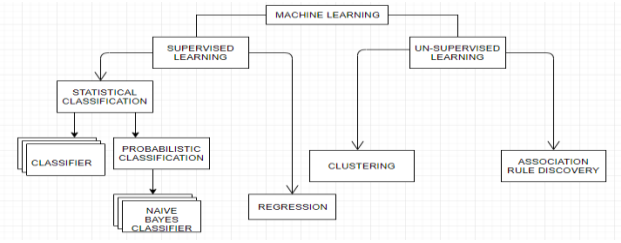


Figure 3: Naive Bayes Classifier

Naive Bayes is a supervised machine learning algorithm and utilizes for less computational time [9] when compared for the other algorithms. Its model is simply to build, and particularly used for large amount of data sets.

Bayes is out-perform even in highly sophisticated classification methods. By utilizing the conditional probability we can calculate the chances of an event using its posterior probability and predictor prior knowledge. Whereas the probability that something will happen given that something else has been earlier exist is known as Conditional probability. Naïve Bayes is used for multiclass classification and binary values, where it is fast and reliable algorithm. This is a probabilistic model and it permits us to represent variability about the model in a principled way by determining probabilities. It helps to solve logical and predictive problems and provides useful learning algorithms and past knowledge and observed data can be combined. It helps to provide a useful point of view for understanding and also analyze many learning algorithms. This helps to determine exact probabilities for hypothesis and also it is robust to noise in the input data. [10]

$$P(H|E) = \frac{P(E|H) * P(H)}{P(E)}$$

Where,
P (H) is a probability of the hypothesis.
P (E) is the Predictor prior probability
P (E|H) is the Posterior probability.
P (H|E) is the probability of the likelihood.
There were some steps to calculate the Naive Bayes

1) Implementing the data into a required table.
2) Generate a probability table by identifying the existences of chances.
3) Use the Naive theorem equation to calculate the posterior chance for varies classification, the class with the best posterior probability is the result of prediction.

Naive Bayes used for Machine learning, the representation of naive that is actually stored when a model is written to a file. However it is a family of algorithms the every one share a typical principle, the every feature is classified it is independent of the value of any other class.

IV. TYPES OF NAIVE BAYES ALGORITHM

1) Gaussian Naive Bayes
2) Multinomial Bayes
3) Bernoulli Naive Bayes

Gaussian Model: This method utilized in classification where it assumes that options follow a standard distribution when attribute values are continuous, a value that is certain to happen they combine with each class are disturbuted according to Gaussian.

Multinomial: It is suitable for classification with discrete features, normally it requires integer feature counts. This technique is pretty successful for document classification [11].

Bernoulli: It is useful for attribute vectors are binary (i.e. zeros and ones). One application would be text classification with 'bag of words' model where 1s&0s as square measure "word happens within the document" and "word doesn't occur within the document" respectively.

V. SIMULATION METHODOLOGY

A Well-known contain network simulator, cooja allows a large and small networks of contiki motes to be simulated, and it is used as a framework to study the performance of ZRP. The analysis of routing protocol is done on the basis of its references to number of nodes available in the ad hoc networks and creations of nodes.

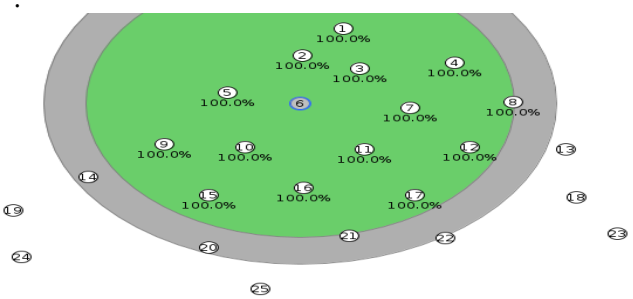


Figure 4: Creation of Zone

As shown above figure , zones are to be created , the green color, first circle part which includes the intra zone routing protocol , and the gray color and the second circle part which includes the interzone routing protocol , and outside part nodes which are include as the unknown nodes .

A. NETWORK ROUTING GRAPH

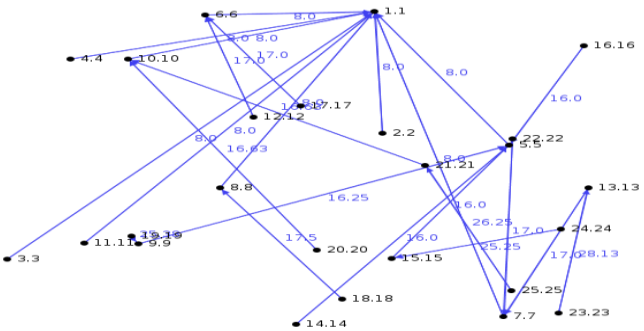


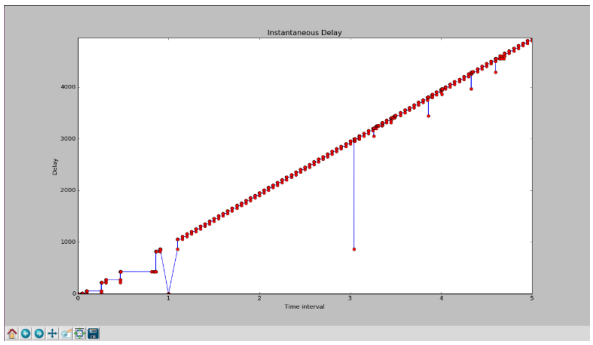
Figure 5: Routing Path

The network zone is responsible for routing, which moves packets across the network using the most appropriate paths. From above figure, the network can be represented by a graph, a route from a source node to reach its terminal node is a path in the graph

A. *TABLE 1 MULATION PARAMETER*

Parameter	Value	Description
Simulator	NS2	Cooja simulator tool
Simulation Time	1 min, 58 sec	Maximum execution time
Number of Nodes	25	Participating nodes in the network
Movement model	Random way point	Network connection
Route Available	Single route	Routing
Data payload	512 bytes	Packet size

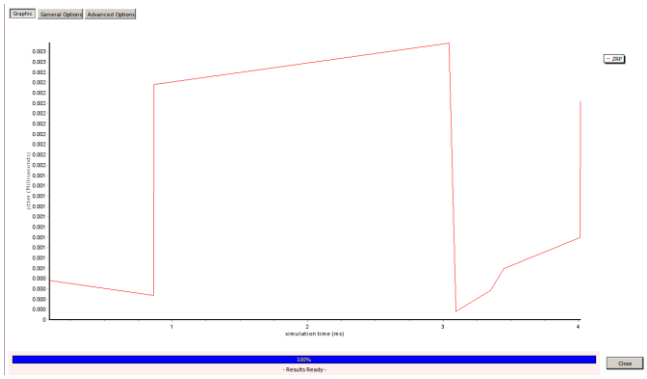
B. DELAY



(a)

From the above graph, it has been observed that the delay has been decreased as the zone size and radius is increases. From source to destination node, the data packet is transfer to the network in overall time delay.

D. JITTER

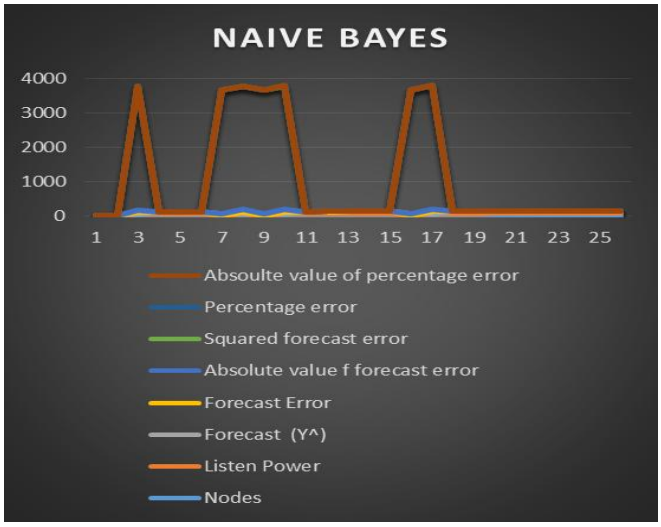


(b)

From the above graph, which the jitter is to be decreases as the node density and number of nodes are to be increases, and also proactive part increases. Where short term timing variation from its ideal position.

E.NAIVE BAYES APPROACH

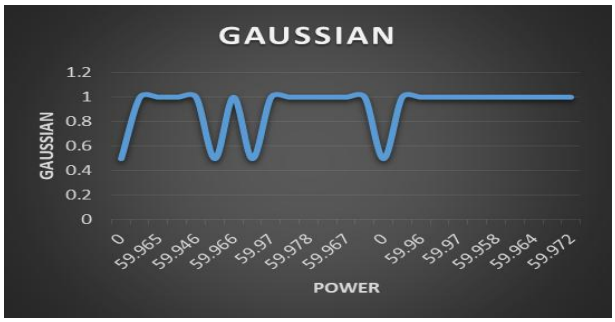
Naive Forecasting estimating technique in which the last period's actuals are used as this period's forecast, without adjusting them or attempting to establish causal factors. It is used only for comparison with the forecasts generated by the better sophisticated techniques.



(c)

From above graph it has been observed that used metric for forecast accuracy and it is calculated as the average of the unsigned percentage error

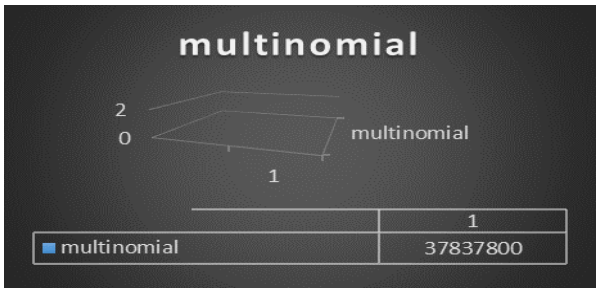
F. GAUSSIAN MODEL



(d)

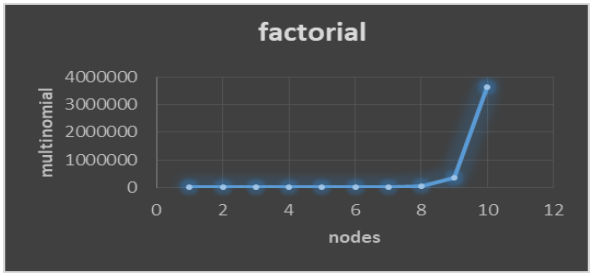
As shown in above graph, A comparison of power efficiency statistical data of zones and Gaussian which performs of the normal distribution of standard deviation and cumulative which increased in quantity, or force by successive additions

G.MULTINOMIAL MODEL



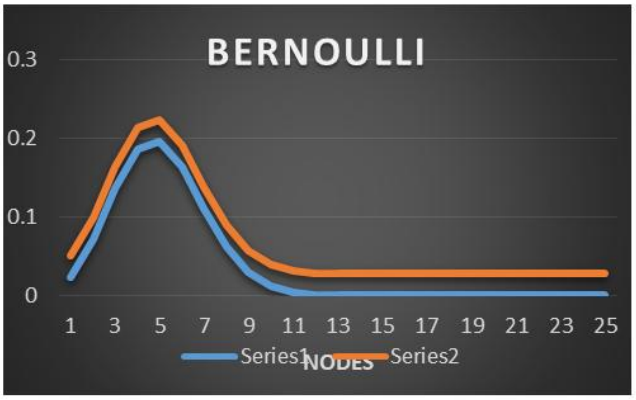
(e)

From the graph, multinomial, which is suitable for classification with discrete features which comparison of nodes and multi values and we calculate the factorial

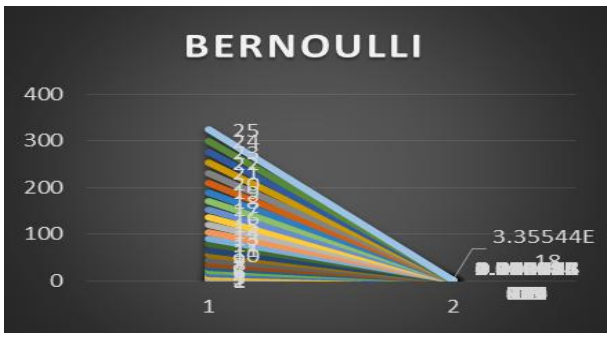


(f)

F.BERNOULLI MODEL



(g)



(h)

From the graph which is represent as Bernoulli distribution and nodes and calculate the cumulative of the true and false values where this model is used for the binary values.

VI. CONCLUSION & FUTURE WORK

Zone routing protocol is an adjustable solution to challenge of discovering and maintaining routes. In one protocol. the routing will merges the two different methods .It reduces the traffic control compared to proactive or reactive routing protocols . The intra-zone control traffic increases with the size of zone. However, using the knowledge of the routing to decrease the amount of interzone control traffic through border casting, zone routing is used for large amount of networks, traffic does not depend on network size because proactive updates are only narrow. In this compositions, the simulation are done at constant pause times and through CBR traffic. where a Naive Bayes is used for classification of task, and which gives the result in the textual data analysis , where to analyze ZRP and then creations of zones apply the statistical data which consists of nodes, hop count ,duty cycles and the data is applied to naive Bayes approach and Gaussian ,multinomial ,Bernoulli models are to be calculated, we see how COOJA network simulator enables the emulation different kinds of motes and how the routing models are computed. COOJA simulator is also used as a power conceptualize in this paper. .For the future scope work of this research to be improved the analysis in various aspects and consider the more number of parameters.

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