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Comparative Analysis of Community Detection Algorithms on Social Network

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Abstract– **Networks are very important structures. As modern humans, we are surrounded by them every minute. Therefore, the detection and aggregation of data and users in communities in social networks are important and complex activities. In this paper, we consider a method of analyzing the network, which is known as community detection. The detection of the community can be useful for identifying communities of common interests, which would be done for the benefit of the youth so that they are involved in things that interest them. There are several types of networks for community identification, like social networks and biological networks. Several different approaches have been proposed to solve the problem and one of these is the Louvain method based on maximality of modularity.**

As the social networks evolve, the network community structure changes. How can the community structure be updated efficiently? In this, we provide two methods based on the Louvain algorithm, to determine the community structure to update, that is the Edge-distribution-Analysis Algorithm, this decide and add of new edges, modularity-change algorithms analyzes rate of modularity and provides whether an update is necessary.

1. INTRODUCTION

Social network analysis started in 1930 and has become an important area of research in computer science. A social network is defined as a set of nodes connected by edges. Nodes could represent people, molecules, computers or routers and edges represent the connections between nodes. During the past decade, social networks have increased dramatically along with rapid developments in Web applications. Millions of people participate in social networks such as Facebook, Twitter etc. As the number of user increases, the complexity induced when evaluating social networks increases too. However these networks tend to be large and complex. Therefore to understand and summarize whole network properties, there is an evolving need to harness this complexity by organizing the network into communities.

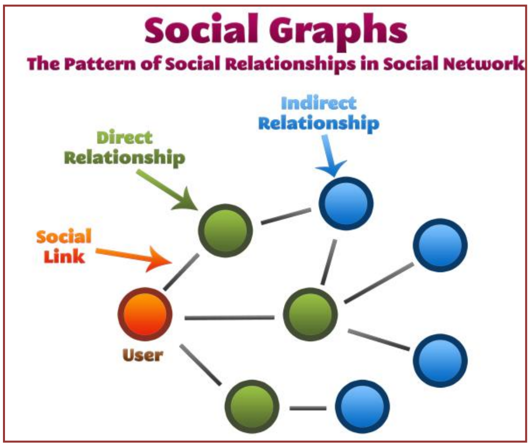

Fig: 1 Pattern of Social relationship in social network

Just after, some of the most important recent innovations, such as the development of scale-

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free networks [8], the first social networking sites started to appear [9], and within less than a decade, Facebook had 66% of the world's online population as active users [10]. Social networks are essentially built by groups of people who share similar interests, backgrounds and activities. In social networks, people can communicate with each other in many ways. They can share and upload profiles with images, videos and texts. The cardinality of nodes expands dynamically, especially on the web, as new nodes and profiles are created continuously.

Communities, also known as modules and clusters, are sets of nodes which are relatively more connected. Nodes in the same community often share interesting properties such as a common function, interest, or purpose. Thus, community detection is one of the most important problems in network analysis. Among the areas to which network analysis is applicable, my research interest is specifically in analyzing computational methods for networks to detect specific categorical communities. Next, I review important questions in these specific fields which motivate my work. How does the community structure affect the social interactions among the people? How community structure affects the formation and evolution of links between nodes, and vice versa. Nevertheless, communities exist and are the foundations of human societies. In the present days, static models are still dominant in social network analysis. This necessitates the development of frameworks and algorithms for identifying the community structures in ever-changing social networks, which is at the heart of my dissertation. Time is still a very important aspect in studying social behaviors. In this dissertation, we study the problem of community identification in dynamic networks. We call this the problem of dynamic community detection.

1.1 COMMUNITY DETECTION

Global community detection, is defined as a methods which is used for identifying the community structures in the given graphs, which focus on the global methods needs consideration on the impact to other parts of graph when determine whether if a sub graph is a community. A representative one belonging to this type is the algorithm of graph partitioning

Local community detection is a community detection methods aiming at identifying the community structures in the graphs by identifying the formative features of sub graphs. Local methods make the decision with only concern on the properties of current sub graph. The method in this category is normally greedy node addition or greedy node deletion. Then we come on a question what is the definition of a community in a social network? Answer will be communities are groups of nodes that have denser connections within the group than outside the group. We take an example of social network that has been studied in this context is Youth Yoga club network. This network contains 34 nodes and 78 edges. The nodes of this network represent the members of yoga club and the edges connect the people who had interactions outside the club. This network was observed for a period of two years. During this period, there is a conflict between some people which led to the breakup of the club into two separate groups, supporting the each party. A question emerged is: Would it be possible to predict this separation by simply examining the structure of the network? From Figure 2, we can easily distinguish two groups of nodes that have a lot of connections within the groups and few between the two groups. The aim of community detection algorithms is to identify such communities. We here discussing about how to choose node in the network to make our defined community.

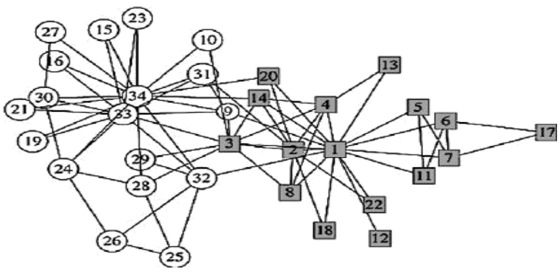

Figure 2: Youth yoga club network

1.2 IMPORTANCE OF THE TOPIC

Community networks are often referred to as:

i. **Product Features:** Wireless connection between COMMUNITY has less power compared to wired network connection. Also, due to signal strength, noise and interference, the current connection

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capacity is usually less than the total capacity of the channels. Therefore, network reload is a constant occurrence of these networks compared to the fixed network [3].

ii. **Based on the dynamic nature of the unanswered community:** the hosts are organized into an active format. Such a project provides the benefits of collapse if it effectively encounters serious challenges in development and builds.

iii. **Regular changes in continuity:** Social organizations can move freely due to their irrationality, their preferences are constantly changing.

2. ROUTE DISCOVERY

CACDA uses a combination of two messages for accomplishing route discovery in Social Networks:

a) Route Request (RREQ)
b) Route Reply (RREP)

When a source node wants to establish a connection with a destination for identification of their particular community, it sends the RREQ message to all its immediate neighbors. RREQ contains the IP address of the source and the destination, a pair of fields related to sequence numbers and a hop count field initialized to zero. Each RREQ message is uniquely identified by a RREQ ID which goes on increasing with each newly generated RREQ in the network. [6]. If a node receives an already processed RREQ via some other neighbor node, it is discarded. The source broadcasts this RREQ to its immediate neighbors. The neighbor nodes on receiving the RREQ, generates a backward route to the initiating source. Also, the hop count (distance from source node) in RREQ message format is increased by one.

The node receiving the RREQ checks its route table for the availability of fresh route(s) to the required destination. If it does not have any such route, it simply rebroadcast the RREQ further to its immediate neighbors with the previous hop count value being incremented. Hence, to search a valid route to a destination, RREQ packet is flooded in the network.

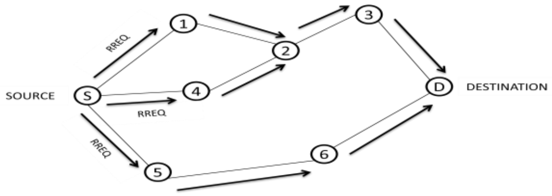

Figure: 3 Flooding of Route Request (RREQ) packet

On the other hand, if the node receiving the RREQ is itself the destination or it does have an unexpired route to the required destination with the sequence number of the path to that destination (indicated in node's routing table) greater than or equal to the sequence number mentioned in the RREQ message, the node creates a *Route Reply* (RREP) message and transmit that on the backward route it created towards the node that sent RREQ. Hence, the backward node that was created during RREQ broadcast from source is now utilized for sending RREP back to the source node.

RREP packet contains the source and destination IP addresses, the sequence number of the path to the destination as indicated in the node's route table and the hop count field set equal to the distance between the node and the destination. The hop count is zero if the destination is creating and sending the RREP itself.

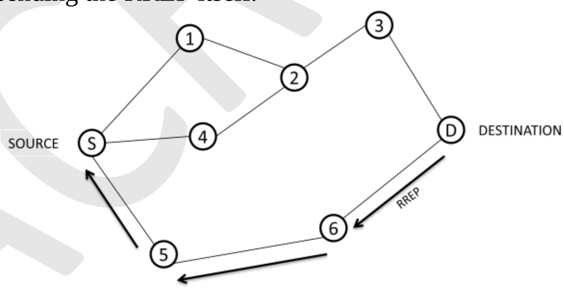

Figure: 4 Propagation of Route Reply (RREP) packet

As soon as the source node receives an RREP from the destination, the source start utilizing the discovered path for transmission of data packets, till it expires or the topology changes.

2.1 CHARACTERISTICS OF COMMUNITY DETECTION

- Multiple mode of communication: Unicast, Broadcast and Multicast.
- Route establishment is On-Demand.
- Effective link repair strategies in case of breakages: Global or Local repair.
- Generation of loop-free and fresh routes with the help of sequence numbers
- Keeps track of only next hop instead of the entire route, hence reducing the overheads considerably
- Exchange of periodic beacon messages to trace and identify neighbor nodes
- Reduced number of routing messages in the network

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2.2 LIMITATIONS OF COMMUNITY DETECTION

- The delay involved while establishing the route is quite large as compared to other reactive routing protocols
- More overheads, with respect to bandwidth and energy, required to maintain the routing table in case of high node mobility
- In case of Global repair, the throughput of the network reduces since more and more packets are dropped till the time RERR reaches the source which then initiates the repair
- Periodic exchange of beacon messages and generation of multiple RREP messages in response to a single RREQ message can cause unnecessary wastage of bandwidth and generate control overheads
- If the source sequence number is not updated from a long time and the intermediate nodes do not have the latest sequence number of the destination, this can lead to inconsistent routes since they will have stale entries in their route tables.

3. QUALITY OF SERVICE IN COMMUNITY

Except for the low-cost and mobile network (COMMUNITY) without infrastructure, research focuses on the security and service quality (QoS) issues in these networks. COMMUNITY is a set of mobile computers (also called "nodes"), which configures itself, organizes itself and freely. These nodes communicate wirelessly with each other without centralized control. Over the past decade, wireless connectivity has seen a growing number of ongoing and adaptable applications for wireless connectivity. COMMUNITY nodes are based on multi-hop communication; which is, each transmission range of nodes can communicate directly with the radio channel, and those who are not in the field of radio communication should be based on intermediate nodes to send messages to their destinations. Mobile computers can transfer, connect, and connect to the network whenever they want, and due to dynamic network topology [10] the routes are often required to be updated. COMMUNITY is one of the most important problems, i.e., to find the right path from source to destination. Use of instant applications like online games, audio / video transmission, VoIP (voice over IP) and other multimedia applications. It is mandatory to provide the required QoS level for reliable data delivery. The essential QoS wireless multi-hop network guarantees more wired networks, primarily due to dynamic topology, is more complicated than access to the channel, flight, interference, multi-hop communication and distributed nature of the competition. Specifically, it is important that the Root Protocol provide QoS Guarantee based on indicators such as available display, latency, packet loss ratio, and noise. Despite the fact that COMMUNITY has many routing solutions, their practical implementation and use in the real world are still limited. Multimedia applications and other applications are sensitive to delays or errors, which attract a large number of them use the device MANNET, the conclusion is that the best routing protocols are not suitable for them. Due to the dynamic topology and physical characteristics of COMMUNITY, QoS guarantees that speed, delay, fluctuation and packet loss are not practical. Therefore, QoS and a soft QoS optimization was proposed [11]. Soft QoS means that in some cases, QoS is not executed, for example, when the route gets corrupted or the network is divided [11]. QoS of COMMUNITY is defined as a set of service requirements when the network is moved from source to destination [12] when the network should be found. Data sessions can have a set of measurable requirements, such as max delay, minimum bandwidth, minimum packet delivery, and maximum volatility. All QoS metrics are checked at the time the connection is established, and when the network is received, then the network must ensure that the QOS data session requirements are met for the connection session. [13] QoS ensures that the network provides a set of services and performance characteristics related to the possibility of instability, throughput, end-to-end delay and packet loss. COMMUNITY provides some enhancements to select routes based on the previous QOS metric, and the delay is one of them [14]. Delayed protocols identify delays in the form of main QOS metrics for the discovery of routes of destination source pairs, that is, the routes are selected based on the latency limits provided by the program. Delay can take the form of delays, total delays, promotional delays, delay instability etc. [14] An important issue with routing strategies in the current scenario is that they do not intend to support QoS matrix, so deliberately delay will work to resolve this issue.

3.1 QOS provisioning in COMMUNITY: Issues

QoS-based solutions are highly influenced by various design issues. QoS support was not provided in the previous routing protocol. For an

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application activated by QoS, an extended path should be used to meet stringent QoS requirements.

3.2 Challenges in QOS provisioning over COMMUNITY

A brief description of major issues encountered in COMMUNITY while providing QOS enhancements to routing protocols are given below: Following is a brief summary of the main issues faced by COMMUNITY in providing QoS enhancements for the following protocol runs:

i) unclear about the physical characteristics: Cordless channels are prone to errors due to obstructions due to obstruction due to the adjacent nodes, endangered noise, etc.

ii) Decentralized Network Architecture The facility of COMMUNITY, it is relatively economical and easy to deploy without infrastructure, looks very viable, which is used in many areas. Due to being decentralized, the COMMUNITY server should send its QOS status information to all other computers, so the QoS protocols are quite complex and are willing to overhead.

iii) Fusion through channels: COMMUNITY nodes interact with each other through shared channels. This connection is necessary for the latest information for network connections, routes and nodes between nodes. This continuous connection can eventually cause a major collision between the signal nodes, which will increase the battery consumption and delay, as well as reduce packet delivery frequency and will use the connecting tape.

iv) Multihop mode: In addition to basic equipment, COMMUNITY nodes also work as router and conduct basic packet forwarding between source and destination. Before the route, the customized route is detected by the intermediate nodes. The data is transmitted through the intermediate nodes via the Hop-by-Hop Discovery Trail; so even if there is a fault in one node, the complete transfer of COMMUNITY cannot be successful.

v) Functional restriction: The entire device that contains the entire COMMUNITY system has limited space in battery power, processing power, limited operating speed, and built-in memory. In addition, compared to the wired network, wireless network channel capacity is low. For the above restrictions; Resources should be effectively managed to best utilize traditional scenarios and inform QoS.

3.3 ROUTE DISCOVERY

In this section, we will discuss the proposed CACDASN protocol, with a focus on route search, as CACDASN routing maintenance operations will be similar to conventional COMMUNITY DETECTION routing protocols. CACDASN Protocol is looking for every available routes between source and destination, subject to the specified delay. Programs running in Source Search and Destination show their maximum latency ranges for RREQ and RREP messages respectively during route search operation. This is specified in additional message "max_delay" in two message formats.

The main purpose of CACDASN is to detect delays in the limited trajectory and provide QoS for application-oriented delay metrics, which is very important for multimedia applications. To reach this goal, the source node must specify the maximum permissible latency in the RREQ message before searching for any route to the destination. Offset_time field is set to zero. In addition, the session control process assigns a self-timer to the source application, so that when it is finished, the route search can be restored.

As discussed above, there is an additional routing_deleted field in the CACDASN routing table. Every intermediate node will update this entry when the RRQ message is received. After starting all the required fields, the source node creates and transmits the RREQ message to its closest neighbors. When the RRQ reaches its destination, the destination creates the maximum RDP packet, which includes maximum_day and offset_time in maximum areas, and brings them

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back to Unicast in the RREQ message of the source status.

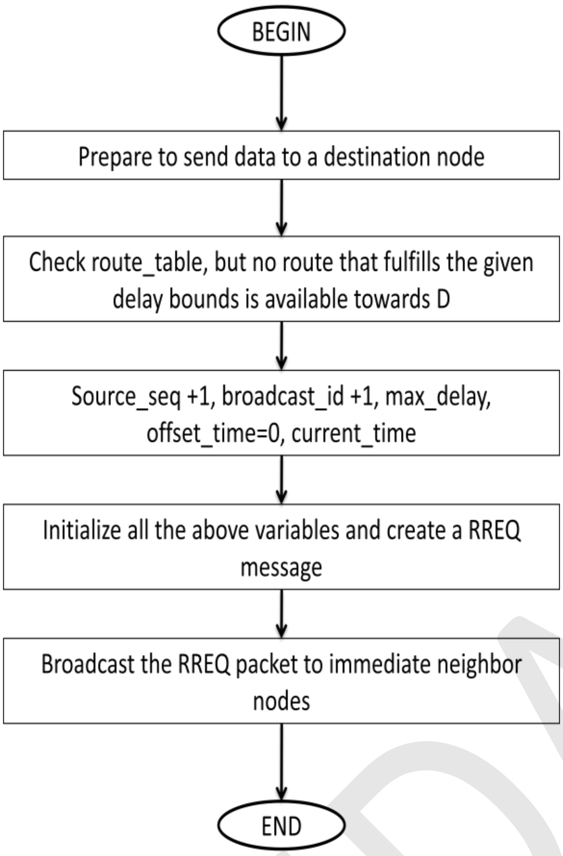

Figure 5: Flowchart for the initiation of Route Discovery process in CACDASN

In Algorithm 1, CACDASN proposed a detailed protocol and how RREQ and RREP messages are handled by each network node.

Algorithms used by variables:

S is the source node;

D is the destination node;

l_delay is a delay link;

q_delay is a line delay;

t_delay is a transmission delay;

Max_delay sends the maximum delay specified in the request in the application;

Offset_time specifies the time at which the RREQ (roottext) package passes in the current node;

R_count - the average number of retransmitters in a given period;

Difference, sifs, p_len, c_bwd are predefined mac values;

Algorithm:

// Set the amount of time in a few seconds until the node uses the number of incoming messages to see the possibility of loss of the node (PL)

// is used to calculate the possibility of link loss using the PL equation:

Link_Pl = 1 - PL

/ / Approximately 802.11 based on the Mac Retransmission Policy, approx. The number of referrals can be calculated according to the following equations:

R_count = 1 / (1-Link_Pl)

Back_off_time = ((2pau (5 + r_count) - 1) / 2) * slot_time

// Back_off_time sets the size of the initial closing window specified in the Mac 802.11 specification. Back_off_time is rising because data retrieval rate increases

t_delay = (difs + (p_len / c_bwd) + sifs + back_off_time) * (r_count + 1)

l_delay = p_delay + q_delay + t_delay

// offset_time has started at zero

Due to (in the exploration phase of each node n node)

l_delay = p_delay + q_delay + t_delay

Offset_timeN = l_delay + offset_timeN-1

If (l_delay is less than max_delay)

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Then the RREQ message starts

more

Repeat for destination

// receives DRRQ

// Discipline Unicast RREP message in which l_delay (communication delays) in one direction

S receives an RREP message

Calculates the latency (l_delayS)

If (l_delayS is less than max_delay)

Session is confirmed by S source

more

S source dismisses the request

Repeat steps 1-6
We will explain the operation of this protocol with the help of an example discussed in the following text. Figure 6 is the COMMUNITY scenario that has been considered for this example.

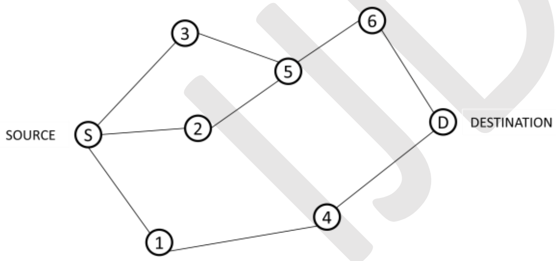

Figure 6: Sample COMMUNITY scenario for CACDASN example

Suppose that the infrastructure of S source node and destination node D is dismissed, the MANNET scenario. When S receives a data packet from an application running on the current path D. table _ruta then S is already in the destination table _route D clip, sending data to RD, using the next hop routing table in the play that if the SD To do is not a valid route, it introduces a routine identification process. In this case, the route search CACDASN is started using the routes that recognize the completion of the initial scheduling delayed schedule. RREQ of the source network is distributed to all nodes in the new item introduced delayed QoS path. RREQ on two occasions and said that the tested node destination is or not. If the source program first sends an RREQ, it shows the maximum allowable restriction max_delay area. Also, offset_time was initially zero, which came to RREQ set to each node that is updated. Node receives RREQ from 1 s node 1, now do their offset_time calculations and update this area get RREQ. For this, the value obtained is node s node s is secured from the route_table route_delay is added to the first node RREQ offset_time node 1. stored in the offset_time to consult your route_table route_delay this is the updated RREQ and so on for all your immediate neighbors Sent by node 1 Maršruto_dėlio entry is also marked by 1 unit to find out if it is greater than max_delay RREQ. \ Now, the Node 4 RREQ receives the first node node 1 checks RREQ duplication and to consider whether it is necessary or not fate. Check your route_table now stored on node 1 route_delay, it offset_time to RREQ area offset_time node 4. Secondly this updated RREQ offset_time field added by route_delay, we can send the hop. Now let the destination move you. Again with the help of the display table, as well as if it is the destination node, or RREQ see the destination IP field as RREQ duplication test d. Because it is necessary for the destination, it will not send RREQ again. Then the node D offset_time is stored in the offset_time D, which actually delivers the accumulated delay and the RREP D multiple destination is created in offset_time RReq receives the message stored in RREQ, adding the offset_time route_delay calculation, but the link only has the least cumulative delay Talk to RREP packets / Offset_time connection between your closest neighbors After receiving the RREP source, S verifies that whether the zone receives the offset_time link is less than the delay max_delay. If offset_time, which sends D. also max_delay, adopt a session query source, otherwise it will be rejected. Therefore, thus CACDASN can find

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existing routes that can send flows from the DS during the deficit of the specified delay.

4. SIMULATION RESULTS AND ANALYSIS

This section will expand the performance evaluation of our proposed routing protocol, DS-COMMUNITY DETECTION, based on analysis of simulation results so that its accuracy and effectiveness can be verified. In our analytical section, we use Exata Cyber Developer version 2.0 to design and produce simulation results for COMMUNITY DETECTION scenarios.

4.1 SIMULATION SETUP

This chapter provides a more detailed explanation about the details of the implementation of this simulation study. This section is divided into 4 sub-squares. In Section 6.1.1, we present a brief presentation of the simulator used for simulation in this study. In Section 6.1.2, we present an overview of modeling model mobility. Section 6.1.3 describes the network scenario which examines simulation results with many simulation parameters, along with the meaning used in the simulation. Section 5.1.4 describes the various metrics on which we will evaluate the proposed protocol.

4.2 SIMULATION TOOL: EXATA CYBER

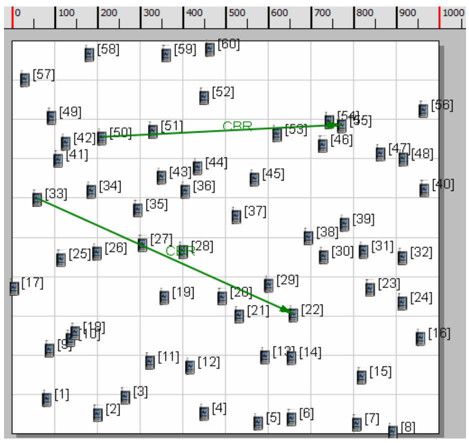
This section briefly presents the simulation tool used in the research in this dissertation. We use the test version of commercially-shaped network simulator used by Exata in the cyber industry to create COMMUNITY DETECTION scripts.
Exata Cyber is part of the development of a new software [22] specifically designed to integrate cyber security capabilities into the communications network [22]. Therefore, the Exata cyber advertising network is most suitable for replicating the wireless network because they are unsafe and mobile and can be easily damaged.
Exata Cyber has simulation and modeling features [23]. Using Exata Cyber, we can create different network scenario types including ad network mobile networks with different landscape settings defined in different values. This allows us to create Virtual Program Network (SVN) [24], which allows you to replicate the physical network in virtual space.

4.3 MOBILITY MODEL

Mobility model refers to movement and position of movements, along with the movement model of rotating movements. Mobility models play a very important role in evaluating the effectiveness of the route protocol because they take realistic network-based speeds, otherwise the results can be misleading. During this modeling, the model of mobility was analyzed, which is the most commonly used "random sample point" model. This model is easy to simulate and use. In this model, the mobile node waits for the defined break time in the beginning of the simulation, after which it randomly selects any destination node in the field. With a distribution equal to 0 m / s to 20 m / s, a random speed is also selected. All sources and destination pairs are randomly selected on the network. To model data nodes as data generation nodes, you configure each network source node using the continuous bit rate (CBR) program. CBR generates data according to packet size, packet stream (per second packet) etc.
All simulations performed in this dissertation are done in 500 seconds. Each data point that appears in charts and tables is three times the average traffic pattern, but different mobility scenarios are randomly generated using different launch values.

4.4 NETWORK SCENARIO AND SIMULATION PARAMETERS

The network script we use for modeling is shown in Figure 7. We used 1000x1000 relief and used 60 nodes. During simulation, a random point mobility model was used which resolves the movement of these nodes in any random direction



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To evaluate the performance of our proposed CACDASN protocol, we have some parameters, which compare it with COMMUNITY DETECTION. In Table 1, we have already mentioned several criteria for designing a scenario that COMMUNITY DETECTION has considered considering simulation studies.

Simulation Tool	Exata Cyber Developer Version 2.0
Topology area	1000x1000m
Simulation Time	300 sec
Application Traffic type	CBR (Constant Bit Rate)
Number of nodes	80
Node Placement model	Uniform
Routing protocols under study	DS-COMMUNITY DETECTION, COMMUNITY DETECTION
MAC Layer protocol	IEEE 802.11
Physical Layer protocol	802.11b
Data Rate	12 mbps
Node Mobility model	Random Waypoint model
Packet size	512
Flow specification	50 packets/second
Node pause time	20 m/s (for constant network load)

During simulation, the starting point runs from source to target point, so that network topology changes continuously on simulation.

4.5 PERFORMANCE METRICS

This section will provide an overview of the metrics that have been considered for evaluation of results produced by our study.

a) Average End to End delay

This metric indicates the time difference between the times when the data packet receives from the date sent from the destination source. Calculate the destination node when the packet is fully received by the date and time of not sending and receiving this record. At the end of the simulation, the received packet time during the general purpose is divided by the total number of data packets,

Lastly, each successful package received = the total number of late / received packets

In other words, the time during which the data packet moves from one source to the destination node.

b) Packet Delivery Ratio (PDR)

It is defined as the proportion of the total number of packets of data without destination errors in the total number of packets sent by the source. i.e.

PDR = total number of packets received / total number of packets sent by CBR application

This metric effectively defines the data loss rate sent by the program, which is an important tool to evaluate the reliability of the routing protocol used.

c) Normalized routing Overhead (NRO)

Normalized routing overhead is defined as the total number of control packets transmitted per data packet delivered successfully at the destination. It is calculated as the ratio of total number of routing control packets sent to the total number of data packets received by the destination.

This metric is used to measure how efficient and scalable the protocol is along with the amount of extra overhead it generates during routing operations. This gives a measure of the bandwidth consumed by the routing control messages of a routing protocol.

4.6 SIMULATION RESULTS

In this section, we will evaluate the performance of our proposed routing protocol, DS-COMMUNITY DETECTION, compared to traditional COMMUNITY DETECTION routing protocols in the three performance metrics analyzed in the previous proposed section. The main purpose of this study is to show that the reference chosen here in relation to the variable parameters of the CACDASN scenario will be above the protocol, i.e. COMMUNITY DETECTION, such as:

- Number of data sessions
- Dynamics of nodes

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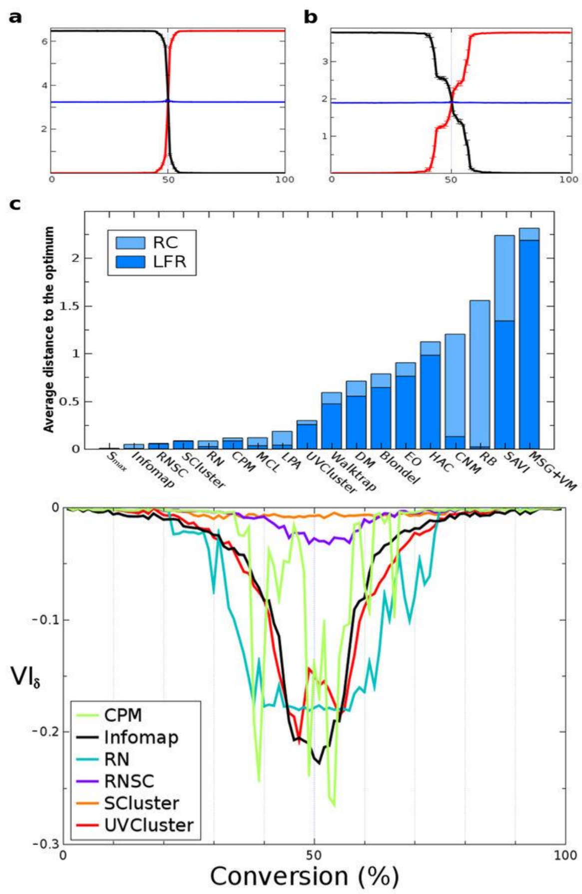
Simulation results are calculated from the average of the values of 3 different races. During simulation, we initially change the number of source-target pairs, i.e., the number of CBR sessions that maintain the node break time continuously and equal to 20 meters / second. This is done to study the effect of the diversity of network loads on the network. We take the price for the number of data sessions equal to 2, 4, 6, 8, 10 and 12. Then, we separated the speed of node mobility from 5 to 45 meters / s, continuing the constant number of CBR sessions in 4. We collected results for this simulation at the time of break of 5, 15, 25, 35 and 45.



5. CONCLUSION

Delicate sensitive applications, such as client programs and real-time, need time to transmit information; Otherwise data will not be available if they are found at a set time. Therefore, the idea of restoring an intentional dialogue becomes an important tool for the discovery of the Adhoc site. In this paper, we offer and implement a late transformation process based on COMMUNITY DETECTION transmission system. I call CACDASN. The main objective of this scheme is to set the right minimum price for the travel program. The necessary actions to be started from the date indicated that they are the most common priority to go. Price will be used to specify the limit access path. Game results are created using a simple cyber. An analysis of these results shows that our contract with CACDASN protocol can work with COMMUNITY DETECTION, which reduces the cost of delay.

In the context of further detail of this study, we can try to implement the arbitration model, not the procedures we do in these conditions. Additionally, DS_COMMUNITY DETECTION Standard Timer's archived track get value cannot always be a story about the dynamic nature of mobile advertising networks. To solve this problem, a modern renewal project can be implemented. Also, in the case of a crowd, the focus of CACDASN can be confirmed. Finally, we recommend comparing CACDASN based on different borders, which were proposed to ensure their performance against different borders according to other laws previously proposed. We can come to conclusion that there are lot more complexities to be resolved if the network goes on increasing day by day. Need of creating new techniques and its analysis then can be done to see further what we can do to detect the communities that we are focusing on. This process will continue as we know the people continue to increase day by day. We propose an algorithm which somewhat reduces the limitations of the two algorithms Hierarchal and Louvain algorithms:

5.1 PROPOSED ALGORITHM:

1. We need to start the disjoint clustering with level L(0)=0 along with sequence number m=0
2. We will search the least non-similar pair of clusters in the present clustering say pair (r), (s) , according to

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d[(r),(s)] = min d[(i),(j)] where the minimum is all pairs of clusters in the present clustering.

3. With the increase in their sequence number : m=m+1. We merge both cluster(r) and (s) into a single cluster to create the next clustering m. Establish the level of this clustering to L(m) = d[(r), (s)]
4. Then, we formulate the proximity matrix,D, by omitting the rows and columns supporting to clusters (r) and (s) and adding both row and column which supports the freshly formed cluster. The proximity between the new cluster, represented (r,s) and old cluster (k) can be described in this manner: d[(k), (r,s)] = min d[(k),(r)], d[(k),(s)]
5. If every objects groups in one cluster, then it stops. Else, follow step2.

This will give better result than both the above algorithms and can be proved to be effective for very large networks in dynamic area.

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