Investigation and Analysis of path duration estimation for stable communication link in VANETS [Vehicular Adhoc Networks]

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Abstract

A new routing protocol which is used in wireless sensor network is ACO. It does the optimization process and generates a new way for energy efficient data transmission. This process will overcome the loss and drawbacks in fuzzy logic process which uses clustering. In fuzzy logic process, the LEACH algorithm is being used which requires a large amount of time and energy. But ACO works in contradiction. Sybil Attack is a type of attack seen in peer-to-peer networks in which a node in the network operates multiple identifies actively at the same time and undetermines the authority/power in reputation systems. Message such as the data gathered via one node is sent to another node that is within the particular surrounding. The data togetherized are the information like if there is any damage in the roads or any accident that had been occurred and cause traffic. The Existing system has the disadvantage of Sybil attack, and can be able to send messages to the vehicles nearby only if the vehicle is in static and it is difficult to find the distance between one node to another and to send data packets if the vehicle (generally cars) is in move. The proposed system detects the data and sends messages to the cars even if it is dynamic by creating a virtual node and removes the old data that is received before thereby overcoming the disadvantage of Sybil attack in the Existing system. Also the proposed system send the data packets to the vehicles that is surrounding the particular range greater than the range in the Existing system.

Keywords: VANET, Ad-hoc, Energyefficient

1. INTRODUCTION

For people living in developed countries, the sheer volume of road traffic can be a daily nuisance. The road traffic conditions affect the safety of the population since in Europe around 40,000 people die and more than 1.5 million are injured every year on the roads. In addition, traffic jams generates huge waste of time and fuel affecting to the economy and increasing the environmental impacts of surface transportation travel.

Advances in ad hoc wireless technology give rise to the emergence of vehicular ad hoc networks (VANETs). This field deals with the problem of enabling interoperable networked wireless communications among vehicles, the infrastructure, and personal communication devices. Various forms of wireless communications technologies have been proposed for deploying VANETs. WiFi (IEEE 802.11 based) technologies are the most commonly used for deploying VANETs. The vehicles are equipped with wireless network interfaces which use either IEEE 802.11b or IEEE 802.11g standards for access media. However, these are general purpose standards and they do not meet properly the requirements of high dynamic networks such as VANETs. Currently, DSRC (Dedicated Short-Range Communication), also called IEEE 802.11p, has been proposed as the communications standard specifically for VANETs.

2. LITERATURE SURVEY

The idea of an ad hoc network is often unfamiliar to end users who have only seen small residential or business networks that use a typical router to send wireless signals to individual computers. However, the ad hoc network is being used quite a bit in new types of wireless engineering, although until recently it was a rather esoteric idea. For example, a mobile ad hoc network involves mobile devices communicating directly with one another. Another type of ad hoc network, the vehicular ad hoc network, involves placing communication devices in cars. Both of these are examples of ad hoc networks that use a large collection of individual devices to freely communicate without a kind of top-down or hierarchical communication structure [1].

Experts point out that for small local area networks, ad hoc networks can be cheaper to build because they don't require as much hardware. However, others make the point that a large number of devices can be difficult to manage without a larger and more concrete infrastructure. Tech leaders are looking at ways to enable more vibrant network functionality with these peer-to-peer networks [2].

What is ACO

ACO is an algorithmic based optimization process based on the comparison of a colony of ants in search of food to find the shortest path between a food source and its house .The colony is able to optimize the journey of its ants through the stigmergy process. Stigmergy refers to the indirect communication between the ants that arises from their deposition of trails of pheromone. These trails act as sign posts allowing the ants to progress. Gradually, increasingly pheromone trails that are small will be strengthened with greater amounts of pheromone, encouraging more ants to go after them and leaving the longer, and less regularly used trails to lose moisture into not present [1].

Within the combinatorial optimization problem framework, ACOA can be viewed as a step by step(iteration) most effective process where, within each step, new knowledge about the search space of the problem is attained and used to help the search in future steps. It should be taken into account that the term iteration has a close synonym to the term generation in genetic algorithms, but it is tend to be chosen because it is consistent. The solution produced that happens within an iteration (i.e., the searching of the ants) is a randomly determined process administered by a set of probability functions [2].

The ACO mechanism is to use its attained information to handle these functions in a skillful manner to increase the probability of the algorithm producing increasingly better, and finally optimal

(or near-optimal) solutions[3].

General ACO Steps

Ants leave pheromones on their travel path, depending on the path quality. Since I am trying to minimize the travel cost, I will have my pheromone quality tau equivalent to lower travel times. Each edge in the complete graph will have a corresponding inverse travel time cost eta and pheromone tau. With each generation, a set number of ants are randomly placed at starting points in the graph. Each ant then builds a solution by traversing the graph. It does so by choosing the next location with a weighted probability. The equation to calculate the probability of going from location i to location j is:

$$p_{ij} = \frac{[\tau_{ij}]^{\alpha} [\eta_{ij}]^{\beta}}{\sum_{h \in \mathcal{E}} [\tau_{ih}]^{\alpha} [\eta_{ih}]^{\beta}}$$

Where tau represents an n by n pheromone matrix and eta represents an n by n inverse travel time cost matrix. All values in the pheromone matrix are first initialized to $1/n^2$. I found that initializing the pheromone matrix with 1's had little to no impact on my results. The corresponding exponents alpha and beta are used to control the influence of the pheromones and travel time cost in the probability calculation between two nodes. In the denominator, I have a summation of these values where h represents all possible locations that are available for the ant to visit. These are the nodes that particular ant has not visited yet. These terms are all added together to calculate the weighted probability of traveling from node i to node j.

After each ant generates their corresponding solution, the pheromone matrix is updated. How this is done depends on the strategy employed. In this solution, I update each pheromone edge by first multiplying it by p (the residual coefficient). This represents the rate at which the pheromones "evaporate" or decrease their influence. We then add to the pheromone edge q/c where q represents the pheromone intensity and C represents the total cost of the generated path. Because the travel time cost is in the denominator, paths with greater travel times will have a lower probability of being picked. This process is repeated for 'g' number of times, where g represents the number of generations.

Advantages

Decision rules are easy to implement and efficient [1].
Interactive methods are easy to communicate and flexible [2].
Mathematical programming are usually optimal [3].
Heuristics are easy to program implement and efficient [4].
Compatible with other modules [5].

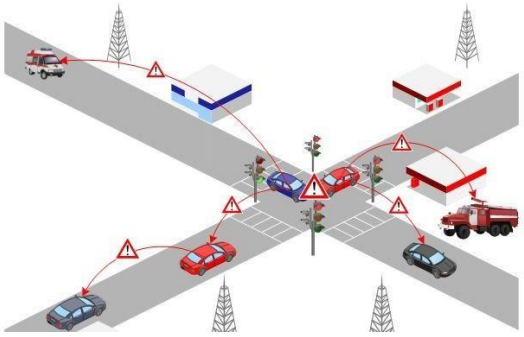
ACO Pseudocode

```
Begin
  Initialize
  While(stops when criterion not
  satisfied) do
   Ants are positioned in starting node
  Repeat
  for each ant do
   Apply state transition rule to choose
next
  node
  Apply pheromone update iteratively
  End for
Until
  Solution made by every ant
   Update best solution
  Apply update of pheromone (offline)
 End While
End
```

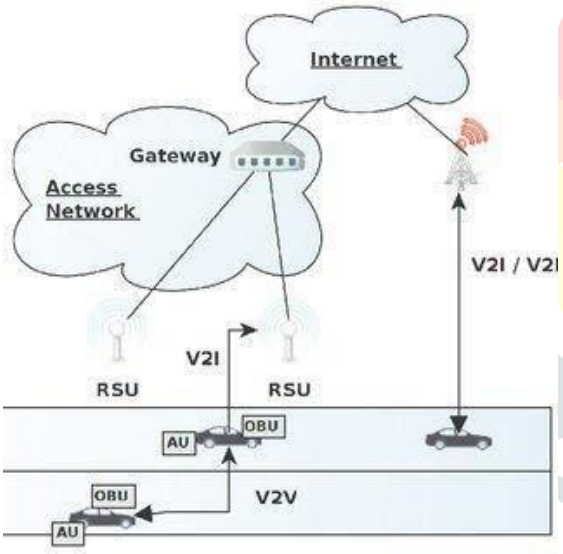
VANET is based on the principle of mobile ad-hoc network.AD-HOC means a system of network elements that combine to form a network requiring little or no planning. VANET is to provide road safety, navigation and other road traffic services. VANET's are a key part of the Intelligent Transportation System(ITS).A special type of Mobile Ad Hoc networks(MANETs) is in which each vehicle can act as a router to communicate with each other without relying on fixed infrastructure supports. There are two wireless communications ways including, (i) vehicle to vehicle(V2V) (ii) vehicle to infrastructure(V2I).

Prevailing System

In Adaptive quality of service based routing vehicular Ad hoc networks they implemented the effectiveness of AQRV with some drawbacks. We propose the QOS based on Ant Colony Optimization to overcome the three drawbacks of the existing system they are large scale size, frequent link disconnection, rapid topology change. A wireless sensor network consists of homogeneous/ heterogeneous sensor nodes which work together to accomplish a common set of objectives.



These nodes are typically equipped with limited, non-rechargeable power resources which are seldom under human monitoring.There have been multiple clustering approaches proposed which are focusing and emphasizing versatile requirements of WSNs. Among them, one of the most traditional clustering approaches proposed by Heinzelman et al., namely,LEACH rotates the role of cluster heads in a cluster periodically for each round from the energy perspective.Here, a round refers to an interval that exists between two consecutive cluster formation processes.



RSU (Road-Side Unit) DSRC communication unit that is located aside the roads. It serves as a gateway between OBUs and the communications infrastructure.

The on-board unit (OBU) is a device, installed in the motor vehicle of the roadside user.

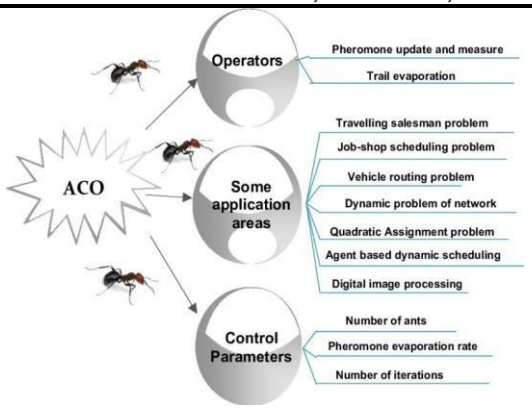
The Application Unit(AU) can be a dedicated device or just a usual one that makes use of the OBU's potential of communication.

Vehicle-to-Infrastructure (V2I) communication is the wireless exchange of data between vehicles and road infrastructure, enabled by a system of hardware, software, and firmware, V2I communication is typically wireless and bi-directional: infrastructure components such as lane markings, road signs, and traffic lights can wirelessly provide information to the vehicle, and vice versa.

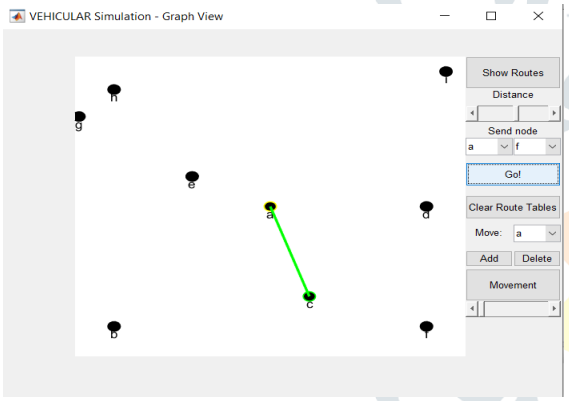
An access network connects subscribers to their immediate service provider. It is contrasted with the core network, which connects local providers to one another.

3. PROPOSED SYSTEM

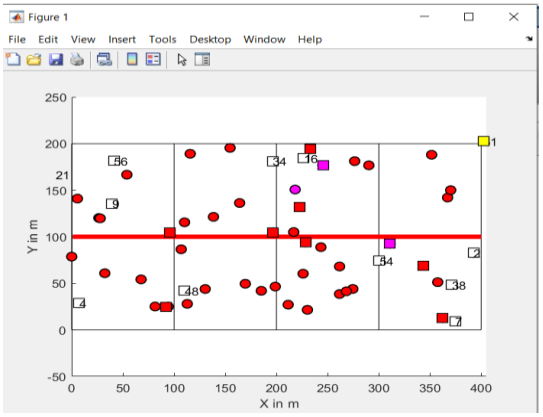
VANET is made more stable with an optimal number of clusters because the network resources are efficiently utilized. There are situations when the network is not so stable. The creation of virtual nodes helps us overcome such problems. Transmitting the message packets while the vehicles are in motion is not an easy task. So we could create a virtual node near the receiver vehicle and transmit the messages efficiently. In a Sybil attack, the attacker subverts the reputation system of a network service by creating a large number of pseudonymous identities and uses them to gain a disproportionately large influence. The proposed system clears the Sybil attack and makes the nodes ready to receive henceforth. The Efficient route to transmit the data packets can also be discovered in both static and dynamic environment.



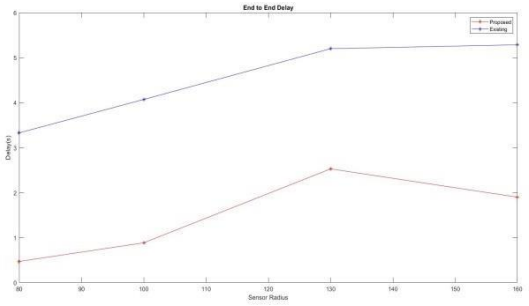
Wireless sensor network consisting of nodes with limited power are deployed together useful information from the field .In WSNs it is critical to collect the information in an energy efficient manner. Whereas in Ant colony optimization, swarm intelligence based optimization technique, is widely used to save energy efficiently and transmit messages. The process of sharing messages to road side unit(RSU) and on board unit(OBU).The information must be transmitted efficiently. The time to exchange the message is also decreased by this method.



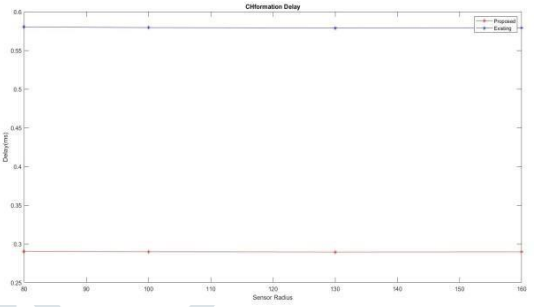
The route which is efficient and fast to send a message to receiver can be discovered by selecting the sender and receiver nodes and clicking the Go button. The Show Routes button gives all possible routes from the sender to receiver node.



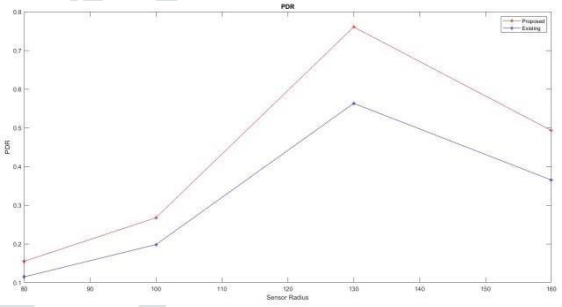
Vehicle to vehicle message transmission is easy while the vehicles are not in motion. The above shows how virtual nodes are used to send the packets to vehicles that are in motion.



The above screenshot shows the difference in End To End Delay between the proposed system and existing system. End to End delay is the time taken to send the packets to receiver from the sender .



The above screenshot shows the difference in Cluster Head formation delay between the proposed system and existing system.



Packet delivery rate tells about how much of the data sent is received successfully by the receiver node, The above screenshot shows the difference in Packet Delivery Rate between the proposed system and existing system.

4. MOTIVATION

Due to the increase in the rate of accidents and traffic problems in our city [1].

To avoid them and decrease the death rate of the People [2].

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6. CONCLUSION

Increasing energy efficiency by using Genetic Algorithm. This technique simultaneously sends and receives the message and very easy to find the shortest path. The technique includes the use of Zigbee transmitter and receiver for the sending and receiving of messages among the nodes of the vehicle within a particular range. It reduces the accidents that occur in our city.