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A NEW Technique for Disseminating Knowledge Concerning VANET Traffic Using Crocodile Hunting Search

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Abstract: - VANETs or Vehicular Ad hoc Networks represent the most rapidly emerging application of Ad hoc Networks. It shares traffic condition information and is one of the attempts to improve road safety and traffic management. This paper develops a new technique in the name of "Crocodile Hunting Search" (CHS) to assist information dissemination in Vehicular hoc networks (VANETs). It is named after hunting a crocodile, methodically moving to catch prey, which CHS bases many of its principles upon. The CHS solution that we use sends important traffic data in a decentralized, flexible way within the network. From the point of view of VANET, we consider each vehicle as a mobile node that carries the packets with the information contained on the traffic conditions. These packets are solicited and forwarded to the various vehicles in proportion to closeness and usefulness. The point here is that the search perimeter would have to be adapted to the variation in the quantity of vehicles and their actual traffic. If times are off-peak and there is less traffic, the cars would therefore widen their searching area, which could not be the case for other solutions during that time of less traffic. On the other side, in localities with narrow narrowing information-seeking to find only what is essential and related becomes increasingly important. We show through large-scale simulations and real-world experimentation that our method can work in sending information over Vehicular Ad Hoc Networks (VANETs). This perspective, the current research, clearly demonstrates that knowledge propagation is way more effective in spreading information than traditional methods. It causes low packet loss, and the communication overhead is also low. The Crocodile Hunting Search is another practicable method of solving the problems that arise while trying to send information effectively in VANETs.

Keywords: Traffic on the network, Crocodile Hunting Search, Vehicular Ad hoc Networks (VANETs), and information sharing

I. INTRODUCTION

Effective traffic information dissemination is an enabler of enhancing road safety and traffic management facilitation in the fast-evolving technologies, of which VANETs are part [1]. This places vehicles in a strategic position to exchange information in real-time effectively, therefore reducing any probabilities of road mishaps and ultimately improving the efficiency in transportation. This paper suggests the deployment of the latest technique called "Crocodile Hunting Search" (CHS) in order to cater to the problems related to the quick propagation of information in Vehicular Ad-Hoc Networks (VANETs). From the above example, therefore, the VANET has to be the adaptive and new form of transmitting important critical traffic data as it is likely to be subject to the intentional predatory behavior of crocodiles. Crocodiles are known to have very efficient locomotion capabilities. On the other hand, CHS uses mechanisms decentral and adaptable for posting the message individual across the network [2]. Text is "[3]."

Vehicle Ad Hoc Networks (VANETs): They are one of the most emerging and quickly developing wireless technologies. The aim was to improve the present level of security and communication potentials of modern transport networks. Vehicular Ad hoc Networks (VANETs) belong to the specific subclass of Mobile Adjson Networks (MANETs), which had been specially designed with the consideration to function in the vehicular environment. Vehicles become mobile nodes in VANETs. VANET is a kind of network that is self-organized and topology changeable. VANET provides simple and efficient ways for vehicles to communicate with each other, the road structures where vehicles travel, and central traffic control systems for information dissemination [4].

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Major VANET objectives include a huge contribution to driving comfort, optimization of traffic dynamics, and a further increase in road safety. The goal is to exploit the potential of the Vehicle Ad-Hoc Networks (VANET) for vehicles to exchange valuable real-time information with roadside infrastructure. The latter dataset avails drivers with information on the prevailing traffic situation, road obstacles, and potential vehicle crashes. All this is availed to drivers almost instantaneously, hence allowing room for informed decisions and rapidly adjusting to the dynamics of the road. Another reason that helps VANETs stand out as vehicular ad hoc networks is that they can provide usage of all kinds of networks that comprise Wi-Fi, certain radio frequencies, and cellular networks, together with other communication technologies. These are operated over some sort of dedicated short-range communication (DSRC) or cellular networks, thus enabling them to communicate among each other or with infrastructure. They do so through the use of connected node networks, which somehow offer reliable connectivity even in robust urban setups [6]. In addition, characteristics of vehicular adjsonhoc networks (VANETs) include adaptiveness and the fact that they are decentralized in operations. These determine and clear the network connections of the vehicles in the coverage, starting or stopping. This makes sure that, in the most precise way, the communication is being held up even if there are movements among vehicles, whether related to changes in their number or variations of movement between them. This means adaptability to fluctuating, ever-changing traffic conditions [7]. Vehicular Ad Hoc Networks, or VANETs, are useful in all fields. VANETs contribute to some important systems, of which a few for an increase in safety are the crash avoidance system, cooperative adaptive cruise control, and intersection management. Vehicular Ad Hoc Networks (VANETs) are designed in such a way that they will permit communication between vehicles so that one can monitor real-time traffic congestion and, in turn, optimize traffic signal operations and give dynamic route guidance as a means of traffic control [8]. Such an approach would allow for applications in the field of remote car diagnostics, intelligent parking solutions, or even entertainment services for travelers. On the other side, VANETs would bring with them many challenges: the problem of security, privacy, and scalability of the network. Some of the greatest challenges are security and authentication, which have to be met for proper affirmation of only allowed parties as participants in secure communications to avoid harmful attacks and access from secret information. Another big challenge is maintaining user privacy and allowing the exchange of relevant data of traffic [8]. Figure 1 depicts the routing process in practical vehicular ad hoc networks.

Figure 1 geocast routing in realistic vehicular ad hoc networks [4].

II. LITERATURE REVIEW

In Vehicular Ad hoc Networks (VANETs), routing protocols are essential for facilitating effective data transmission and communication between vehicles and roadside infrastructure. Routing protocols are important to develop and maintain dependable communication pathways in a dynamic and highly mobile environment where vehicles constantly join, exit, and migrate within the network. Routing protocols in VANETs have as their major objective to assist the rapid and correct data dissemination, ensuring that important information, such as traffic updates and safety warnings, reaches its intended users in a timely way. To overcome the particular problems presented by vehicular contexts, several routing protocols have been suggested and created expressly for VANETs. In VANETs, where vehicles constantly transmit safety-critical information like traffic updates and accident warnings, the study's primary goal is to overcome the difficulties of data distribution. Given the dynamic and extremely mobile character of vehicle environments, the proposed protocol seeks to improve the accuracy and timeliness of the delivery of these messages [1]. The system outlined in the study includes a multi-hop data distribution mechanism, allowing messages to be transmitted through intermediary vehicles and delivered to their intended locations. To make sure that the writers can be relied on, they use a feedback system where people who receive messages confirm that they got them. The protocol uses retransmission methods to make sure that messages get delivered even if a packet is lost or an error happens during transmission. At number 4, By looking at real-time traffic data, the main goal of the study is to find out how well location-based data dissemination techniques work in VANETs. The authors look at the unique features of vehicular traffic environments and list the opportunities and problems in order to efficiently share location-specific data for various VANET applications. For their study, the researchers use real traffic data from road networks to create realistic traffic situations. The researchers look into how well well well well known ways of sending data, like geo-casting, opportunistic routing, and location-based forwarding, work in real-life traffic situations. The paper looks at the pros and cons of the different advanced data distribution protocols and algorithms used in VANETs. It also talks about upcoming issues and problems with scalability, security, dependability, and being able to adjust to changing traffic conditions in VANETs location-centric data distribution. In [5] The main purpose of the survey is to give a full picture of the newest ways to share information in VANETs.. The authors examine a variety of data dissemination protocols, algorithms, and techniques, taking into account how well they work in vehicle situations and their benefits and drawbacks. Geographic routing, broadcasting, flooding, and opportunistic communication are only a few of the different categories covered by the survey, which covers both infrastructure-based and ad hoc (infrastructure-less) data distribution options. The major traits of the procedures falling under each category are thoroughly examined and addressed. Considers several parameters, such as message delivery rate, end-to-end delay, packet overhead, and energy efficiency, to assess how well various data dissemination systems perform. Analyze the effects of various traffic situations and network densities on these protocols' effectiveness. In [6] The study's major goal is to use stochastic traffic flow models to increase the effectiveness and dependability of data dissemination in VANETs. The cars work together to distribute data over many hops as part of the authors' multi-hop cooperative communication method, which expands the network's coverage and reach. The researchers employ stochastic traffic flow models, as illustrated in Figure 2, to mimic real-world traffic conditions in VANETs. These models consider factors such as vehicle density, velocity, and movement patterns to accurately depict the dynamic characteristics of vehicular traffic. The scientists aim to enhance data dissemination strategies by gaining a deeper understanding of traffic flow behaviour through the utilization of stochastic models. The multi-hop cooperative data dissemination strategy allows vehicles to act as relays, transmitting data packets to nearby vehicles.

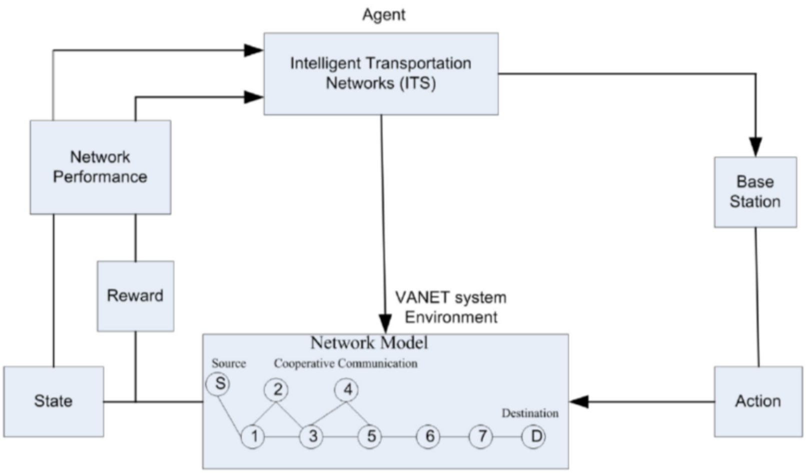

Figure 2 Markov decision process performance for VANETs using MHCDD.

In the [7] The primary objective of the research is to address the challenge of efficiently and rapidly disseminating traffic-related data among automobiles. The authors propose an adaptive beaconing technique that uses beacons—moving objects that periodically broadcast information—to deliver real-time traffic updates, such as accidents, traffic jams, or road closures. The study describes the primary components of the adaptive beaconing process, including beacon creation, transmission, and reception. The contention-based message distribution concept is introduced by the authors, whereby moving objects adjust their beaconing rates in reaction to local traffic volume and event occurrence. This adaptability ensures that important messages are conveyed more often in crowded areas while requiring less overhead in less crowded ones. The steps outlined in Figure 3 can be found in [8]. By suggesting a traffic density-based congestion control mechanism, the study's major goal is to address the problem of traffic congestion in VANETs. The authors want to create a dynamic strategy that may effectively manage and relieve congestion in such circumstances when vehicular networks suffer differing degrees of traffic density in various places. The paper covers the essential elements of the congestion control approach, which entails gathering real-time data on traffic density from networked automobiles. The number of nearby cars and their movement patterns are taken into account by automobiles as they continuously scan their surroundings to determine the traffic density.

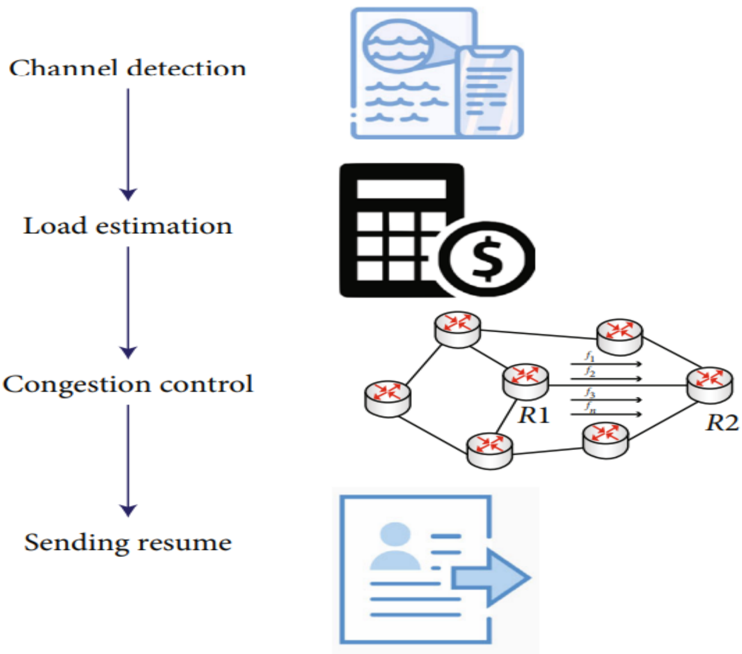

Figure 3 Traffic Density-Based Congestion Control Algorithm [7].

Table 1 shows the data dissemination protocols in VANETs:

Paper	Method	Dataset	Analysis	Result
[9]	Optimal path routing protocol	Highway VANET	Simulation	Improved warning messages dissemination, reduced latency, and enhanced network efficiency.
[10]	Cognitive agent approach	VANETs	Cognitive agents, regression-based model	Effective aggregation and dissemination of critical information, improved network performance.
[11]	DV-CAST: Distributed vehicular broadcast protocol	VANETs	Simulation	Reduced broadcast redundancy and improved packet delivery ratio.
[12]	Cooperative VANETs	VANETs	Cooperative congestion quantification	Accurate and distributed road traffic congestion quantification.

[13]	Smart traffic management protocol	VANETs	Smart traffic management, VANET architecture	Efficient traffic management based on VANET architecture.
[14]	Novel protocol for information dissemination	Vehicular networks	Simulation, Performance evaluation	Improved information dissemination, reduced latency, and enhanced network efficiency.
[15]	Emergency message dissemination	VANET, vehicular Fog computin g	Simulation	Effective emergency message dissemination, reduced congestion, and improved performance.
[16]	Optimizing content dissemination	Large-scale IoV systems	Real-time traffic management, large-scale IoV	Optimized content dissemination for real-time traffic management.
[17]	Vehicular named data networking	Smart traffic lights	Named Data Networking, Vehicular communication	Smart traffic light control using Vehicular Named Data Networking.
[18]	Low-overhead traffic congestion control protocol	VANETs	Low-overhead congestion control, Performance evaluation	Reduced congestion and overhead in VANETs.
[19]	Integrated VANET-based data dissemination and collection	Urban scenarios	Data dissemination and collection protocol	Integrated data dissemination and collection in complex urban scenarios.
[20]	FIRE-NRD: Fully-distributed traffic management system	VANETs	Fully-distributed traffic management, Performance evaluation	Efficient traffic management for next road decision in VANETs.
[21]	Novel protocol for information dissemination	Vehicular networks	Simulation, Performance evaluation	Improved information dissemination, reduced latency, and enhanced network efficiency.
[22]	Improved Contention Based Forwarding	VANETs	Simulation, Performance evaluation	Enhanced data broadcasting in VANETs using improved contention-based forwarding.
[23]	Multi Agent Assisted Safety Information Dissemination	V2V Commun ication	Multi Agent Approach, V2V communication	Improved safety information dissemination using intelligent agents.
[24]	Multi-metric contention-based broadcast suppression	VANETs	Multi-hop data dissemination, Performance evaluation	Efficient multi-hop data dissemination with reduced broadcast suppression in VANETs.

III. METHODOLOGY

Determine the obstacles to efficient information transfer in VANETs and the shortcomings of the current knowledge dissemination techniques. Clearly state the study's goals, which include enhancing traffic management and road safety through effective and trustworthy transmission of traffic information. Create the "Crocodile Hunting Search" (CHS) algorithm, which was motivated by crocodiles' hunting habits. The idea of purposefully seeking out and collecting pertinent information (traffic conditions) in a distributed and adaptive manner should serve as the foundation for the algorithm. Describe the CHS approach's method for distributing traffic information packets. A vehicle should "hunt" for other pertinent cars nearby when it obtains a packet in order to distribute it to them. The main idea behind CHS is to change the search radius based on the number of vehicles and the traffic conditions. For high-traffic areas, the car narrows the looking field so as to look for the most relevant information, while for the low-traffic areas, the car broadens the looking field in order to look for other related information. The central idea of CHS is to dynamically adapt the search radius, influenced by the number of vehicles and the traffic load.

Low traffic will allow the vehicles to have a wide search around. When there is a lot of traffic, they search a smaller area to focus on the most important information.

X(t+1) =X(t) – Cr*(X(t)Best local –X(t)) *R1 (1)

X(t+1) =X(t) + CC (X(t)Best global –X(t)) * R2 (2)

To sum up the Crocodile Hunting Search (CHS) algorithm that was suggested for VANET, we can say the following:

- Set parameters of crocodiles to be the number of crocodiles (N), the size of the solution (D), and any other parameter of the method, like Cr, CC, R1, R2, and P, which is not specific to the problem.
- Begin with a random initial population size of the crocodile, i.e., start with N. Each of the crocodiles belonging to the population can represent a potential solution to the respective optimization problem.
- Calculate fitness: For each crocodile, compute the fitness value of the answer with reference to the objective function of the optimization problem.
- Now, decide who is the right person. It's a crocodile population from the current individuals that has a better fitness value to be found.
- Set variation probability as p = 0.5 in the beginning and set the iteration counter as t = 1: Set the variation probability as p = 0.5 initially. Set the iteration counter t = 1.
- Key Loop: A. Update the values of Cr, CC, R1, R2, and P according to the requirements of the algorithm and within specified guidelines. For example, Cr has to be adjusted according to a linear decrease during iterations, CC has to be updated in response to crocodile communication.
- If P > 0.6, update position using the equation: When the position is updated for a crocodile to globally search for food, then global search is updated by the global equation to simulate a larger crocodile chasing the fish towards the shore. c. If it is not true, then it can be adapted with the following equation: Update the position of crocodile to perform local search similar to rotation of small crocodiles in the shallows and catching fish with an equation.
- If the fitness of the trial position is improved, inform the individual of the new trial position. If updated, assess the fitness of the new trial position. If the new trial position is fitter than the old trial position, accept the update.
- Update the best current position found with a new position: It replaces the best current position with the new one in case the new trial position is better.
- Update p: Based on crocodiles' communication. Adjust the variation probability (p).
- Check the stopping standard—it decides whether to proceed with the next iteration or not, as per predefined stopping criteria, including the maximum number of iterations or reaching a good solution.
- The algorithm terminates as soon as it encounters some stopping condition, and the answer taken is that found up to the moment.
- The CHS algorithm is composed of two main steps: exploitation (circling prey) and exploration (looking for prey). These two stages are crocodile hunting behavior-based stages, which are working in such a way that optimum answers for different optimization problems can be obtained in VANET.
- The main key objective is to locate the best appropriate information reflecting an executable D-dimensional solution to the particular issue at hand.

IV. Result and analysis

In this study the authors try to measure and analyze if the proposed model based on some criteria like (throughput (Mbps), throughput vs. mobility speed, and end-to-end delay (in seconds)), the authors compare the result with Particle Swarm Optimization (PSO)[26], Firefly Algorithm (FFO)[27], Enhanced Enhanced Ant Colony Optimization Based Algorithm to Solve QoS-Aware Web Service Composition (EFACO)[28]. The result of the Crocodile Hunting Search (CHS) throughput (in Mbps) and solution times (in seconds) for four different optimization algorithms is shown in Figure 4. Everyone depicts a distinct scenario with a range of throughput numbers (from 10 to 100). The CHS technique seems to be the best choice for increasing throughput in VANET settings, according to Figure 4. In comparison to PSO, FFO, and EFACO, it regularly delivers greater throughput numbers. Additionally, CHS is an excellent candidate for VANET optimization because its solution time is competitive with other approaches.

It's crucial to remember that the only basis for this judgment is the given information. To confirm the generalizability and robustness of the findings, additional analyses and comparisons on various VANET situations and under various circumstances will be required. The overall viability of each optimization method in real-world applications may also depend on other elements including implementation complexity and convergence behavior.

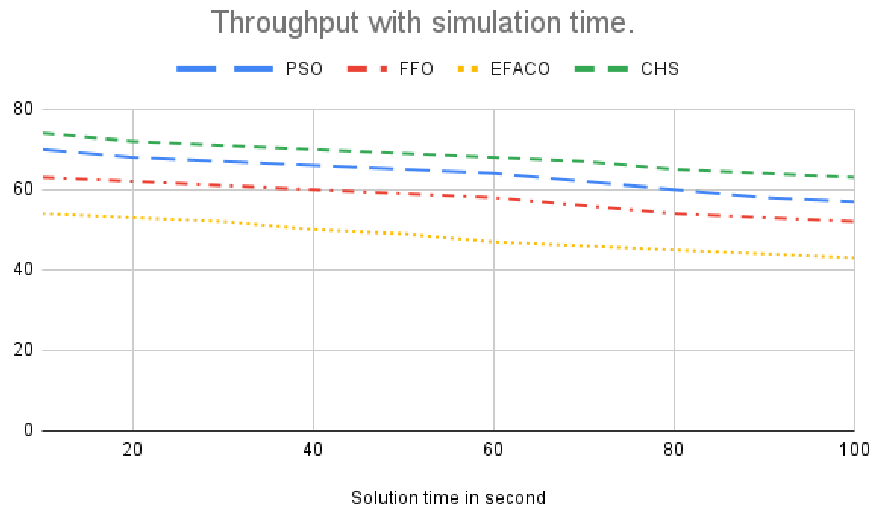

Figure 4 Throughput comparison of PSO, FFO, EFACO, and CHS with simulation time.

Four optimization strategies (PSO, FFO, EFACO, and CHS) are contrasted in Figure 5 concerning throughput values for nodes travelling at varying speeds and network sizes. Regardless of the number of nodes in the network or the speed at which they move, the CHS approach consistently achieves higher throughput values compared to PSO, FFO, and EFACO. CHS demonstrates its ability to handle high-mobility scenarios and large networks by effectively managing increased data throughput. Hence, in diverse network scenarios, utilizing CHS is a feasible approach to improve the efficiency of data transmission in VANETs. To find out how reliable the results are and whether they can be used in different VANET settings and movement patterns, more research needs to be done. We test four optimization methods (PSO, FFO, EFACO, and CHS) on different numbers of network nodes to see how they affect the End-to-End Delay (in seconds).

When it comes to VANETs, end-to-end latency is a very important metric for communication networks. It works out how long it takes for a packet or piece of data to travel across the network from where it starts to where it ends up. Lower end-to-end delay numbers, as shown in Figure 6, mean that the network is working better and data is being sent faster. The CHS method always has the smallest end-to-end delays compared to PSO, FFO, and EFACO, it doesn't matter how many network nodes are used. It shows that CHS can cut down on the time it takes to send data and improve real-time communication in VANETs. Consequently, the Cooperative Handover Strategy (CHS) shows great potential in minimizing the time delay and enhancing the efficiency of real-time communication in

Vehicular Ad-Hoc Networks (VANETs). However, additional analyses on various VANET situations and under various traffic conditions will be helpful in confirming the robustness and generalizability of the findings.

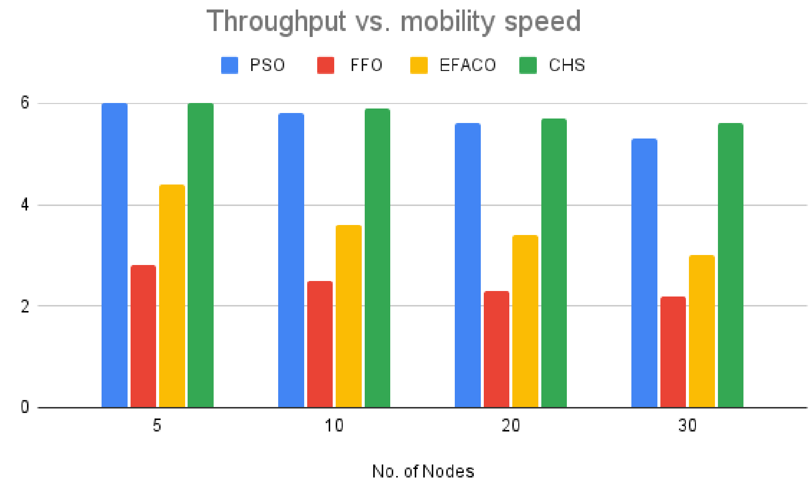

Figure 5 Throughput vs. mobility speed

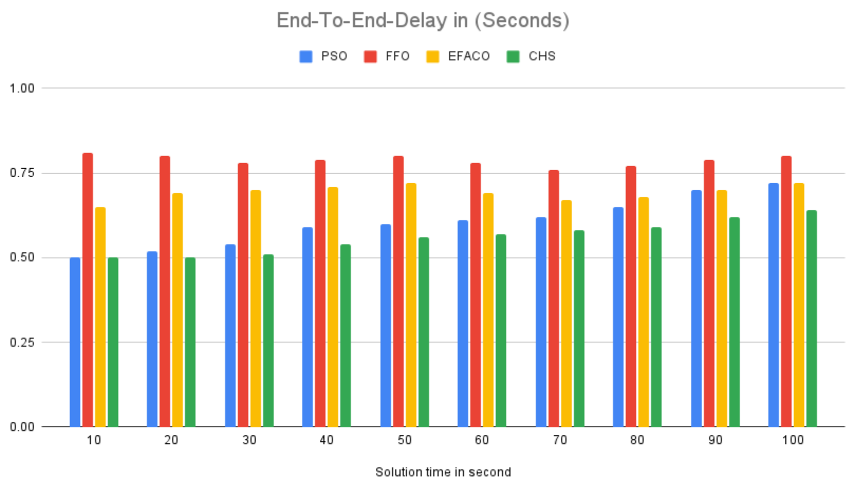

Figure 6 End-To-End-Delay in (Seconds)

V. CONCLUSION

To improve traffic management and road safety through the reliable transmission of traffic information, the study intends to overcome the difficulties in effective information transfer in Vehicular Ad Hoc Networks (VANETs). To enable dispersed and adaptive information transmission in VANETs, the proposed method—known as the "Crocodile Hunting Search" (CHS) algorithm—takes cues from crocodiles' hunting behaviors. The CHS algorithm is designed to dynamically adjust the search radius of vehicles based on traffic volume and car count. When vehicles are in areas with low traffic, they expand their search range to encompass a larger area. In contrast, cars in areas with a lot of traffic narrow their search to only find relevant information. Because it can be changed on the fly, CHS efficiently sends traffic information packets and makes real-time communication better in VANETs. After that, the study compares the CHS algorithm to PSO, FFO, and EFACO in terms of throughput (measured in Mbps), throughput about mobility speed, and end-to-end delay (measured in seconds) in a number of different situations with different numbers of nodes and mobility speeds. The research shows that the CHS algorithm always does better than the PSO, FFO, and EFACO algorithms in terms of end-to-end delay and throughput values. In this case, CHS shows that it can handle situations with a lot of mobility and big networks while also making data transmission more efficient. More research is needed to make sure that the results are correct and can be used in different VANET environments and traffic conditions, which is something that the authors agree on. In terms of throughput and end-to-end latency, the results show that CHS works better than other optimization strategies. This makes it a possible way to make VANETs safer and better at managing traffic. More research and comparisons between different VANET scenarios are needed to prove that the CHS algorithm works.

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