ABSTRACT

Vehicular ad hoc network (VANET) is a novice technique which has drawn the attention of several industries and academics. VANET is a promising profitable infrastructure framework used in various areas of applications. Security parameters in VANET are now receiving popularity in the research community. Today, the greatest security threats are arising to affect the VANET security. The increased attention on internet had made information integrated with communication system more susceptible to attacks, related to security in internet. The attacks against VANET security are availability, authentication, driver’s confidentiality, privacy, non-repudiation and data trust.

A defensive mechanism provides a solution to control the attacks across the VANET security. However, a single defense mechanism is unable to provide solution to the attack models as more sophisticated method is required for VANETs. Game theory model is used as a defense mechanism against sophisticated and complex type of attacks arising in VANET. Subsequently, game theory model addresses the issues related to trust, incentives and externalities arising in security system.

A security game for vehicular network includes a fuzzy game and zero sum game to solve the transportation security, reliability, and management. The zero-sum game is observed to defeat the strategy of defending locations. The zero sum game and fuzzy game detects the attacks
less efficiently concentrating on transportation security, reliability and management. In addition, the game theory fails in recognizing the known and unknown opponents in VANET communication.

Improved security in addition to better transportation, reliability and management is required so a method termed heuristic based ant colony optimization is designed. The encouraging source of Ant Colony Optimization (ACO) is the eating behavior of real ants. The ants initially survey the location around their nest for searching food in a random manner. As soon as an ant recognizes the foodstuff origin it examines the quality and quantity of the food and takes back some of the foods to nest as needed. At the time of returning back ant drops a chemical pheromone trail on the ground. The idea behind dropping is to lead the other ants for food based on the quantity of pheromone dropped, assuming the quantity and quality of the food. This leads to find the shortest path between the nodes.

The characteristic of real ant colonies is used in VANET security in order to solve attack problems with shortest path. The excellent outcomes are obtained by an ACO approach combined with a dynamic heuristic. The use of favorable heuristics is important and grants solving the first test collection in every run without using pheromone at all. On the second test collection, the outcomes are enhanced when leading search by pheromone in finding the opponents. So, the heuristic based ant colony optimization is used to reduce the problem in finding known and unknown opponents of game theory in providing security to VANET.
Recently, game theoretic models are used to address network security issues. Game Theory also helps the agents predict each other's behavior and suggests a course of action to be taken in any given situation. The Game theory model concentrate on VANET security using Nash Equilibrium integrated with Markov Chains (NEIMC). The Markov Chains are chosen to evaluate the appropriate model for security related issues in VANET. An enhancement has also been made to extend the traditional ideas of game theory in VANET towards predicting the transition rates for maximizing the security. The Markov Chain model characterizes the hackers on basis of two criteria to classify them according their motivations and skills. Nash Equilibrium is applied in game theory when two or more number of players involved in game under VANET. Nash Equilibrium is computed based on the game model like intelligent virus game, blocking game and so on which are derived from Markov Chains.

The security of game theoretic approach in VANET is increased by adapting the set of defensive measures with Markov chains and Nash equilibrium. But the defensive measures does not par with distinct set of threats and attacks. To improve the security in game theoretic approach for VANET, a framework by analyzing the mode of other vehicles in the locality to come up to this problem is designed. The proposed method is reinforcing security using vehicle mode analysis (RSVMA) for recognizing vehicle mode. The output of several mode analysis parts are integrated for every vehicle in conveying reliability value which has been replaced between all vehicles
present by constructing status. Based on status information, vehicles are categorized into reliable, unreliable or impartial.

The Reinforcing VANET security using vehicle mode analysis is evaluated in an efficient manner using NS2 simulator. Initially the experiment is evaluated with 200 nodes in a flat area of $1000 \times 1000$ m$^2$. The incoming time of the nodes are measured in terms of seconds. The RSVMA introduced a security measures by analyzing the mode of the players for the VANET security with heuristic based ant colony optimization.

The resultant performance discussion of heuristic ant-colony optimization based game theory with Nash equilibrium integrated Markov chain for reinforcing security is evaluated by the number of metrics such as vulnerability, trusted communication, centrality measures, data traffic, privacy conservation, vehicle speed both in upward and downward direction, trustworthiness and probability of attack. A performance result shows that heuristic ant-colony optimization based game theory with Nash equilibrium integrated Markov chain for RSVMA shows better performance when compared to the security games for vehicular network. As in the RSVMA, the probability rate of attack is less with the use of HACO, NEIMC and the security level has also been high by using vehicle mode analysis compared to the other works. The threat is efficiently encountered and processed by the HACO and Nash equilibrium integrated with Markov chain scheme provided.