Reputation System Based On Message Dissemination in VANET

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ABSTRACT

In this paper, we work on reputation system based on message dissemination in vehicular ad-hoc network (VANET). As we know VANET used mainly two types of communication first one vehicle to vehicle communication (V2V) and second vehicle to infrastructure communication (V2I). Any type of network communication between two entities is more important because of information transmission with in time and right information .the proposed reputation system based on message processing at the vehicle in term of arrival rate and departure rate. the work also consider communication range of vehicle using HMM to repute the system results shows that the proposed scheme is also suitable candidature to evaluate message reputation in the absence of infrastructure.

Keywords

States; Observation; HMM; Reputation.

1. INTRODUCTION

Reputation is opinion of one vehicle about various vehicle in the VANETs. Reputation computation schemes in VANETs are where one vehicle maintains the trust of other vehicles and use it to calculate their trustworthiness. The goal of reputation computation in VANET is to identify and isolate the vehicles altering the messages. Moreover it obviates the need for time consuming authentication of message and drastically reduces time to react [1], [2].

VANET enables vehicles on the road to utilize wireless communication to exchange safety message; enhance safety, traffic flow and minimizing accidents in VANET. Communication among vehicles is called as IVC or V2V communication between vehicles and road side unit (RSU) is known as V2I [3].

AICTC '16, August 12–13, 2016, Bikaner, India
© 2016 ACM. ISBN 978-1-4503-4213-1/16/08…$15.00

DOI: http://dx.doi.org/10.1145/2979779.2979823

In the VANETs, prime concern is security. An effective attack through an adversary might have been disastrous effects leading to life loss. At the times an adversary may achieve event change, false event generation, data dropping and data aggregation. Using VSRP (Vehicular Security through Reputation and Plausibility checks) for overcome various problems [4].

To evaluate reputation value of vehicle a simple feedback aggregation algorithm based on binary feedback ratings is used. System is able to the work against temporary central server unavailability. Reputation based global trust establishment scheme (RGTEs) is presented [5].

However, in this atmosphere, a malicious attacker can be generate bogus traffic warning information to impact the various drivers' cause intelligent collisions and behaviors. To define whether traffic event reported through a warning data is actually happened and prevent false traffic warning information spread on the VANET, several secure communication protocols and trust systems have been proposed in [6], reputation framework to filter out bogus messages spread by malicious attackers in VANETs. In contrast to Nai-Wei's method, they have proposed a more complex model which applying fuzzy theory to represent and aggregate reputations presented in [7].

They have presented main architecture ideas that enable VARS to the operate effectively in given atmosphere, present most relevant algorithms and provide few simulation outcomes; VARS have proposed a modular method that strictly separates Direct, opinion generation and indirect reputation handling. Further modules are needed for message Handling and situation recognition presented in [8].

The scheme is used Dempster-Shafter Theory and reputation aggregation algorithm to compute the reliability of messages and aggregate the reputation score is presented in [9].

Existing scheme is able to compute trust value of messages on the basis of direct recommendation and indirect recommendation however, in absence of infrastructure assistance reputation computation of messages by disseminating of vehicles in VANET is issue.in this paper, we propose reputation system on the based on message dissemination in VANET.it will not only evaluate the reliability of the messages but also able to predict the legating of the broadcast messages.

The paper remainder is organized as follows. In the section II we present Hidden Markov Model. The proposed model for reputation method based on the data dissemination in VANET is presented in Section III. Outcomes are analyzed in section IV and in Section V the work has been concluded.

2. Hidden Markov Model

Finite state machine in which probabilistic states amount function observation sequence. In our case, it provides a reputation system in VANET based on arrival rate, departure rate and communication range probability's. Some of the HMM benefits are: Additional control by simply manipulation of verification and training procedures, theoretical/mathematical results analysis, Effective prediction of similar patterns, and Ability to the incorporate novel information robustly.

Finite state machine contain hidden states (Q), an observations (O), transition probability (A), emission probabilities (B) and initial state probabilities (Π) set. The present state is not observable. Instead, all state create s an output with a various probability (B).Typically the states Q and observation O are understood, so an HMM is said to be a triple (A, B, Π).

Hidden states Q = { q_i }, I = 1. . . N.

Transition probabilities A = {a_{ij} = P(q_j at t +1 | q_i at t)}, where P(a | b) is the conditional probability of a given b, t = 1, . . . , T is time, and q_i in Q. Informally, A is the probability that the next state is q_j given that the current state is q_i.

Observations (O) = { o_k }, k = 1. . . M.

Emission probabilities B = { b_{ik} = $b_i(o_k)$ = P(o_k | q_i) }, where o_k in O. Informally, B is the probability that the output is o_k given that the current state is q_i.
Initial state probabilities Π = {p_i = P (q_i at t = 1)}.

HMM is able to provide reputation system based on message exchange by vehicles in VANET. It is widely used for vehicles to take decisions in the absence of infrastructure and come equipped with efficient algorithms for computing the probabilities of events and for messages classifications. The HMM constitutes the forward algorithm, backward algorithm, Viterbi algorithm and Baum Welch algorithm [10], [11].

Forward Algorithm: Forward algorithm for calculating observation sequence (o) of growing length. First, probabilities for the one-sequence is calculated as an initial state Π product's likelihood and emission likelihood of provide sequence within Q states.

Backward Algorithm: it calculates recursively backward variables going backward along statement sequence. The forward algorithm is most of the time used for calculating the chance of a remark sequence to be emitted by means of an HMM, however, each approaches are heavily used for finding the optimal state sequence and estimating the HMM parameters.

Viterbi algorithm: The algorithm elects the finest state sequence that maximizes the probability of the state sequence for the given observation sequence. It is applied in forward and backward and find out best possibility.

Baum-Welch Algorithm: It is a training algorithm. It calculates transition and emission probabilities for hidden state. And find out best path among all.

3. Proposed Model

The proposed reputation system of VANET considers the probabilities of arrival rate of message, departure rate of message and communication range of vehicles. Fig 1 shows the reputation system using HMM, Basically secure communication can be happen in two ways like trusted or untrusted. In our proposed model, we are using both the cases with the help of HMM. We assumed two states and three observations when vehicles are trusted or Untrusted then what is arrival rate, departure rate and communication range of vehicles so that vehicles can observed the messages broadcasted by others.

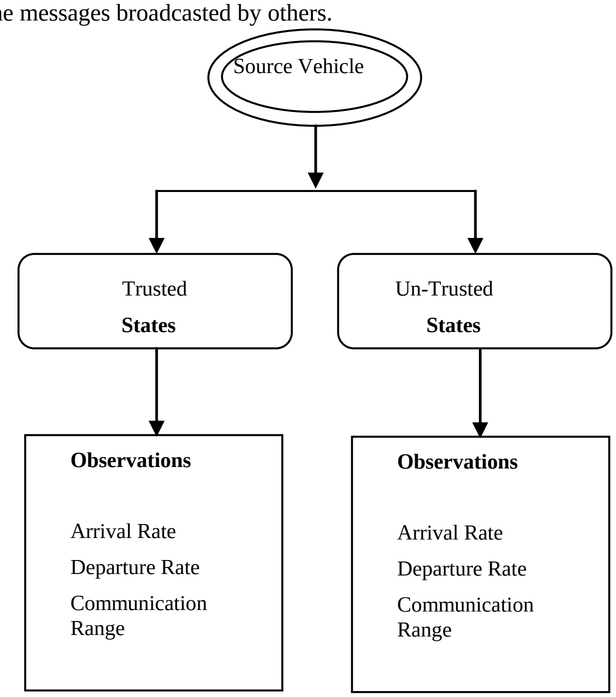

Fig 1:- Reputation System Using HMM

The proposed model is able to maintain the trust based secure communication on the basis of braodcast messages. If messages are found that it is currect then messages is trusted and reputation of such vehicles will increase and trustee vehicle will take the decision basis on such received messages. Proposed Hidden Markov Model for VANET assumed Transition and emission probabilities are shown by Table 1 and Table 2 respectively.

Table 1. Proposed Transition Probability for vehicle

States	Trusted	Un-trusted
Probability	0.6	0.4
	0.3	0.7

Table 2. Proposed Emission Probability for vehicle

States\Observation	Arrival Rate	Departure Rate	Communication Range
Trusted	0.6	0.2	0.2
Un-trusted	0.4	0.5	0.1

4. Results and discussion

In this section, simulation setup and results are presented. Simulation is conducted to verify the efficiency of the proposed model, the efficiency of the HMM for trust based secure communication in VANET is verified using MATLAB. We have considered two states and three observations in proposed model .the probability of states for ‘Trusted’ and ‘Un-Trusted’ are 0.6 and 0.4 respectively. These probabilities are also known as start probabilities.

The computed values of Forward sequence are:

1.0000 0.1200 0.0792 0.0140 0.0109

0 0.1500 0.0564 0.0063 0.0086

Similarly Computed values using backward functions are:

0.0086 0.0293 0.0570 0.3000 0

0.0143 0.0341 0.0730 0.7000 1.0000

Baum-Welch algorithm:

It calculates transition and emission probability for trusted and untrusted states are shown by table 3 and table 4 respectively.

Table 3: Output Matrix for Transition probability by using HMM

States	Trusted	Un-trusted
Probability	0.4231	0.1528
	0.5769	0.4601

Table 4: Output Matrix for Emission probability by using HMM

States\Observation	Arrival Rate	Departure Rate	Communication Range
Trusted	0.2164	0.1684	0.2015
Un-trusted	0.1847	0.2296	0.1986

Out Coming Hidden Transition States Probability by Using Hidden Markov Model in fig 3 and fig 4 shows respectively, the variation of estimated reputation value and the actual reputation value with respect to trusted and untrusted vehicles.The behavior of probability of events of vehicles was observed randomnly may be more or less after computation by proposed HMM. In this scenario, specific probability distribution used here is not equilibrium one, which is provide transition probabilities, actually approximately shown below.

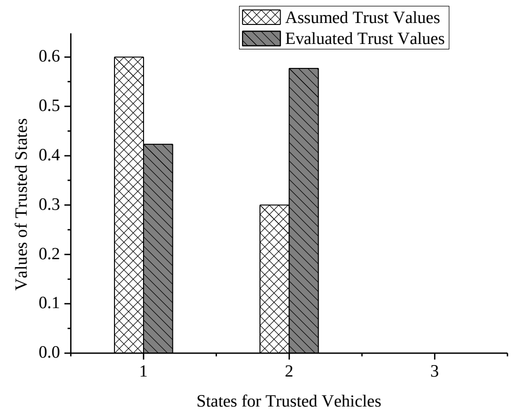

Fig 3: HMM base Tranisition probability for trusted vehicles

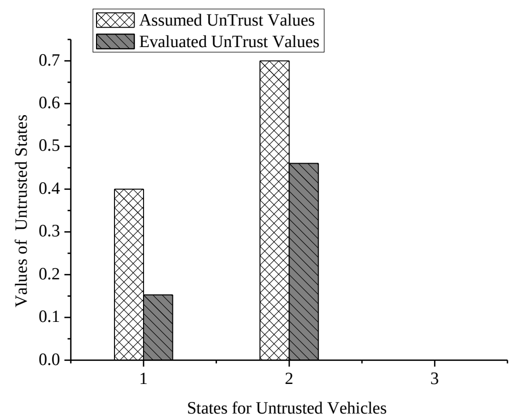

Fig 4: HMM base Tranisition probability for Untrusted vehicles

Out Coming Hidden Emission Observation Probability by Using Hidden Markov Model in fig 5, fig 6 and fig 7shows respectively.The observation probability represents the changes of the trusted and untrusted vehicles probability in the underlying Markov chain. In this model, The proposed model is able to maintain the reputation on the basis of braodcast messages. If messages are found that it is currect then messages is trusted and reputation of such vehicles will increase and trustee vehicle will take the decision basis on such received messages.

Fig 5 shows Emission probability proposed by hidden markov model. In this figure HMM calculate arrival rate of such vehicles and find out broadcast messages so that it will take decesion for predicted actual arrival rate as compare to present observed vehicles arrival rate.

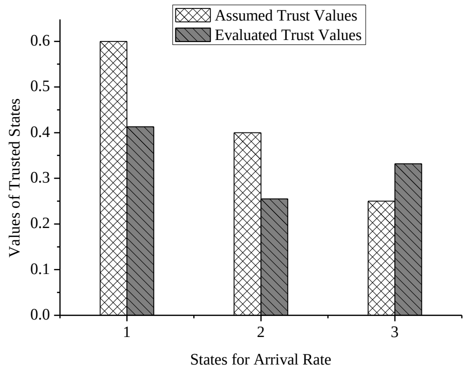

Fig 5: HMM base Emission probability for Arrival rate

Fig 6 shows Emission probability proposed by hidden markov model. In this figure HMM calculate departure rate of predicited arrival rate so that it will find out that how many messages is receving by other vehicles when arrival rate are shown in fig 5.

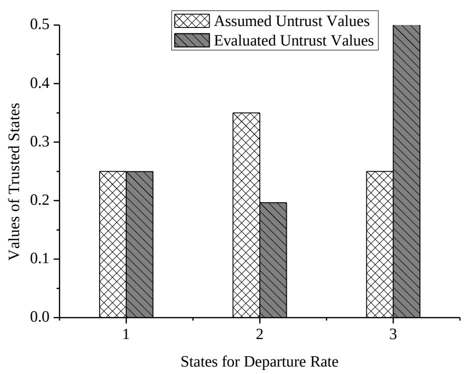

Fig 6: HMM base Emission probability for Departure rate

Fig 7 shows Emission probability proposed by hidden markov model. In this figure HMM calculate coomunication range of predicited arrival rate and departure rate so that it will find out that how many messages are not in the range are predicted in fig 5 and fig 6.

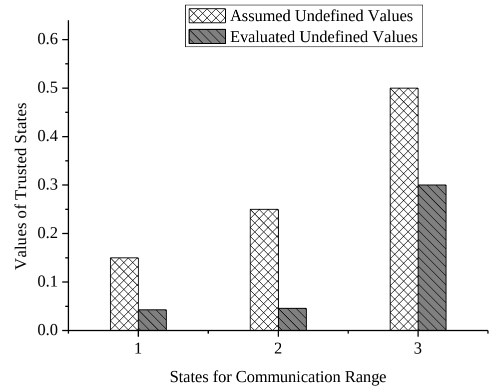

Fig 7: HMM base Emission probability for communication range

Viterbi Path:

It maximizes the probability of the state sequence for the given observation sequence. it is applied in forward and backward and find out best possibility for the states like trusted or untrusted.

Viterbi Path: 2 1 1

It means vehicles first will find that our path is in wrong direction and indicating that it is untrusted so vehicle will change path and go for next path and will find trusted and will follow direction so with the help of Viterbi, vehicles can justify our path so after that vehicles will justify and will go for the observation of these trusted path and will find out arrival rate, departure rate and communication range.

So this full working process is called as Hidden Markov Model for VANET Environment. And getting path are represent that that work is better as compare to others.

5. Conclusion

In this role, reputation system on the basis of message dissemination in VANET is presented. the propose model is able to evaluated the trust value of messages in the absence of infrastructure assistance. Reputation system is more viable due considers realistic VANET environment of message processing at entities of VANETs.

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