Mayank Bhatt et al. / International Journal of Engineering and Technology (IJET)

# Traffic Collision Avoidance in VANET Using Computational Intelligence

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*Abstract*—In current era technology expending its arteries to each and every field and in computer world arteries are known as a network. So as the numbers of vehicles are increasing in road the number of problem are arising too. In Computer network a technology known as MANET is used for moving nodes which allow the user to communicate without wired network. For further illustration researcher implemented in vehicles and it come up with a new technique known as VANET.VANET is used for making network possible in high speed and frequent topology changing environment. As the number of vehicles are increasing the chances of congestion, traffic jam, security are increasing too. This paper shows a technique to handle the congestion and find the optimal path to reach destination. Proposed method first find out the location and based on that it form a region so the optimal use of node is possible and the forwarding to invalid node will eliminate and energy will save.

*Keywords-* MANET, VANET, BAT algorithm

## I. Introduction

As the number of persons are connecting to the computer network day by day the communication medium challenges are also increasing. Network either it is mobile or computer both are the mandatory need for today folks. The number of mobile network user is drastically increasing which make a challenges to the network provider for the reliable communication and the data delivery in a best path. Researcher introduced a new technology which is known as MANET. MANET is a Mobile ad-hoc network which is used to communicate not only with stationary node but also with the mobile node.

As the number of mobile users are increasing the number of vehicles are increasing too so that means the user need their connectivity while they are in the move. By observing the demand of mobile network in vehicles the researcher introduced new phenomena VANET which is a sub part of MANET.

VANET stands for vehicle ad-hoc network which made the possible to communicate when node are in the high speed of mobility. VANET have various challenges because of its frequently changing topology but there is various methods are introduced by the researcher to resolve them but still the work is going on. Many IT and vehicle industries are working together to apply the use of VANET in market and to provide the user safety, reliable data exchange, route detection, security etc.one of highlighted challenges in VANET is to find the optimum route or to search the destination. Researchers are still working on to optimize the route or find the destination in VANET in reliable manner so the optimized rout should provide to the vehicle and the traffic collision gets reduced. In this report Bat algorithm to optimize the route in VANET is introduce. In proposed method first the location of destination node is finding by help of predictive method or GPS. GPS have some drawback area like line of site problem and budget constraints so mainly focused area is predictive based method. Second the region is formed based on the destination parameters and finding the valid nodes to provide path BAT .Third BAT will process the valid node and provide the best optimized result to the source node.

## II. Literature Review

(Zeadally S. et al, 2012) explained VANET, its working process and various fields where VANET is applied. Paper describes about the communication methods in VANET. Generally there is three types of communication is present those are inter-vehicle communication (it uses multihop to transmit the information to the other destination available part), Vehicle to roadside communication ((in this it use single hop broadcast to the all available destination vehicle. In this message send in a multi-hop fashion till the message not reached to the desired destination). Routing protocols are explained in paper is Proactive routing protocols (it use the link state routing and distance vector routing strategies ,these are used to make system update on routing among all nodes of a network even if network is not in currently use),Reactive routing protocols(dynamic source routing & AODV(ad hoc on demand distance vector )),these both are used to maintain the only route which is currently in use),Position Based routing(it only used to maintain the physical location information of participating neighbor nodes, Greedy Perimeter stateless routing and Distance Routing Effects algorithm for mobility defines the position based routing)). For application prospective Reactive routing protocols have more priority because they only focused on demand route which save the bandwidth of the network, for identifying and searching bases the

position based routing have a major role. conclusion of this paper is that it gave a introduction of VANET and showing in which the VANET is lacking and the various solutions that can be possible to solve the problems of VANET.

(Hasan et al, 2007) explained  how VANET is helpful for life of a human .in this a life safety message Is generated whenever the driver activity is changed like  If suddenly the speed increases or driving lane is changed the DSRC is help to generate the lifesaving warning to driver. The proposed protocol of this paper gives the highest priority to transmit the acknowledge signal to the vehicle when it is in difficult conditions. The choice of that vehicle is done locally based on the speed, direction, location and speed of nearest coming vehicle. Issues and solution in this paper is Broadcasting beyond the signal transmission range in which the DSRC recommended that the 10s is the communication range for a abnormal vehicle but if the vehicle behind the abnormal vehicle react aggressively than it self  it can be cause of generating lifesaving message, Hidden terminal problem says while communicating with the abnormal vehicle and nearest vehicle there can be collision occur due to hidden terminal problem when this collision happen the proposed algorithm shows a incomparable minimum latency, malicious message. Conclusion of this paper show the effective and reliable use of proposed protocol in VANET with minimum redundancy.

(Sarkar et al, 2014) explained about QOS (quality of service) metrics and about vehicular traffic management solutions for the safety in traffic. According to paper finding optimum path is very typical task for dynamic protocol and management of vehicle moment is quite complex. There is two categories are present to divide the routing protocols which are Table driven protocol and Source initiated on demand protocol. Table driven protocol maintain the position information of neighborhood vehicles and if any change occur it update the information of node, In source-initiated on demand protocols the source node firstly find the route of destination and destination reply on same path .Analysis of AODV, DSR, DSDV is also present on the basis of throughput, end to end delay and Packet deliver ratio. This paper concludes that DSR, AODV both give the appropriate result in city scenario.

(J. D et al, 2008) explained that how to solve the problem of drowsiness of a driver in vehicles. First they check whether the driver is in drowsy state or not for that they used the image processing. For checking the state of driver they installed a camera in  the front for taking the continues picture of driver face  than they take the help of their program which was already written on matlab than by collecting image data they used a fuzzy logic to alert the driver. In matlab program firstly they convert the RGB pixels to YCbCr because RGB have much brightness which can be cause of failure of eye detection so to solve they converted the image in YCbCr. Most important advantage of converting the image into YCbCr that effect of luminosity decreases and which provide help in image processing. After converting the image they set a threshold value. Threshold is an operation for enabling a pixel to black if value is below to the given threshold else it will set it white. After converting and setting the threshold value next step is to convert it into the binary image which help it to show the vivid appearance of the image. Next they detect the eye region by dividing the image in four regions the upper part of that divided section containing the eyes of driver. The whole process based on the collection of all pixels if black pixels are more than the eye is opened. By establishing grade of membership by entering mean of the eyes and standard deviation as input they conclude that eye is open, close or in a drowsy state. Limitation of this paper that it is not a proper solution if the light is too in day or at too much dark in night that time the proposed method in this paper cause an error.

(Rezwana Karim et al, 2008)explain about Vehicular connectivity and how VANET is suitable for Vehicular network application compared to other available system like cellular ,adhoc communication ,wireless LAN and Infosystem.it also discussed about the issue related to VANET like Routing issues ,spectrum issue(VANET have sort range of wireless connection ,FCC recently allocated the 75Mhz in the 5.9Ghz band for DSRC),security issues. In this paper they also showing about the two other contender of vehicular network 3g, Info-system. Routing is also a main concerning area of VANET it focused on to carry data and to forward it to next node or finding the next suitable path, 3 Main Routing algorithm are categorized which are  suitable for vehicular ad-hoc network is opportunistic forwarding ,trajectory based forwarding and graphical forwarding. Opportunistic forwarding work good with broadcasting but it fail when a routing is a single based node. Security and privacy are two both main factor need to be consider at time of designing the vehicular ad-hoc network. message changing ,path interruption ,denial of service all are effect the performance of VANET .two approaches are used for certificate security are used conventional revocation list approach and concept of validation tickets. About the conclusion that VANET is superior to other two available methods, No doubt 3g is more secure and provide continuous connectivity but it have high cost and limited bandwidth and latency, Info-system is perform high data rate but VANET replaced it with less delay in transmission.

(Xi, S. et al, 2008) explained the application of city traffic control in VANET is studied. The network work model used the DSR & DSDV two routing protocols of MANET. When comparing the both DSR and DSDV the result shows that delay is higher in DSR compared to DSDV when vehicles moving slowly the Route cost of

DSDV is less than DSR but whenever speed increases of the vehicle the Rout cost of DSDV is higher than the DSR. There for DSR (reactive routing protocol) is always good in VANET compared to proactive protocols.

(Shieh et al, 2014) explained Compact bat algorithm is used for solving the numerical optimization problem which is proposed in original Bat algorithm founded by Xin-She Yang .Bat have property to sense their prey by using their echolocation. Bat use the velocity and loudness to move in the free space for find the prey. Previous Bat algorithm is solved by the compact algorithm by reducing the some parameter which lead to the less memory usages.A probabilistic representation of the bat's behavior is inspired to apply for this proposed algorithm, In which they replaced population with the probability vector based on single competition .which lead to the entire algorithm functioning a modest memory usages .The advantage of compact algorithm is that they copy the behavior of the population based algorithm by enabling it, by this a smaller number of parameter is stored in memory so these algorithm need the less memory for running. In this paper the simulation compare both the algorithm original bat algorithm and the compact bat algorithm. The benefits of compact Bat for optimization algorithm used to develop the embedded device with small size, low price and best for present computing today.

(Dao, T. K et al, 2013) explained the modified versions of Bat algorithm which are wibull coded binary bat algorithm, Real Bat algorithm and hybrid of binary and real. They tried these algorithm to optimize the route in road network. They give the fixed path to the Bat so the bat will move to that reason. Bats is using its loudness of echo and finding its path according to the investigation criteria. Bat is the rout determination in a graph network. Conclusion that the variation of the bat is always possible which is totally based on the nature of problem.

### III.     PROPOSED ALGORITHM

Step1: for predicting the destination node location

Assumptions:-

1). Destination node went from the source node

2). Velocity Vi, Direction $\Theta$, current coordinate, Time of passing terminal

NOTE-Current coordinate can also be fetched by the position of the source terminal

By Mathematic formula-

If velocity V is known and the time t is available then

Distance = speed × Time;

$$d = v \times t$$

$\Theta$ is known then by help of trigonometry-

$$\sin\Theta = \frac{l}{d}; l = d \times \sin\Theta \qquad \text{(1)  ( x coordinate )}$$

$$\tan\Theta = \frac{l}{b}; b = \frac{l}{\tan\Theta} \qquad \text{(2)  ( y coordinate )}$$
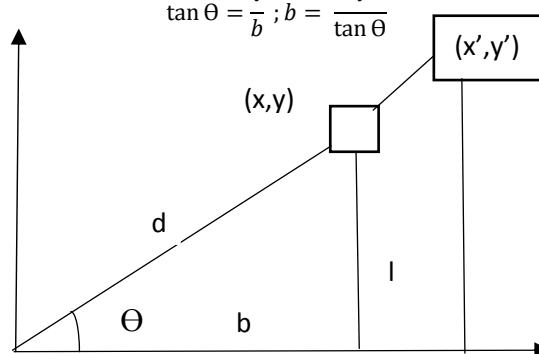


Figure 1: Location of Destination Node

(l,b) are (x,y) coordinates.

If the node change its position from (x,y) coordinate to (x',y') than for that location it will use predictive location based routing method to find those coordinate by last two updates  or it can calculate that with same using trigonometry method

Step2:- Cluster or a region formation

1. Destination coordinate are (x, y)

2. Form the cluster of (x, y) region

3. Detect the valid nodes

While (L1, L2)! =(x, y)

{

If (L1<=x)

{

If (L2<=y)

{

Marked the node as a valid node

Store the information of connected node & the degree of that node

}

}

Else

Marked that node as invalid and do not process further;

Break;

Possible condition can occur-

Table 1: Possible Condition can occur

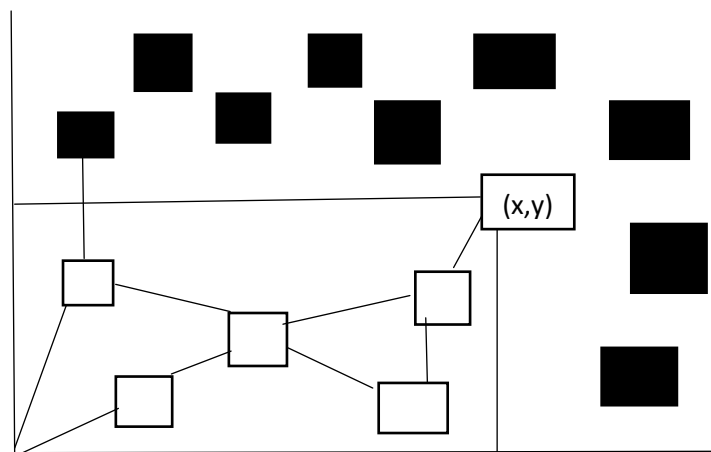| X | Y | L1 | L2 | |
|---|---|----|----|-------------|
| 5 | 6 | 3  | 4  | Valid       |
| 5 | 6 | 9  | 2  | Invalid     |
| 5 | 6 | 5  | 6  | Destination |
| 5 | 6 | 7  | 8  | Invalid     |

Fig 2:  Valid and invalid node

Step 3:-Bat algorithm process

1. First all the information of node will provide to the Bat

2. Bat process for the first node and check for the degree of that node

if (degree of node 2 or more|)

{

Bat will process the next connected node till the node degree!=1;}

if (degree=1&&(L1,L2)==(x,y))

Marked it as destination node;

3. Bat process the node which are lying inside the region and note down the energy, distance or hop count till the destination not found.

4. Bat Process each node and bat checks the connected node and calculate the fitness value for reaching every next node.

Step4:- on the basis of route destination the best path will calculated by Bat and it will informed to the source node .Source node take further action according to their problem.
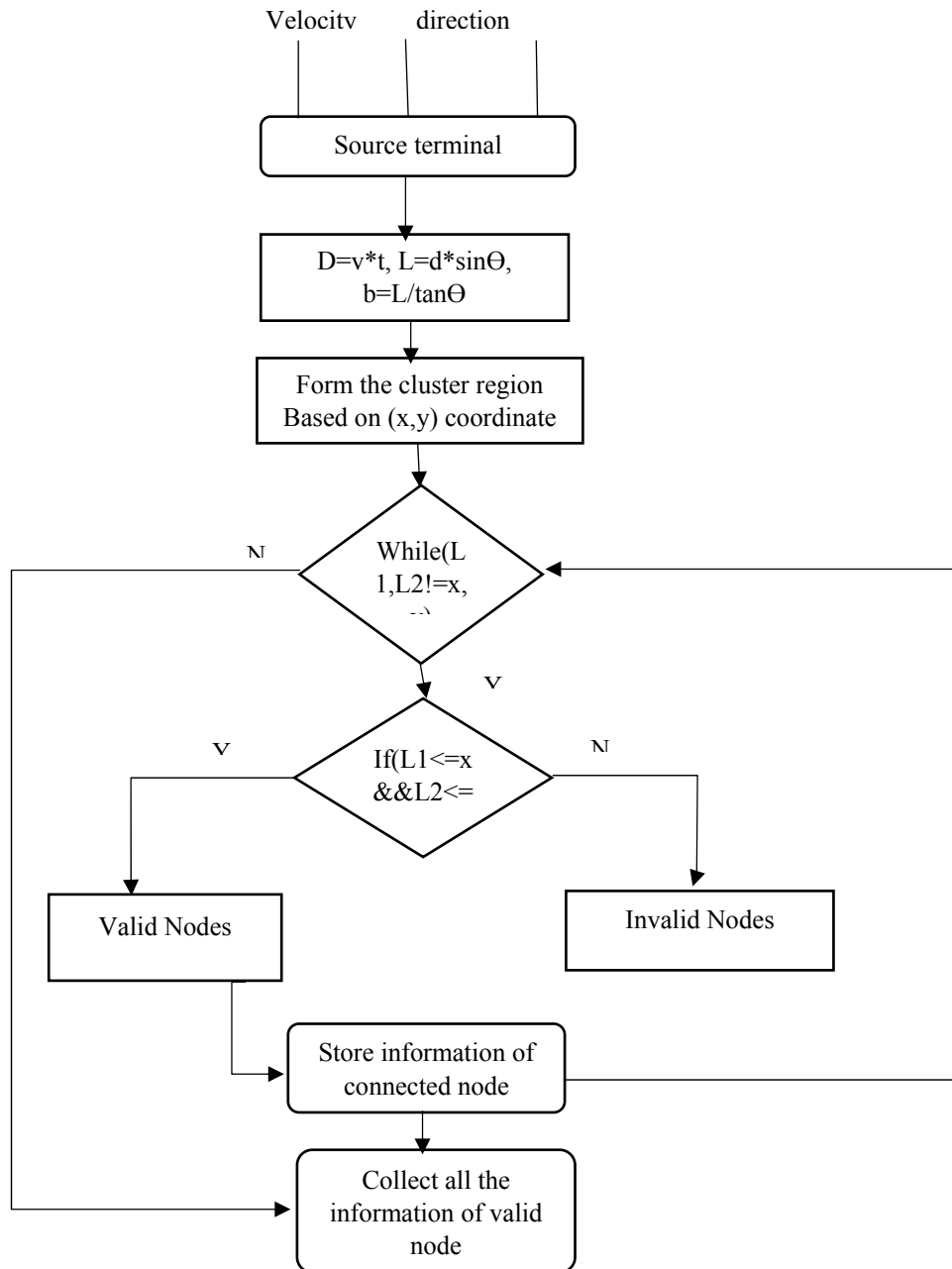


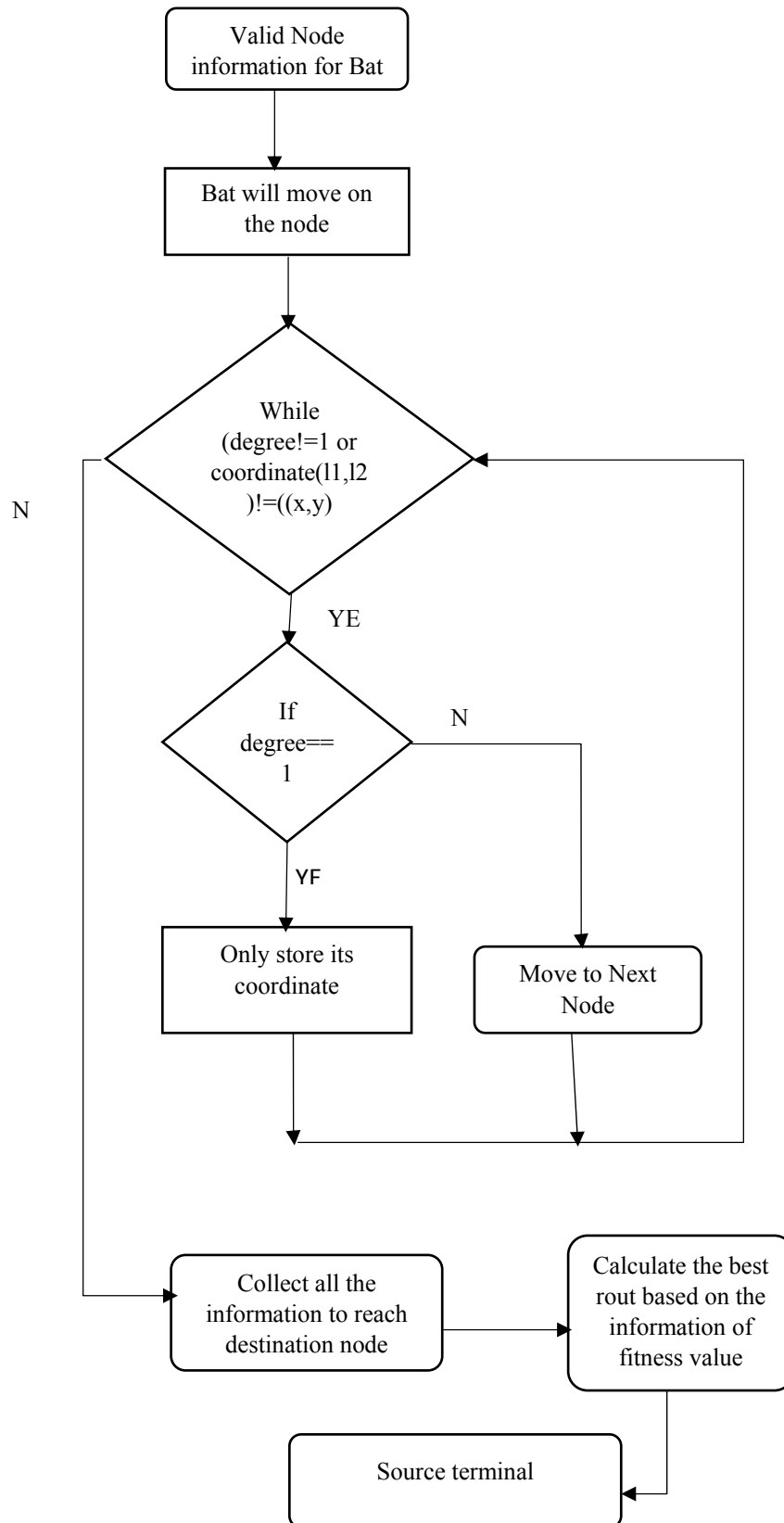Fig 3: Identification of Candidate Solutions

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                      ┌─────────────────┐
                      │  Valid Node     │
                      │ information for Bat│
                      └─────────────────┘
                             │
                      ┌─────────────────┐
                      │  Bat will move on│
                      │   the node      │
                      └─────────────────┘
                             │
                         ◇ While
                   (degree!=1 or
                   coordinate(l1,l2
        N          )!=((x,y)
                         │ YE
                      ◇ If
                   degree==         N
                      1
                         │ YF
              ┌──────────────┐   ┌──────────────┐
              │ Only store its│   │ Move to Next │
              │  coordinate  │   │    Node     │
              └──────────────┘   └──────────────┘

    ┌──────────────┐      ┌──────────────┐
    │ Collect all the│    │ Calculate the best│
    │ information to reach│ │ rout based on the│
    │ destination node│    │ information of │
    └──────────────┘      │  fitness value │
                          └──────────────┘
           ┌──────────────┐
           │ Source terminal│
           └──────────────┘
```

Fig 4: Selection of Optimal Solution using BAT algorithm

## IV.    CONCLUSION

VANET used for safety purpose, entertainment purpose and for the tracking purpose. The proposed method in this report is a combination of VANET and the Bat algorithm. Bat Algorithm is used to find out the best optimal solution for finding the route. Proposed method first divide the region after getting the coordinate of destination node which is used to verifying the valid nodes. Valid nodes are to helpful to save the resources because proposed method is defining the region so that Bat will only process valid node. This method can be emended by any application related to track the position of the destination node or it can used for delivery the data or moving the other vehicle what is the optimal and best path.

### References

[1]   Ahmed Soomro, I., Hasbullah, H., & Ab Manan, J. L. (2010). Denial of Service (DOS) Attack and Its Possible Solution in VANET. 2010
[2]   Al-Sultan, S., Al-Bayatti, A. H., & Zedan, H. (2013). Context-aware driver behavior detection system in intelligent transportation systems. Vehicular Technology, IEEE Transactions on, 62(9), 4264-4275.
[3]   Dao, T. K., Pan, J. S., Chu, S. C., & Shieh, C. S. (2014). Compact Bat Algorithm. In Intelligent Data analysis and its Applications, Volume II (pp. 57-68). Springer International Publishing.
[4]   Das, S., Raw, R. S., Das, I., & Sarkar, R. (2014). Performance analysis of routing protocols for VANETs with real vehicular traces. In Intelligent Computing, Networking, and Informatics (pp. 45-56). Springer India.
[5]   Farooq, M. U., Khan, K. U. R., & Pasha, M. (2012, March). Integration of vehicular roadside access and the internet: Challenges & a review of strategies. In Devices, Circuits and Systems (ICDCS), 2012 International Conference on (pp. 568-571). IEEE.
[6]   Karim, R. (2008). VANET: Superior system for content distribution in vehicular network applications. Rutgers University, Department of Computer Science, Tech. Rep.
[7]   Kumar, V., Mishra, S., & Chand, N. (2013). Applications of VANETs: Present & Future. Communications and Network, 5(01), 12.
[8]   Nagargoje, S., & Shilvant, D. S. (2015). Drowsy Driver Warning System Using Image Processing. International Journal, 3(3), 13-18.
[9]   Pan, J. S., Dao, T. K., Kuo, M. Y., & Horng, M. F. (2014). Hybrid Bat Algorithm with Artificial Bee Colony. In Intelligent Data analysis and its Applications, Volume II (pp. 45-55). Springer International Publishing.
[10]  Park, J. J. J. H., Stojmenovic, I., Jeong, H. Y., & Yi, G. (Eds.). (2014).Computer Science and Its Applications: Ubiquitous Information Technologies (Vol. 330). Springer.
[11]  Sampigethaya, K., Huang, L., Li, M., Poovendran, R., Matsuura, K., & Sezaki, K. (2005). CARAVAN: Providing location privacy for VANET. WASHINGTON UNIV SEATTLE DEPT OF ELECTRICAL ENGINEERING.
[12]  Sur, C., & Shukla, A. (2013, December). Adaptive & Discrete Real Bat Algorithms for Route Search Optimization of Graph Based Road Network. InMachine Intelligence and Research Advancement (ICMIRA), 2013 International Conference on (pp. 120-124). IEEE.
[13]  Taha, M. M., & Hasan, Y. M. (2007, December). VANET-DSRC protocol for reliable broadcasting of life safety messages. In Signal Processing and Information Technology, 2007 IEEE International Symposium on (pp. 104-109). IEEE.
[14]  Tee, C. A. T. H., & Lee, A. C. (2008, October). Survey of position based routing for Inter Vehicle Communication system. In Distributed Framework and Applications, 2008. DFmA 2008. First International Conference on (pp. 174-182). IEEE.
[15]  Wu, J. D., & Chen, T. R. (2008). Development of a drowsiness warning system based on the fuzzy logic images analysis. Expert Systems with Applications, 34(2), 1556-1561.
[16]  Luhach, A. K., & Luhach, R. (2015). Research And Implementation Of Security Framework For Small And Medium Sized E-Commerce Based On Soa. Journal Of Theoretical And Applied Information Technology, 82(3).
[17]  Luhach, A. K., Dwivedi, S. K., & Jha, C. K. (2014, December). Applying SOA to an E-commerce system and designing a logical security framework for small and medium sized E-commerce based on SOA. In Computational Intelligence and Computing Research (ICCIC), 2014 IEEE International Conference on (pp. 1-6). IEEE.
[18]  Devi, T. K., Sharma, S., & Prakash, A. (2015). Euler's Totient based Group Formation Scheme in VANET. International Journal of Computer Applications, 120(5).
[19]  Kaur, M., Sharma, S., & Prakash, A. (2015). A Novel Token based DME Algorithm in MANET. International Journal of Computer Applications, 120(5).
[20]  Bansal, P., Sharma, S., & Prakash, A. (2015). A Novel approach for Detection of Distributed Denial of Service attack in VANET. International Journal of Computer Applications, 120(5).