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A Sustainable Traffic Management and Intelligent Transport Systems

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***Abstract*— In modern world road infrastructures are become incapable of handling the rapid traffic growth in metro cities. Nowadays the growing vehicle population increased more traffic congestions in the world. To solve this traffic congestion problem, more advanced approaches like Traffic Management Systems and Intelligent Traffic Control Systems are required. A basic of Network analysis is in connection with traffic issues is explored. The Shortest path problem is more inevitable for solving congestion control issues. In this paper a new Traffic and Intelligent Transport Systems designed with A* Algorithm for finding shortest path in the road network. This system will reduce the congestion control over the traffic. The Road Traffic range can be increased many times and Travelers can be guided appropriately to reach the destination. So we use the methods of shortest path and Advanced Intelligent Traffic Management System(AITMS)in saving traveling Time, traveling Distance, reduce the fuel consumption and saving our environment from the pollution like Noise pollution and Air pollution.**

Index Terms*— Advanced Traffic Management System, Intelligent Traffic Control system, Road Network, Traffic Congestion, A* Algorithm, Wireless Sensor, Intelligent Routing.

I. INTRODUCTION

Shortest path problems are more inevitable in Real Road Network application such as optimal Rout finding and Traffic guiding System. In the Road, the traffic is changing from Time To Time period. It needs to sense the Real Time traffic the wireless sensor camera is used at that path. To service the huge amount of request arrived at a time in real time traffic. This system uses A* Algorithm as the best shortest path algorithm. This algorithm accept huge request and find the optimal path. Suppose we have heavy traffic in one path, this algorithm will find the alternate solution (alternate optimal path). So this will improve the reduction of road traffic congestion.

The congestion over road traffic is intimated by the advanced traffic management system and it monitors the traffic congestion and it provides real time adjustment to control the traffic. This system will result optimal traffic flow rates and respond to incident quicker with more efficiency. Some examples for Advance Traffic Management System is Coordinated signal System, Traffic Management System, Traffic Surveillance System based on image processing. AITMS application is to coordinate traffic flow ,to reduce travelling time and to avoid the road crash.

The advance Intelligent Traffic control system guides the traffic management system. The Intelligent transport system (ITS) consists of image processing accomplished by density identification for routing of traffic which is inadequate in most circumstances like fog, rain and dust etc. The other descriptive system which is based on interaction of vehicles but this technique will not be practically implemented because million of vehicles are on the road. This technique will improve the real road network.

ITS architecture provides a framework for the need of improvement of the surface transportation infrastructure. It creates the enormous impact that includes alleviation of traffic congestion thereby developing operation management with the support of public safety goals such as accident avoidance.

II. LITERATURE SURVEY

Various methodologies have been proposed and research is done in the area of AITMS. Also many advanced techniques have been introduced for intelligent traffic state estimation. Some research work is illustrated below:

Ben W. Kolosz et al.[4] reviewed to identify the fundamentals and challenges of ITS performance evaluation, focus the main dissimilarity with established technologies for standard schemes. These have been used to determine four performance cornerstones for ITS are as follows: 1) Data Management and IC, 2) Sustainability, 3) Standardization, and 4) Adaptability. Paulo Rog´erio Pereira et al.[9] developed the advanced routing mechanisms, scheduling and dropping schemes, traffic distinction, system localization, related time estimation, stationary relay nodes, and caching mechanisms may provide important outcome merits to VDTNs.

Vicente Milanés et al.[1] presented a V2I-based Traffic Management System with the approach to develop for better traffic flow in urban areas like vehicle's safe , comfortable distance and speed adjustments. Atsushi Yamamoto et al.[8] obtained the inference path-loss formulas for the study of the propagation losses and it has

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been obtained by statistically processing the data for the different heights of the antennas in the LOS (the normal communication condition) and NLOS cases.

Kit Yan Chan et al.[2] developed short-term traffic flow predictors, which can adapt to the time-varying traffic flow data and the time varying configurations of on-road sensor systems. Bashir Muhammad Sa'ad et al.[5] proposed excellent visible BLC prototype with the help of self assembling nano-particle technology based MM film has high transparency, a measured 38.8% fractional bandwidth, calculated coupling and transmission of and a return loss and isolation better than 10 dB. Although the design manifest some discrepancies between simulated and measured values, they were however, within an suitable range Katsunori Ebihara et al.[7] proposes the feasibility of layered space-time coding (STC) in an outdoor image-sensor-based (ISbased) transperant light communication (TLC) technique with the advantage of LEDs array.

Jeong-Ah Jang et al.[11] used the traffic conflict technique (TCT) for estimating "near-accident" collisions at intersections and expands the concept with the aim of improving drivers' comfort, convenience, and safety.Zijie Zhang et al.[3] found that the information of propagating action in wireless communication networks formed by auto mobiles traveling on a highway and obtained the formula for corresponding to dissimilar roads of the highway and different sort of vehicles.

Prajakta Desai et al[15].proposed a practical multipath-based approach, which is designed to achieve acceptable route allocation within a short time frame and with low communication overheads and Route Allocation using Virtual Agent Negotiation (CARAVAN).Kanok Boriboonsomsin et al.[16] described the fuel and emission saving benefits which attract the drivers more to the eco-routing navigation system.

Hua Cai et al.[13] presented Roadside ITS Data Bus Prototype for better communication service on an intelligent highway. Victor Corcoba Magaña et al.[10] determined one of the major benefits of the system in order to save fuel is its ability to smoothen deceleration patterns . This system predicts the positive improvement on fuel consumption when the system is used regularly by drivers. Taimoor Abbas et al.[12]prescribed a measurement-based analysis with the impact of antenna placement on vehicle-to-vehicle communications. It provides a best solution for obtaining the best reception performance in most of the propagation environments. Myriam Neaimeh et al[14]. presented the great impact of how to minimize the energy consumption and giving trust to the drivers that they will reach the destination by providing the information of best route available. It also predict the possible range of and Ev's in terms of how they react with certain speeds to reduce the anxiety.

III. RELATED WORKS

AITMS system involves to intimate details of traffic routing for each intersection junction based on wireless sensor network. The system has a central microcontroller at every junction which accepts the data from tiny wireless sensor nodes place on the road. The sensor nodes can detect the presence of vehicle and the transmitter transmits the traffic density to the central programmable microcontroller. The microcontroller makes use of the A* algorithm to find ways to manage and regulate traffic in a systematic manner efficiently.

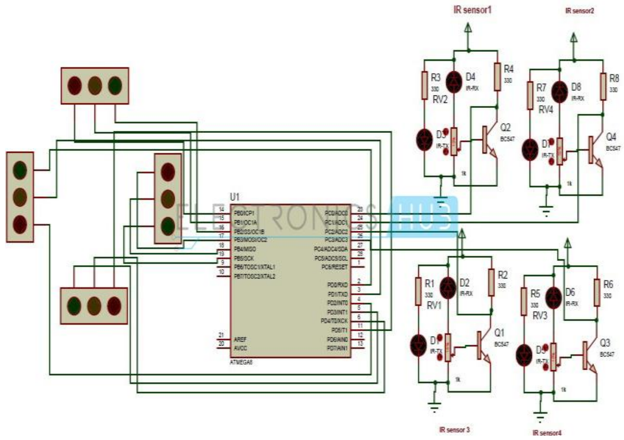

Figure 1: Density Based Traffic Signal System Circuit Diagram

Figure 1 depicts main heart of AITMS . If there is a traffic on road then the sensor outputs logic 0 otherwise logic 1.IR sensors are connected to the PORT C (PC0, PC1, PC2, and PC3) of the microcontroller and traffic lights are connected to PORT B and PORT D.. By receiving the outputs, the traffic system is controlled based on the outputs.

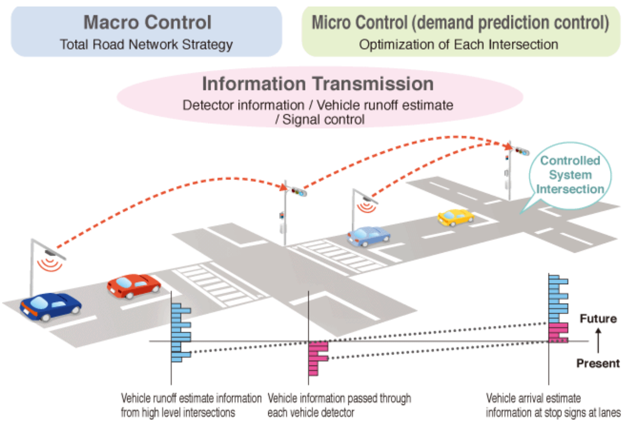

Figure 2:The Outline for the traffic signal control system MODERATO-S

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Figure 2 describes the Signal Control Algorithm "MODERATO-S". It makes the optimal signal control to minimize the waiting time at intersections. The macro control controls the overall road network by the central device of traffic control centers.

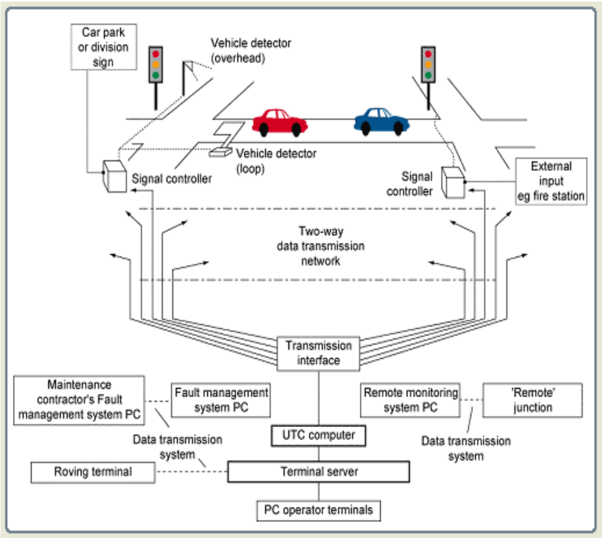

Figure 3: Advance Traffic Management System

Figure 3 depicts the improvement of the flow of vehicle traffic and improves the safety. Real-time traffic data from cameras, speed sensors, etc. flows into a Transportation Management Centre which may result in actions with the goal of improving traffic flow.

IV. PROPOSED WORK

In this paper we propose Advanced Traffic Management System which uses A* Algorithm for finding optimal path. A* is a shortest path Algorithm to find optimal path in road traffic.

In A* algorithm starting vertex is denoted as Source Node and pointing the Destination node. Initially the source node does not have any weight value. We assign the value for that source node. Each edge is denoted as path with some non negative weight value. In starting step assign the source node value as zero. In real time many request are accepted and then assign the initial node (initial junction) so this algorithm finds the shortest path and gives the response to the corresponding request. In the proposed AITMS system, we find the solution to locate where the traffic is occurred, using sensor.

Here the sensor is placed in every junction then the sensor captures the visual image for traffic congestion and transmits the data to the microcontroller through wireless transmitter medium. The microcontroller receives the input and processes that data and gives immediate intimation to ITS and this result is sent back to the A* algorithm. Then the algorithm immediately finds another optimal path. This technique will improve traffic flow network over the heavy traffic congestion.

V. A* ALGORITHM

A. Description

A* uses a best-first search and finds a least-cost path from a given initial node to out of one or more possible goals. As A* traverses the graph, it builds up a tree of partial paths. The *open set* or *fringe* of the tree are stored in a priority queue that orders the fringe based on the cost function, which combines a heuristic estimate of the cost to reach a goal and the distance traveled from the initial node. Specifically, the cost function is $g(n)$.

We maintain two lists: OPEN and CLOSE:

OPEN consists on nodes that have been visited but not expanded (meaning that sucessors have not been explored yet). This is the list of pending tasks.

CLOSE consists on nodes that have been visited *and* expanded (sucessors have been explored already and included in the open list, if this was the case).

```
1  Put node_start in the OPEN list with f(node_start) = h(node_start) (initialization)
2  while the OPEN list is not empty {
3    Take from the open list the node node_current with the lowest
4        f(node_current) = g(node_current) + h(node_current)
5    if node_current is node_goal we have found the solution; break
6    Generate each state node_successor that come after node_current
7    for each node_successor of node_current {
8      Set successor_current_cost = g(node_current) + w(node_current, node_successor)
9      if node_successor is in the OPEN list {
10       if g(node_successor) ≤ successor_current_cost continue (to line 20)
11     } else if node_successor is in the CLOSED list {
12       if g(node_successor) ≤ successor_current_cost continue (to line 20)
13       Move node_successor from the CLOSED list to the OPEN list
14     } else {
15       Add node_successor to the OPEN list
16       Set h(node_successor) to be the heuristic distance to node_goal
17     }
18     Set g(node_successor) = successor_current_cost
19     Set the parent of node_successor to node_current
20   }
21   Add node_current to the CLOSED list
22 }
23 if(node_current != node_goal) exit with error (the OPEN list is empty)
```

Figure 5:A* Algorithm

Here, $g(n)$ is the known cost of getting from the initial node to n; this value is found out by the algorithm. $h(n)$ is a heuristic estimate of the cost to get from n to any goal node. For the algorithm to find the real shortest path, the heuristic function must be admissible, meaning that it never overestimates the actual cost to get to the nearest goal node. The heuristic function is problem- specific must be expanded by the user of the algorithm.

For example, in an application like routing, $h(x)$ might represent the straight-line distance to the goal, since that is physically the smallest possible distance between any two points.

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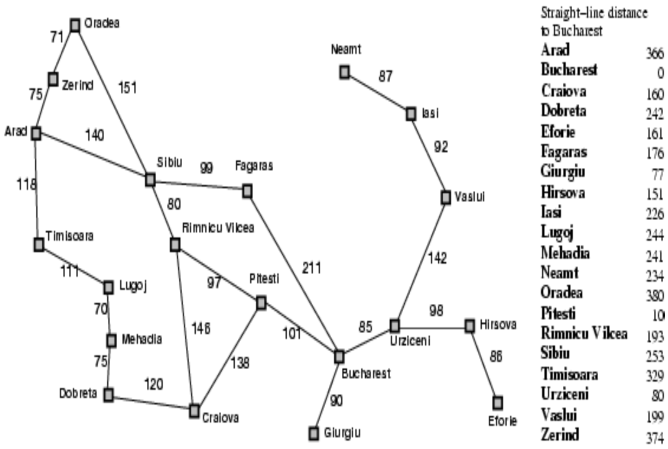

Figure 6:Example of straight line distance calculation.

COMPARISON BETWEEN A & DIJKSTRA'S ALGORITHM*

Dijkstra's algorithm works by visiting vertices in the graph starting with the object's initial point. It then repeatedly test and check the closest not-yet-examined vertex, adding its vertices to the set of vertices to be examined. It expands outwards from the starting point until it reaches the goal. Dijkstra's algorithm is mainly used to provide a assurance to finding the shortest path from the initial point to the goal, as long as none of the edges have a negative cost. (I write "a shortest path" because there are often multiple equivalently identical -short paths.) In the following figure, the pink square is the starting point, the blue square is the goal, and the teal areas show what areas Dijkstra's algorithm examined. The lightest teal areas are those very distance from the starting point, and thus form the "frontier" of study:

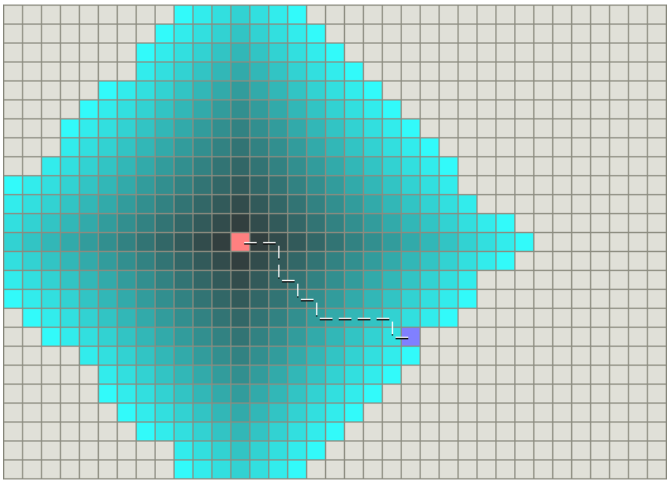

Figure 7:Resultant graph of Dijkstra's algorithm

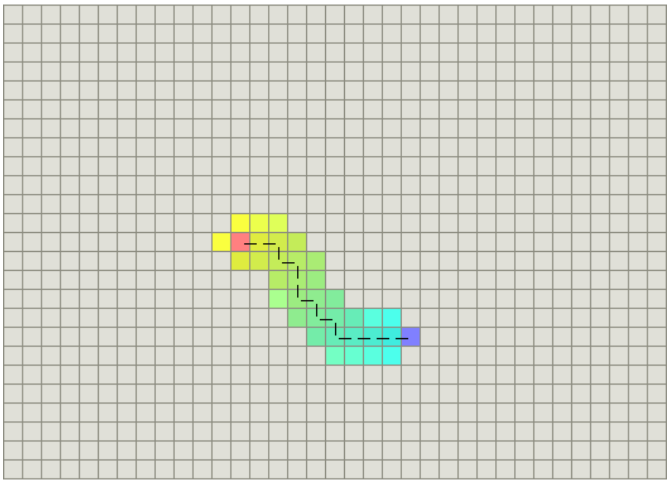

Figure 8: Resultant graph of Greedy Best-First-Search

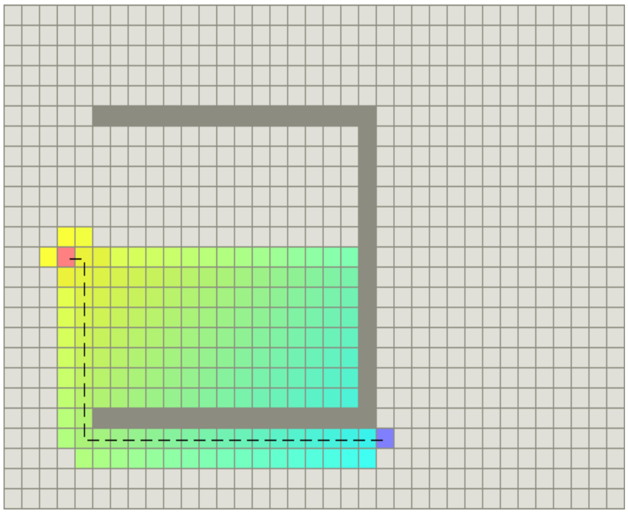

Figure 9: Resultant graph of A* Algorithm

In the example with a concave obstacle, A* finds a path as good as what Dijkstra's algorithm found:

The secret of its success is that it closely joined all the pieces of information that Dijkstra's algorithm uses (favoring vertices that are close to the initial point) *and* information that Greedy Best-First-Search uses (favoring vertices that are very near to the goal). In the standard terminology used when talking about A*, g(n) represents the *exact cost* of the path from the starting point to any vertex n, and h(n) represents the heuristic *estimated cost* from vertex n to the goal. In the above pictorial respresentaions , the yellow (h) represents vertices very distance from the goal and teal (g) represents vertices far from the initial point. A* balances the two as it moves from the initial point to the goal. For each and every time it travel through the main loop, it examines the vertex n that has the lowest $f(n) = g(n) + h(n)$.

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EXPERIMENTAL RESULT

CONCLUSION

In the above concept A* algorithm give time complexity is best compare to another shortest path algorithms. So we use this algorithm for finding optimal path in efficient manner. And we include the concept are ITS, AITMS. The result for above concept is intimate the real time traffic congestion that is where the traffic is present. If the traffic is present in founded path it will automatically intimated by the advance concepts then the shortest path algorithm immediately find alternate path. This technique will improve the Real Road Traffic Management, Traffic flow network, and also improve the save travel time, travel distance and mainly avoid heavy traffic congestion. This technique involve most importantly save our environment from the pollution like Noise pollution, Air pollution.

REFERENCE

[1] Vicente Milanés, Jorge Villagrá, Jorge Godoy, Javier Simó, Joshué Pérez, and Enrique Onieva," An Intelligent V2I-Based Traffic Management System" IEEE Transactions on Intelligent Transportation Systems, VOL. 13, NO. 1, March 2012

[2] Kit Yan Chan, Member, IEEE, Tharam S. Dillon, Life Fellow, IEEE, and Elizabeth Chang, Senior Member, IEEE, "An Intelligent Particle Swarm Optimization for Short-Term Traffic Flow Forecasting Using on-Road Sensor Systems", IEEE Transactions On Industrial Electronics, VOL. 60, NO. 10, October 2013

[3] Zijie Zhang, Member, IEEE, Guoqiang Mao, Senior Member, IEEE, and Brian D. O. Anderson, Life Fellow, IEEE ," Stochastic Characterization of Information Propagation Process in Vehicular Ad hoc Networks", IEEE Transactions On Intelligent Transportation Systems, VOL. 15, NO. 1, February 2014

[4] Ben W. Kolosz and Susan M. Grant-Muller, Member, IEEE, "Appraisal and Evaluation of Interurban ITS: A European Survey" , IEEE Transactions On Intelligent Transportation Systems, VOL. 16, NO. 3, June 2015

[5] Bashir Muhammad Sa'ad, Sharul Kamal Abdul Rahim, Senior Member, IEEE, Thomas Peter, Member, IEEE, Mohd Subri Bin Abdul Rani, Siti Fatimah Ausordin, Dayang Norulfairuz Abang Zaidel, and Chandarasekaran Krishnan , "Transparent Branch-Line Coupler Using Micro-Metal Mesh Conductive Film", IEEE Microwave And Wireless Components Letters, Vol. 24, No. 12, December 2014

[6] Naoya Kosaka and Gosuke Ohashi, Member, IEEE, " Vision-Based Nighttime Vehicle Detection Using CenSurE and SVM", IEEE Transactions On Intelligent Transportation Systems, VOL. 16, NO. 5, October 2015

[7] Katsunori Ebihara, Student Member, IEEE, Koji Kamakura, Member, IEEE, and Takaya Yamazato, Member, IEEE ,"Layered Transmission of Space-Time Coded Signals for Image-Sensor-Based Visible Light Communications", Journal Of Lightwave Technology, VOL. 33, NO. 20, October 15, 2015

[8] Atsushi Yamamoto, *Member, IEEE*, Koichi Ogawa, *Senior Member, IEEE*, Tetsuo Horimatsu, *Member, IEEE*, Akihito Kato, *Member, IEEE*, and Masayuki Fujise, *Member, IEEE*, "Path-Loss Prediction Models for Intervehicle Communication at 60 GHz", IEEE Transactions On Vehicular Technology, VOL. 57, NO. 1, January 2008.

[9] Paulo Rog´erio Pereira, *Member, IEEE*, Augusto Casaca, *Senior Member, IEEE*, Joel J. P. C. Rodrigues, *Senior Member, IEEE*, Vasco N. G. J. Soares, *Student Member, IEEE*, Joan Triay, *Student Member, IEEE*, and Cristina Cervell´o-Pastor "From Delay-Tolerant Networks to Vehicular Delay-Tolerant Networks", IEEE Communications Surveys & Tutorials, VOL. 14, NO. 4, Fourth Quarter 2012.

[10] Victor Corcoba Magaña and Mario Muñoz-Organero, Member, IEEE," Discovering Regions Where Users Drive Inefficiently on Regular Journey", IEEE Transactions On Intelligent Transportation Systems, VOL. 16, NO. 1, FEBRUARY 2015 .

[11] Jeong-Ah Jang, Keechoo Choi, and Hanbyeog Cho," A Fixed Sensor-Based Intersection Collision Warning System in Vulnerable Line-of-Sight and/or Traffic-Violation-Prone Environment ",IEEE Transactions On Intelligent Transportation Systems, VOL. 13, NO. 4, December 2012.

[12] Taimoor Abbas, Student Member, IEEE, Johan Karedal, and Fredrik Tufvesson, Senior Member, IEEE , "Measurement-Based Analysis: The Effect of Complementary Antennas and Diversity on Vehicle-to-Vehicle Communication", IEEE Antennas And Wireless Propagation Letters, VOL. 12, 2013

[13] Hua Cai and Yingzi Lin, "A Roadside ITS Data Bus Prototype for Intelligent Highways" ,IEEE Transactions On Intelligent Transportation Systems, VOL. 9, NO. 2, June 2008

[14] Myriam Neaimeh, Graeme A. Hill, Yvonne Hübner, Phil T. Blythe ,"Routing systems to extend the driving range of lectric vehicles ",IET Intelligent Transport Systems, ISSN 1751-956X,July 2013.

[15] Prajakta Desai, Member, IEEE, Seng W. Loke, Aniruddha Desai, Member, IEEE, and Jugdutt Singh, Member, IEEE, "CARAVAN: Congestion Avoidance and Route Allocation Using Virtual Agent Negotiation ",IEEE Transactions On Intelligent Transportation Systems, VOL. 14, NO. 3, September 2013 .

[16] Kanok Boriboonsomsin, Matthew J. Barth, Senior Member, IEEE, Weihua Zhu, Member, IEEE, and Alexander Vu , "Eco-Routing Navigation System Based on Multisource Historical and Real-Time Traffic Information" ,IEEE Transactions On Intelligent Transportation Systems, VOL. 13, NO. 4, December 2012.