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A Novel Approach for Congestion Control in War State Battle Field Using Cloud Sensor for Collision Detection and Prevention

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Abstract

War State Battle Field is the basement of the military action. Battle Field is very significant for commanders to considerate and make full use of it in decision-making. This is basically depend on the vehicular traffic control in war state battle field. In this the tanks represents a vechicle. A tanks traffic on war state battle field is a vital problem and is seemly a major pretend to conclusion makers. In this research paper we will try to bring the scenario of battle field arena where the traffic consists of the vehicles called tanks. So the main focus in this research is put on the collision detection of the tanks among each other using cloud sensor by controlling the congestion in the battlefield.

Keywords: *War State Battle Field, cloud sensor, cloud computing, congestion control, collision detection & prevention*

1. Introduction

The Cloud computing is very famous in recent years. Many connected computers distributed over a network at the same time in cloud computing. It is combination of Grid Computing and Cluster Computing [1]. Cloud computing provide services, shared resources or common infrastructure on demand through internet. Service provider provides the facilities on pay per use policy. Cloud computing has been evolved as the future generations computing paradigm. Customer can use storage space, processing capabilities, servers, operating system and application development environments. User can scale up and down the resources in an instant (timely) and on-demand manner in cloud [2]. Cloud computing allows the systems and users to use Platform as a Service (PaaS), Infrastructure as a Service (IaaS), Software as a Service (SaaS) [3]. Based on resource ownership, Cloud computing comes in three forms: public clouds, private clouds and hybrid clouds [4].

In this paper traffic over-crowding is a critical trouble in many urban centres across the universe. The existing methods are not accurate in terms of performance and cost for traffic management and control. Urban region have a more problem of traffic crushes, particularly when a bit of conjunctions take into thoughtfulness. [5]. The traffic signal is typically controlled by a controller inside a cabinet climbed on a concrete grid. Some electro-mechanical controllers are still in use [6]. Traffic control will turn a real significant topic in the hereafter when the number of road user's increases. There are several models for traffic simulation. Huge amount of traffic cause waiting and accidents. Due to heavy traffic emergency vehicles face adversities.

The traffic is not only the traffic which in considered to be on roads consisting cars, trucks bikes etc. The traffic can be in other means too e.g. air traffic where the aeroplanes and helicopters are considered to mean of communication, army vehicles traffic when going to wars etc. There are various number of traffic systems that can be considered for our research.

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But in this research we won't be considering the normal traffic of which we were talking about earlier. In this research we will try to bring the scenario of battle field arena where the traffic consists of the vehicles called tanks. The tanks in the battlefield are considered to be in motion in one direction one after the other reaching the battlefield area and shelling from the present motioned place to the other side. So the main focus in this research is put on the collision detection of the tanks among each other by controlling the congestion in the battlefield by bringing the concept of collision detection and avoidance through the algorithm which takes the speed factor as the major priority. Not only the collision is detected and avoided also the whole battlefield scenario is brought in light where tanks are shelling too.

In Battlefield Monitoring System [7] Cloud sensors and moving tanks communicate with each other and the moving tanks pass the message to fusion centre. The cloud sensors and moving tanks are powered devices. The simulation is created using the java code.

2. Literature Survey

2.1 The distributed treatment of traffic information collection system is realized. In [8] paper author discussed the essential troubles in the effectuation and referred settlement schemes. This project used in working client's power, net analysis sites planning and time synchronization among nodes.

2.2 Self-scheduling collects incoming vehicles into critical clusters. Author proposes [9] unfolded conclusion insurances that besides integrate look-ahead of upcoming vehicle platoons. The simulation effect show that the gain of this access is simple queue solving. The formation of "green waves" vehicles run through the road network without halting and amending overall traffic runs.

2.3 The Intelligent Traffic Control Unit focuses on three areas-Ambulance, Priority vehicles and Density control [10]. In Ambulances radio frequency identification concept is applied to fix the Ambulances track Green. The outcomes distinctly state that gamiest priority is granted to the ambulance. Secondly in priority vehicles infrared transmitter and receiver are used to make the vehicle track Green. In the third part IR and photodiodes are used in the line of sight to detect the density at the traffic signal.

2.4 This theme [11] suggests a method for accurately calculating the routine of vehicles on a route at daylight. The running aims are evoked from a frame-differencing algorithm and the data from grain unit members. The algorithm acts well below hard road traffic conditions such as traces, flora and big trucks. The most significant trinket of the aimed method is the vestiges handling utilizing sole strength of B&W icons and top hat shifts.

2.5 This system based on UML. Author provides this proficiency for manipulating the traffic in main road network utilizing signs [12]. These signs are mechanically moderated aside sensors. To afford well advancement to vehicles through the road network these detectors coordinates the operation of the traffic signals in the entire area. The signal timing varies throughout the day while coordinating all the signals. It withdraws the addiction on less spoiled schemes on sign designs.

2.6 Author presented a vehicle sensing and active traffic signal time handling is used in priority based traffic light controller system [13]. The project is also designed to follow international standards for traffic light operations and control over multiple intersections. Both single and multiple intersections are dynamically adaptive to traffic conditions in these techniques.

2.7 In [14] context author presents an approach for evaluating the best energy motes for energy consumption in Battlefield Monitoring System using simulation along with

three modes *i.e.* transmit mode, receive mode and idle mode. Also it evaluates the best routing protocol among which performs best in that energy motes.

3. Pseudo Codes for Congestion Control in War State Battle Field

3.1 Procedure to Process Vehicle Node Information at Server Side.

```
Define List VL for Vehicles V
Define List NL for Vehicle V where NL is neighbours list
While true
                    Get Vehicle Node V
                    If V.Type equals to Activation
                      Add Node V to List VL
                    Else
                      //Update vehicle node V parameters such as distance, mines to
list VL
                      UpdateVechile(V)
                      //Get neighbors list for node V
                      NL = GetNeighbors(V)
                      Send list of neighbors to node V
                    End If
End while
```

3.2 Procedure to Update Vehicle Information

```
Set flag found = false
Set Updating Vehicle information to U
Set new templist of vehicles to empty
For each vehicle V from List VL
                    V = VL.Node
                    If U.vehicleID == V.vehicleID)
                      V.distance = U.distance
                      V.mines = U.mines
                      Add node V to templist
                      Set flag found = true
                    Else
                      Add node V to templist
                    End If
    End For
If flag found == false
                    Add new node U to templist
End If
VL = templist
```

3.3 Procedure to Find Neighbors for Vehicle U

```
Set list of neighbors NL for node U
Set flag neighbor = false
Set totalDistance = 10000 // It may vary as per choice in meters
Set collisionDistance = 10 // it may vary as per choice in meters
Set neighborDistance = 50 // it may vary as per choice in meters
Set distance D1, D2, D3 to 0
For each node V in list NL
                    Get node V from list NL
                    If V.vehicleID != U.vehicleID
```

```
                    D1 = totalDistance – U.distance
                    D2 = totalDistance – V.remDistance
                    D3 = D1 – D2
                    If D3 < 0
                        D3 = (-1) * D3 // make D3 positive value
                    End If
                    If (d3 > collisionDistance And d3 < neighborDistance)
                        Set flag neighbor = true
                        Add node V to NL
                    Else If (d3 < collisionDistance)
                        Set flag neighbor = true
                        Add node V to NL
                        //protect from collision between two vehicles
                        PreventCollsion(U, V)
                    End If
                    If (neighbor == true And U.mines == 0 And V.mines > 0)
                        //Protect tank U by V
                        ProtectTank(U,V)//this procedure provide cover to
neighbor tank U
                    End If
                End If
End For
```

3.4 Procedure to Protect collision between Two Tanks

```
PreventCollision( Tank U, Tank V)
If (U.remDistance > V.remDistance)
                    SpeedUp(V)
                    SpeedDown(U)
        Else
                    SpeedUp(U)
                    SpeedDown(V)
End If
```

3.5 Procedure to Change Speed of Tank

```
Set toggle operation of speed for toggle = Up
While true
                    Sleep for 1 Second //Wait statement
                    //Get random value between 1 to 5
                    Val = Random(1,5)
                    Get current speed to variable spd
                    If (toggle == Up)
                      Increment spd by Val
                      If spd > maxSpeed
                        Spd = maxSpeed
                      End If
                      Toggle = Down

                    Else
                      Decrement spd by Val
                      If spd < minSpeed
                        Spd = minSpeed
```



```
                    End If
                    Toggle = Up
                End If
End while
```

3.6 Procedure to Speed Up Tank

```
//Get random value between 1 to 5
Val = Random(1,5)
Get current speed to variable spd
Increment spd by Val
If spd > maxSpeed
                    Spd = maxSpeed
End If
```

3.7 Procedure to Speed Down Tank

```
//Get random value between 1 to 5
Val = Random(1,5)
Get current speed to variable spd
Decrement spd by Val
If spd > minSpeed
                    Spd = minSpeed
End If
```

3.8 Procedure to Shoot Mines Randomly for Tank V

```
While V.mines > 0
                    Val = Random(1,10)
                    Sleep for value Val
                    Decrement value for V.mines
End While
```

4. Experimental Setup

4.1 War State Battle Field Services

The main objective of the proposed system is area wide management of tanks (traffic) flow aiming to maximize tanks throughput and safety of all tanks participants. It is realized by a distributed cloud sensor system based on cloud computing. The system operates by means of interaction between its components, called cloud services, using cloud server architecture. Services required for the system to function have been termed core services:

(i) Sensor Service: A Sensor Service (SS) provides data about the current road situation, such as cameras and in-road induction loop. It is a wrapper for these devices. The SS is based on associated Sensor Node. Sensor Node is able to determine the geographical position of detected objects.

(ii) Neighbour Detection Service: Neighbour Detection Service improves the routing performance in tanks, especially in networks with moderate or high mobility. In neighbour detection scheme adopts explicit handshake mechanism to reduce the latency.

(iii) Collision Prevention Service: Collision avoidance is a fundamental problem in navigation. When the tanks (Vehicle) are at risk of a collision, the system determines appropriate steering motions for both tanks at each time step, so that they can

cooperatively change position to avoid collisions and return to their original position when the risk is averted.

(iv) Mines Cover Service: In this scenario mines represents bombs. When one tank finishes his mines then the other tank protect this tank.

(v) Distance Service: Distance is a numerical description of how far apart objects are. In most cases, "distance from A to B" is interchangeable with "distance between B and A". In this scenario the distance between tank t1 from tank t2 is 100m.

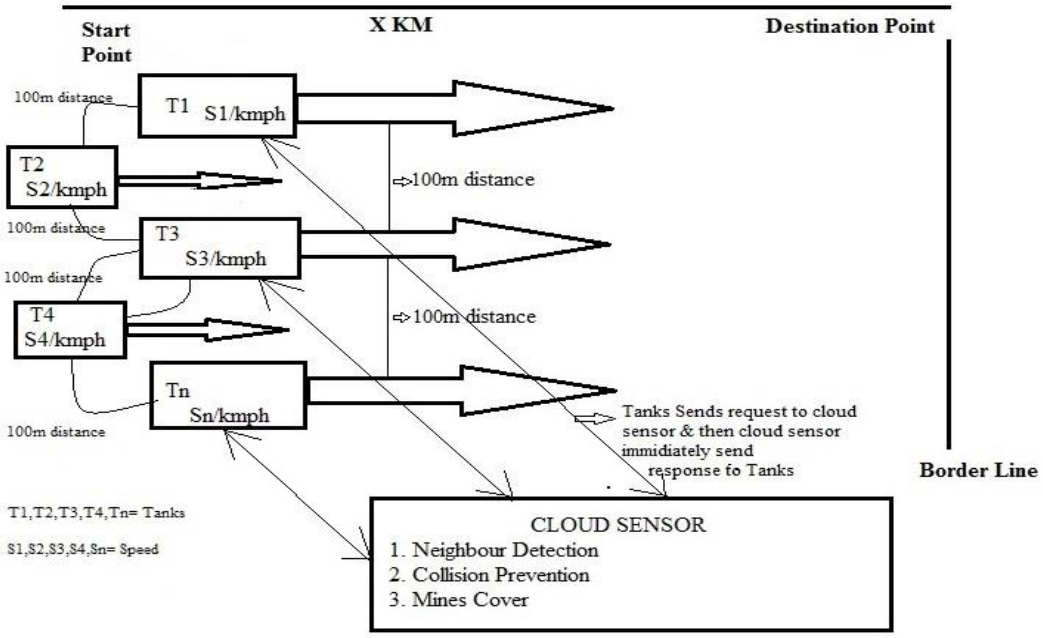

Figure 1. Scenario for Collision Detection & Prevention in War State Battle Field

5. Simulation and Results of War State Battle Field Using Sensor Cloud

The above discussed benchmark algorithms were optimized using congestion control algorithms in a language java. The screen short is placed in the following figures and results of the parameters were available with collision detection and prevention algorithm in subsequent table 1,2 &3.

Total Nodes	3
Min Speed	30
Max Speed	50
Available Mines	10
Distance Left	10000
IP Address	127.0.0.1
Distance Variation	100

Figure 2. Optimization Parameters

(A) (B) (C)

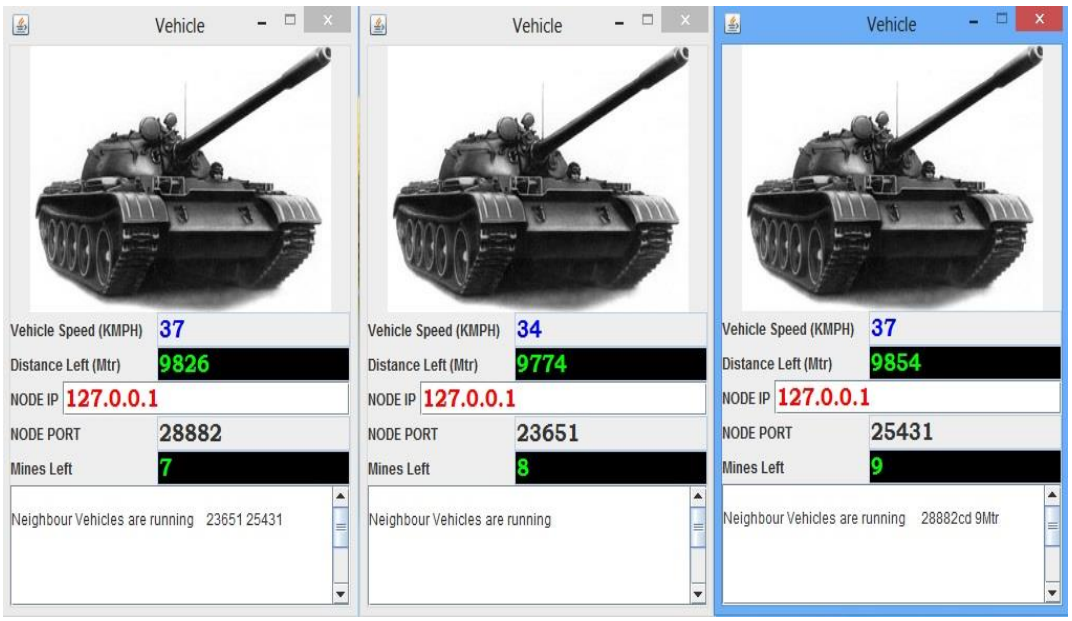

Figure 3. Three Tanks (A,B,C) Moving using Above Parameters

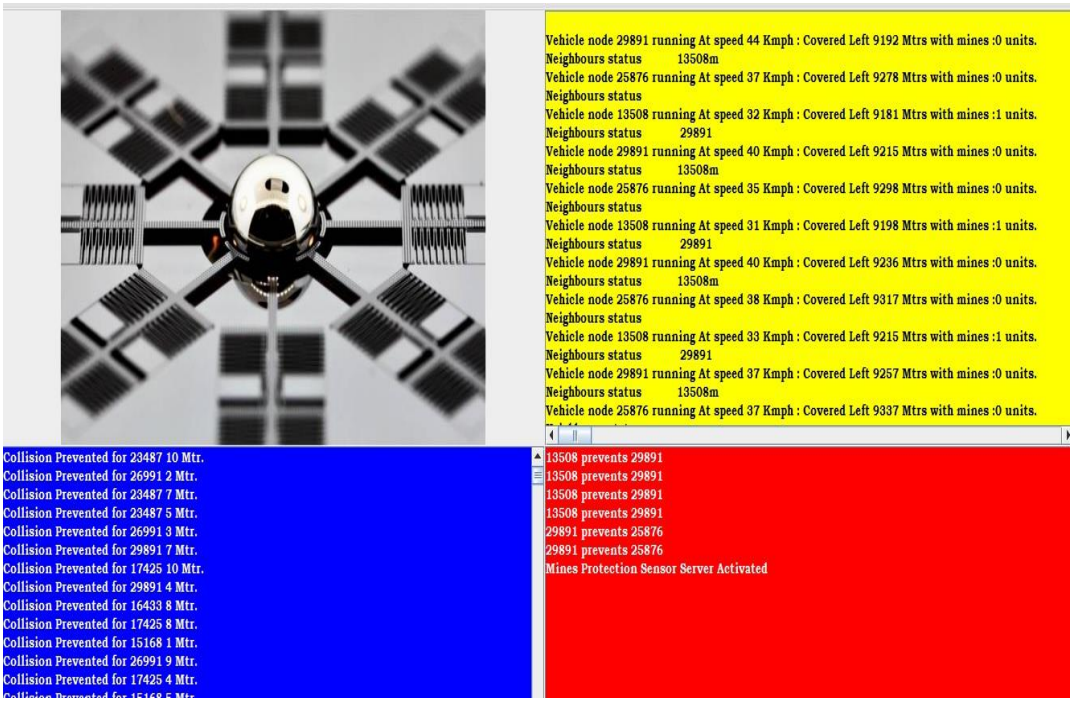

Figure 4. Optimization Results

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Table 1 and 2. Results Obtained by using Collision & Mines Cover Parameters

nodeid	collfrom
11318	13732cd 0M
11318	13732cu 2M
11318	13732cu 6M
11318	13732cu 9M
11838	14327 26951cd
11838	14327 26951cd
11838	26951cu 2Mtr
11838	26951cu 6Mtr
11838	26951cu 9Mtr
11838	14327cd 7Mtr
11838	14327cu 2Mtr
11899	14723cd 2Mtr
11899	14723cd 2Mtr
11899	14723cd 3Mtr
11899	14723cd 3Mtr
11899	14723cd 4Mtr
11899	14723cd 4Mtr
11899	14723cd 6Mtr
11899	14723cd 6Mtr
11899	14723cd 7Mtr
11899	14723cd 7Mtr

nodeid	minescover
14723	27712 11899m
14723	27712cu 10Mtr
14723	27712cu 9Mtr
18687	21026m
20514	12953m
20514	12953m
22422	14197cu 1Mtr
22422	14197cu 1Mtr
22422	14197cu 1Mtr
22422	14197cd 0Mtr
22422	14197cd 2Mtr
22422	14197cd 1Mtr
22422	14197cu 1Mtr
22422	14197cu 3Mtr
22422	14197cu 5Mtr
23722	21162m
27712	14723cd 3Mtr r
27712	14723cd 3Mtr r
27712	14723cu 1Mtr r
27712	14723cu 1Mtr r
27712	14723cu 5Mtr r

Table 2. Results Obtained by using Simulation Parameters

nodeid	speed	distanceleft	minesleft	neighbors
11318	42	9943	10	13732cd 0M
11318	41	9922	10	13732cu 2M
11318	44	9898	10	13732cu 6M
11318	43	9875	9	13732cu 9M
11318	45	9850	9	13732
11318	43	9827	8	13732
11318	45	9803	8	13732
11838	40	9936	10	14327 26951
11838	41	9914	10	14327 26951
11838	40	9892	9	14327 26951
11838	42	9869	8	14327 26951
11838	43	9846	8	14327 26951
11838	43	9823	8	14327 26951
11838	40	9800	8	14327 26951
11838	38	9779	7	14327 26951cd
11838	39	9759	6	14327 26951cd
11838	36	9739	6	26951cu 2Mtr
11838	37	9719	6	26951cu 6Mtr
11838	39	9699	6	26951cu 9Mtr
11838	41	9677	5	26951
11838	43	9654	4	26951
11838	41	9632	4	26951
11838	42	9610	3	26951

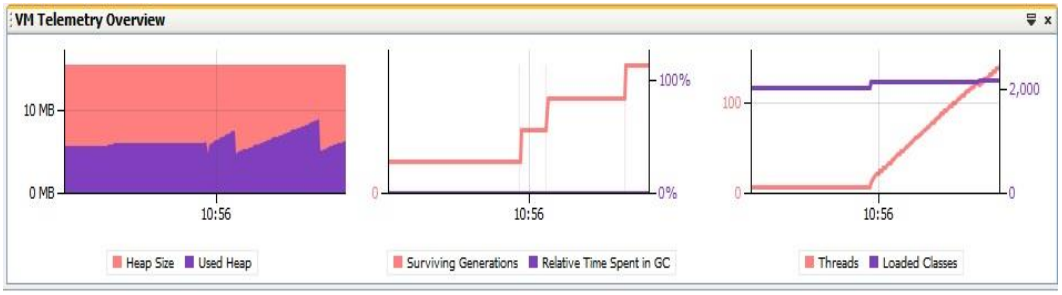

Figure 5. Graphical Representation of the Simulation Results

6. Conclusion

In this paper we have implemented War State Battle Field Using Cloud Sensor for Collision Detection and Prevention using Java programming in real time. This system controls the change of tanks speed at intersection points & control the collision between two tanks. The use of this approach makes it economical , reliable and provides tanks range for communication. The system proposed in this thesis is both cost efficient in terms of communication and computation. Mathematical congestion analysis of the proposed traffic control system has been done that exhibits that the congestion control in battlefield system are secure against all traffic control and therefore can be implemented in practical scenarios. We can establish inter vehicular communication which is not present in current work instead it is to be via RSU and Cloud Servers together.

References

[1] C. Germain-Renaud and O. Rana, "The convergence of clouds, grids, and autonomics", IEEE Internet Computing , vol. 13, no. 6, (**2009**), p. 9.
[2] H. Alhakami, H. Aldabbas and T. Alwada, "Comparison between cloud and grid computing: review paper", International journal on cloud computing: services and architecture (IJCCSA), vol. 2, no. 4, (**2012**) August, pp. 1-21.
[3] H. T. Dinh, C. Lee, D. Niyato, and P. Wang, "A Survey of Mobile Cloud Computing: Architecture, Applications, and Approaches, Wireless Communications and Mobile Computing-Wiley Online Library, (**2011**).
[4] P. Kaur and I. Chana, "Unfolding the Distributed Computing Paradigms", 2010 International Conference on Advances in Computer EngineeringBangalore, India June 20-June 21ISBN: 978-0-7695-4058-0.
[5] C. Kim and Y.-S. Hong, "Traffic Signal Using Smart Agent System", American Journal of Applied Sciences, (**2008**), pp. 1487-1493.
[6] Legon-Okponglo, "Design and Development of Micro-Controller Based Traffic System Using Image Processing Techniques", University of Ghana, published in ICAST, 2012 IEEE 4th International Conference.
[7] N. Lanjwar and D. Nitnaware, "Performance Analysis of Routing Protocols for Battlefield monitoring System", International Journal of Scientific Engineering and Technology www.ijset.com , (**2012**) April.
[8] X. Chen, J. Zhang, S. Qian and P. Xu, "Applied Research on Traffic Information Collection Based on Wireless Sensor Networks", Elsevier 2012 International Conference on Future Electrical Power and Energy Systems.
[9] X.-F. Xie, G. J. Barlow, S. F. Smith, and Z. B. Rubinstein, "Platoon-Based Self-Scheduling for Real-Time Traffic Signal Control", IEEE International Conference on Intelligent Transportation Systems (ITSC), Washington, DC, USA, (**2011**).
[10] S. Jaiswal and T. Agarwal, A. Singh and Lakshita, "Intelligent Traffic Control Unit", International Journal of Electrical, Electronics ISSN No. (Online): 2277-2626 and Computer Engineering, vol. 2, no. 2, (**2013**), pp. 66-72.
[11] P. F. Alcantarilla, M. A. Sotelo and L. M. Bergasa, "Automatic Daytime Road Traffic Control and Monitoring System", Intelligent Transportation Systems, 2008, ITSC 2008, 11th International IEEE Conference on (**2008**) 12-15 October , pp. 944–949.
[12] K. Ranjini, A. Kanthimathi and Y. Yasmine, "Design of Adaptive Road Traffic Control System through Unified Modeling Language", International Journal of Computer Applications (0975 – 8887) vol. 14, no. 7, (**2011**) February.

[13] K. R. Shruthi and K. Vinodha, "Priority Based Traffic Lights Controller Using Wireless Sensor Networks", International Journal of Electronics, Signals, and Systems (IJESS) ISSN: 2231- 5969, vol. 1, no. 4, (**2012**).
[14] R. Bagga(saini), M. Bala and V. Sahni, "Energy Models with Different Routing Protocols in BMS Using Qualnet Simulator", International Journal of Advanced Research in Computer Science and Software Engineering ISSN: 2277 128X, vol. 4, no. 11, (**2014**), November.

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