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An Approach of Distributed Systems for Intersection Traffic Problems

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Abstract

An intelligent transportation system, Vehicle tracking at border crossings is an important issue and a widely researched topic. Crossing points are an important issue and a popular research topic. Existing approaches, such as traffic signal planning and projected path change direction.. Furthermore, most of the vehicular dynamics, obtaining the optimized solution in real-time is extremely difficult. We define a novel approach to crosswalk traffic control, influenced by an emergence for vehicular ad hoc networks. Vehicles can start competing in exchange the intersection for to pass on the correct or relevant time via vehicle-to-vehicle or vehicle-to-infrastructure communications, i.e., traffic is controlled through vehicle coordination. This method is adaptable and efficient. We consider the free deadlock algorithm for realize vehicle coordination: (i) mutual exclusion method classified as single commands, (ii) mutual exclusion technique prioritize (iii) the mutual exclusion methodology depend on multi-agent systems queue structure is used for communication within a group, while an exterior element (such as a router) is being used for intranet.

Keywords: *traffic, vehicular, network, algorithm.*

I. AN INTRODUCTION

Urban areas worldwide are experiencing traffic jams and rising emissions. These days, traffic automation [1] [2], was one of the most important aspects of a smart city various Because of this, smart transport system was developed. with increasing in the traffic emissions, many causes a whether or not there will be opportunities to improve the effectiveness with which vehicles should avoid rising emissions in the road [3] [4]. The normal approach to solving the associated with critical problem at a crossroads is traffic light scheduling. Vehicles in this method travel in a stop-and-go pattern. That was based on the presence of a green light. Nonetheless, recent traffic light control efforts have focused on Traffic light scheduling that is responsive and intelligent. Computationally intelligent algorithms [5, 6], as well as evolutionary computation algorithms, are key approaches [7, 8], fuzzy logic [9], neural networks [10, 11], and machine learning [12].

Determining the green light ideal time is a difficult work because the parking in a system is very highly complicated multidimensional systems [13], [14]. Traffic data should be processed as quickly as possible for security and safety, either using an imaging technology or a line scan system. [15], [16]. Furthermore, the complexity [17], [18] of advanced analytics is insufficient for a system of real-time traffic management. There are many trajectory maneuver-based algorithms that really are distinguishable from traffic management system (for example, [19][20]). An intersection controller maximizes vehicle trajectories based on the conditions of nearby vehicles. Wireless links are used to communicate between vehicles and intersection controllers. A methodology would be created to only remedy the lowering machine wait period at intersections to alleviate traffic congestion. However, by elements in the form (vehicles) in a homogeneous manner, such an algorithm requires all automobiles on the line of traffic to be the same. Even so, for most instances, lowering the number of longer waits is inadequate for emergency services. In the case of an ambulance, the vehicles are mostly runs on h road for the live survival of the human being, or they are continuing just after bad dudes (e.g., thieves, bandits, and so on) in the case of a police car, or they are protecting people in emergency cases (e.g., fire outbreak, aftershocks, flooding, and so on) in the case of a fire truck, and so on. Disregarding other circumstances could lead to a significant loss of life and property. As a result, emergency responders must pass and through crossroads as rapidly as feasible. Even so, in situations of distress (e.g., an unfortunate incident, a super volcano, a seismic activity, landslides, food products, storm surges, warmer temperatures, downpours, law and order circumstances, and so on), emergency personnel are frequently delayed due to traffic delays at road intersections.

As a result, emergency service efficiency is highly dependent on responsiveness. Paramedic response time, for example, can be defined by the time among making a report and the paramedics effectively needed to transport an injured person to a hospital. Several studies [21, 22] had already multiple times affirmed and illustrated a direct relationship between reaction times and level of control. According to the made of gold hour hypothesis [23], [24], the first 1 hour traumatizing harm seem to be critical to survival. As per this hypothesis, if a physician in a traffic accident is rushed to the hospital within 1 hour, the participant's chances of survival improve significantly. Expenditure smart traffic lights are frequently not implemented in emerging nations, rather going to opt for a simple timer or green wave method [25]. for emergency the delay in traffic are responders will continue to be an issue in the future. A plethora of intelligent algorithms are suggested to handle vehicular flow of traffic at intersections. Many studies have been conducted, for example, to actually fix the traffic congestion problem at a crossroads using a vehicular networks system (VANET) (e.g., [26][27]), that each motor conveys with the other vehicles prior to actually proceeding through the intersection. However, in addition to being expensive, the system has high complexity for message sending from one end to another.

In this article, we will look at how to reduce the previously mentioned issues at traffic intersections for any and all types of vehicles. We have already proposed three different mutual exclusion algorithms: In a single mutual exclusion algorithm based on instructions,

a mutual exclusion algorithm based on priority, and a mutual exclusion algorithm based on a multi-agent system. Instead of using Routing, our recent advancement uses an ad hoc network to connect automobiles to a wifi router. The connectivity is used to relieve single-point traffic congestion. Rather than, all automobiles have culturally homogenous characteristics and interact within our work, we use a controller which does not enable for vehicle interaction (router).

Our current craze could be used to assist smart cities in reducing traffic congestion. Deadlock methods were used to solve a variety of real-world problems in distributed systems. Raymond's lock-based mutual exclusion algorithm [28] allows each base station to have only one parent and uses a First out (first-in-first-out) queuing system for resource sharing requests.

It is unknown, however, whether this notion will collaborate to remedy the traffic congestion problem. So because Robert algorithm was able to just be O (log n) for proper place in the critical section entry and it is expected that few some idea having same approach will performed the less sophistication once applied to the traffic congestion problem. With minor modifications, we are able to connect with the concept to solve traffic jams at a crossroads, assuming the node was a lane. The deadlock heuristic principle, that also asserts that just one car is allowed at the CS anywhere at given time, was considered. However, in the vast majority of actual crossing points, that's not the case. Our algorithms are more computationally intensive than that of the Raymond method but less complex over the vehicular adhoc network type approach (e.g., Wu et al. [33]).

II. A SUMMARY OF OUR ALGORITHM

MEASIR, like Gradinariu and Tixeuil [34], means allowing only one command to be executed at a time, whereas MEAPRI, like Housni and Trehel [35], uses a priority-based technique. MEAMAS is based on multi system (MAS) concept [36]. It allows the vehicle at the crossroads to communicate or start moving in platoons.

Any device that comes at the crossroads will be tied to a specific coordinator node, and these node can be tie up with the case that contained the hardware device at the crossroads in which the vehicle help to pass through it. Thus every modem provides the vehicles on its lane by handing out tokens that allow each other to transfer through the intersection. Only router can help for positioned n each intersection for the completion of the task too be completed [37] [38]. As a consequence, four routers are needed.

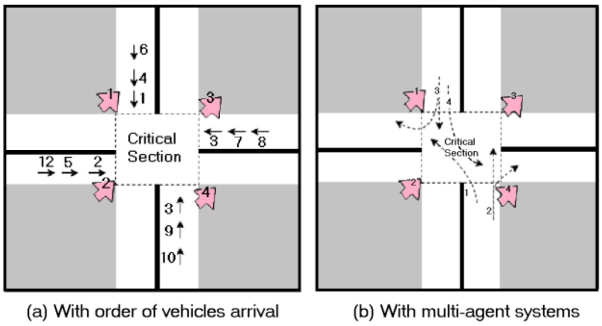


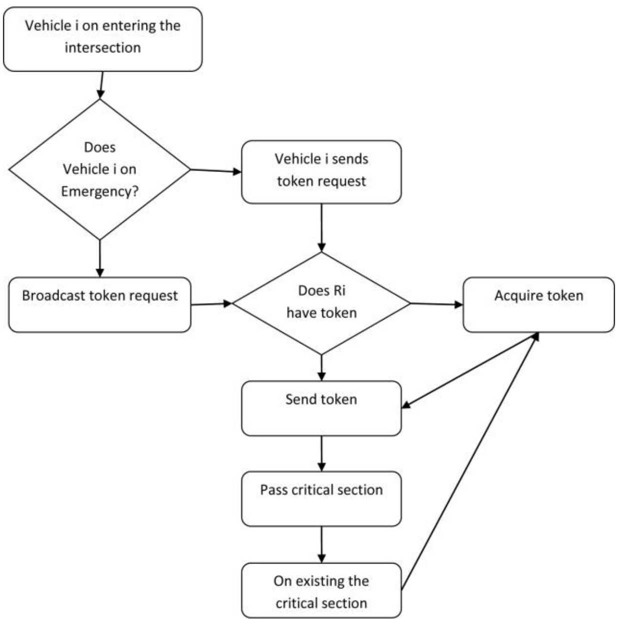
Fig- An Example of Intersection

Different size arrows represent vehicles and routers, respectively. Internal and overseas operations are included in all algorithms. Whenever the affiliated device reaches at the intersection, the machine sends it an exterior operation request, and then it is decided to add to the queue of vehicles travelling the same route. lane adjacent to it A router broadcasts during core operations. After receiving a token, I sent out a professional certification proposition to other routers. Seize control of the token if there is a request from a vehicle in its lane as well as the router is indeed unavailable. If the device has the symbol or obtains it from another modem, it sends the token to the motor at the front of the queue to grant permission. MEASIR, MEAPRI, and MEAMAS are all capable of displaying a constant green traffic light signal to incoming emergency vehicles. Automobiles in our suggested deadlock-free methodologies do not responding to emails with others (e.g., Hartenstein and Laberteaux [39] and Elhadef [40]) or via wireless technology if they're a pickup, a paramedics, a police car, or a similar type of emergency-service vehicle (e.g., Wu et al. [41]). Only emergency services are given a token and are allowed to cross through to the intersection as soon as they arrive. All the other automobiles move ahead through the intersection normally. Whenever a car reaches an interconnection, it sends a request for approval to pass through to its affiliated router. It'll only be capable of passing through the crossroads after receiving a token from its router. At any given time, only one car may be visible at the CS. Figures 1(a) and 1(b) depict composed of two parts examples that take car arrival and MAS into account, respectively. Both MEASIR and MEAPRI assume that no messages are lost, whereas MEAMAS uses the MAS notion to allow traffic to pass in a group. MEAMAS, on the other hand, has resolved the MEASIR and MEAPRI assumptions. Even though MEAMAS ensures that the token is distributed to all vehicles. All automobiles sends an acknowledgement to router from which it will received the token. If the information is lost, then the router sends an information to the symbol of the vehicle again for a predetermined amount of time if no acknowledgement is received. Whenever the counter completes the counting and the acknowledgement information is received, then the message will be considered as the lost message.

V. PROPOSED FLOWGRAPH / FLOWCHART

The proposed flow graph describe the process for the mutual exclusion method classified as a single command and the mutual exclusion technique for the prioritize, in which the steps are described as-

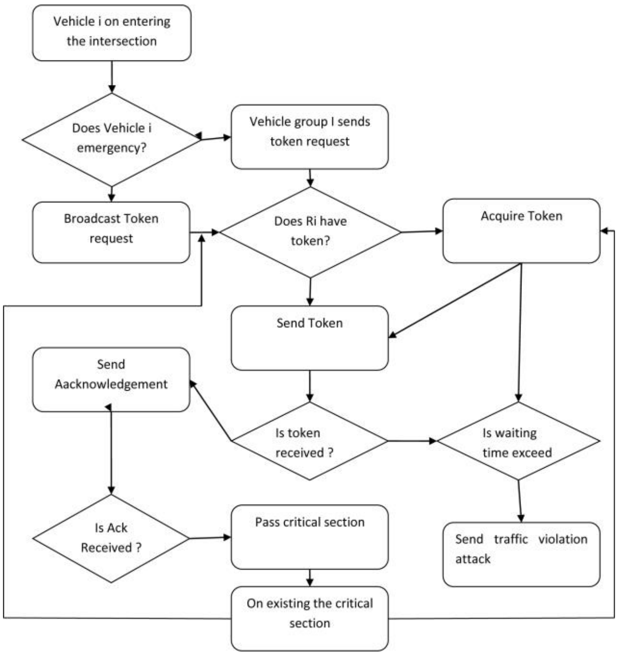
1. When vehicle i is entering in the intersection
2. Then, check that “Does the vehicle i is in emergency?”
3. If yes, broadcast the token request. Move to step 5
4. If NO, vehicle i send the token request. Move to step 5
5. Does Ri have token? Check it.
6. Token request generate –
7. Send the token / if acquired token
8. Pass to the critical section.
9. On existing the critical section
10. Continue do the process.
11. End



Generic Diagram of MEASIR and MEAPRI

All the other automobiles move ahead through the intersection normally. Whenever a car reaches an interconnection, it sends a request for approval to pass through to its affiliated router. It'll only be capable of passing through the crossroads after receiving a token from its router.

Both MEASIR and MEAPRI assume that no messages are lost, whereas MEAMAS uses the MAS notion to allow traffic to pass in a group. MEAMAS, on the other hand, has resolved the MEASIR and MEAPRI assumptions. In the following manner, we can further precede the methodology named as multi exclusion based methodology based on multi agent systems.



Flowchart of MEAMAS

VI. RESULTS AND DISCUSSION

In this paper, we describe the three different algorithm name as MEASIR, MEAMAS and MEAPRI for the reduction in the traffic control congestion. These deadlock free approaches can help to control the traffic light and for controlling the traffic. This can help for researcher to compute the deadlock free congestion and for controlling the traffic for achieving the lower computation burden and waiting times and help to improve the better accuracy, precision and etc. in futuristic point of view in this algorithm we can upgrade to multi point intersection interaction for the code optimization.

References

[1] S. M. M. Ali, J. C. Augusto, and D. Windridge, ``A survey of usercentred approaches for smart home transfer learning and new user home automation adaptation," Appl. Artif. Intell., vol. 33, no. 8, pp. 747_774, Jul. 2019.

[2] G. M. Toschi, L. B. Campos, and C. E. Cugnasca, ``Home automation networks: A survey," Comput. Standards Interfaces, vol. 50, pp. 42_54, Feb. 2017.

[3] F.-Y. Wang, ``Parallel control and management for intelligent transportation systems: Concepts, architectures, and applications," IEEE Trans. Intell. Transp. Syst., vol. 11, no. 3, pp. 630_638, Sep. 2010.

[4] VII. (2019). Vehicle Infrastructure Integration. [Online]. Available: http://www.vehicle-infrastructure.org/

[5] D. Zhao,Y. Dai, and Z. Zhang, ``Computational intelligence in urban traffic signal control: A survey," IEEE Trans. Syst., Man, Cybern., C (Appl. Rev.), vol. 42, no. 4, pp. 485_494, Jul. 2012.

[6] P. Lertworawanich, M. Kuwahara, and M. Miska, ``A new multiobjective signal optimization for oversaturated networks," IEEE Trans. Intell. Transp. Syst., vol. 12, no. 4, pp. 967976, Dec. 2011.

[7] B. Zhou, J. Cao, X. Zeng, and H. Wu, ``Adaptive trafc light control in wireless sensor network-based intelligent transportation system," in Proc. IEEE 72nd Veh. Technol. Conf. Fall, Sep. 2010.

[8] B. P. Gokulan and D. Srinivasan, ``Distributed geometric fuzzy multiagent urban traffic signal control," IEEE Trans. Intell. Transp. Syst., vol. 11, no. 3, pp. 714727, Sep. 2010.

[9] P. La and S. Bhatnagar, ``Reinforcement learning with function approximation for trafc signal control," IEEE Trans. Intell. Transp. Syst., vol. 12, no. 2, pp. 412421, Jun. 2011.

[10] E. Bingham, ``Reinforcement learning in neurofuzzy trafc signal control," Eur. J. Oper. Res., vol. 131, no. 2, pp. 232241, Jun. 2001.

[11] D. Srinivasan, M. C. Choy, and R. L. Cheu, ``Neural networks for realtime traf_c signal control," IEEE Trans. Intell. Transp. Syst., vol. 7, no. 3, pp. 261_272, Sep. 2006.

[12] J. Qiao, N. Yang, and J. Gao, ``Two-stage fuzzy logic controller for signalized intersection," IEEE Trans. Syst., Man, Cybern.

A, Syst. Humans, vol. 41, no. 1, pp. 178_184, Jan. 2011.

[13] J. Qiao, N. Yang, and J. Gao, ``Two-stage fuzzy logic controller for signalized intersection," IEEE Trans. Syst., Man, Cybern. A, Syst. Humans, vol. 41, no. 1, pp. 178_184, Jan. 2011.

[14] L. Zhao, X. Peng, L. Li, and Z. Li, ``A fast signal timing algorithm for individual oversaturated intersections," IEEE Trans. Intell. Transp. Syst., vol. 12, no. 1, pp. 80_283, Mar. 2011.

[15] F. Galip, M. Caputcu, R. H. Inan, M. H. Sharif, A. Karabayir, S. Kaplan, M. Ozuysal, B. Sengoz, A. Guler, and S. Uyaver, ``A novel approach to obtain trajectories of targets from laser scanned datasets," in Proc. 18th Int. Conf. Comput. Inf. Technol. (ICCIT), Dec. 2015, pp. 231_236 .

[16] M. H. Sharif, ``Particle _lter for trajectories of movers from laser scanned dataset," in Proc. 3rd Medit. Conf. Pattern Recognit. Artif. Intell. (Med- PRAI) (Communications in Computer and Information Science), vol. 1144.Cham, Switzerland: Springer, 2019, pp. 133_148. [Online]. Available: https://link.springer.com/chapter/10.1007/978-3-030-37548-5_11"

[17] C. M. Institute. (2019). P vs NP Problem. [Online]. Available: https//:www.claymath.org

[18] M. H. Sharif, ``A numerical approach for tracking unknown number of individual targets in videos," Digit. Signal Process., vol. 57, pp. 106_127, Oct. 2016.

[19] B. van Arem, C. J. G. van Driel, and R. Visser, ``The impact of cooperative adaptive cruise control on traffic characteristics," IEEE Trans. Intell. Transp. Syst., vol. 7, no. 4, pp. 429_436, Dec. 2006.

[20] R. J. Caudill and J. N. Youngblood, ``Intersection merge control in automated transportation systems," Transp. Res., vol. 10, no. 1, pp. 17_24, Feb. 1976.

[21] T. Blackwell and J. Kaufman, ``Response time effectiveness: Comparison of response time and survival in an urban emergency medical services system," Academic Emergency Med., Official J. Soc. Academic Emergency Med., vol. 9, no. 4, pp. 288_295, Apr. 2002.

[22] O. Braun, ``EMS system performance: The use of cardiac arrest timelines," Ann. Emergency Med., vol. 22, no. 1, pp. 52_61, 1993.

[23] A. C. of Surgeons, Atls, Advanced Trauma Life Support Program for Doctors. Chicago, IL, USA: American College of Surgeons, 2008.

[24] J. Campbell, International Trauma Life Support for Emergency Care Providers. London, U.K.: Pearson, 2018, p. 12.

[25] X.Wu, S. Deng, X. Du, and J. Ma, ``Green-wave traffic theory optimization and analysis," World J. Eng. Technol., vol. 02, no. 03, pp. 14_19, 2014.

[26] W. Wu, J. Zhang, A. Luo, and J. Cao, ``Distributed mutual exclusion algorithms for intersection traffic control," IEEE Trans. Parallel Distrib.Syst., vol. 26, no. 1, pp. 65_74, Jan. 2015.

[27] D. Markert, P. Parsch, and A. Masrur, ``Analyzing the impact of probabilistic estimates on communication reliability at intelligent crossroads," in Proc. 22nd Euromicro Conf. Digit. Syst. Design (DSD), Aug. 2019, pp. 206_213.

[28] K. Raymond, ``A tree-based algorithm for distributed mutual exclusion," ACM Trans. Comput. Syst., vol. 7, no. 1, pp. 61_77, Jan. 1989.

[29] W. Wu, J. Zhang, A. Luo, and J. Cao, ``Distributed mutual exclusion algorithms for intersection traf_c control," IEEE Trans. Parallel Distrib. Syst., vol. 26, no. 1, pp. 65_74, Jan. 2015.

[30] G. Singh, J. Singh, and A. Z. Richa, ``Algorithm for effective movement of emergency vehicles from traffic control signal," Int. J. Eng. Res. Appl., vol. 7, pp. 9_13, 2017.

[31] A. A. Krishna, B. A. Kartha, and V. S. Nair, ``Dynamic traffic light system for unhindered passing of high priority vehicles: Wireless implementation of dynamic traffic light systems using modular hardware," in Proc. IEEE Global Humanitarian Technol. Conf. (GHTC), Oct. 2017, pp. 1_5

[32] R. Anil, M. Satyakumar, and A. Salim, ``Emergency vehicle signal preemption system for heterogeneous traffic condition : A case study in trivandrum city," in Proc. 4th Int. Conf. Intell. Transp. Eng. (ICITE),Sep. 2019, pp. 306_310.

[33] W. Wu, J. Zhang, A. Luo, and J. Cao, ``Distributed mutual exclusion algorithms for intersection traffic control," IEEE Trans. Parallel Distrib. Syst., vol. 26, no. 1, pp. 65_74, Jan. 2015.

[34] M. Gradinariu and S. Tixeuil, ``Con_ict managers for self-stabilization without fairness assumption," in Proc. 27th Int. Conf. Distrib. Comput. Syst. (ICDCS), Jun. 2007, p. 46 .

[35] H. Xu, Y. Zhang, L. Li, and W. Li, ``Cooperative driving at unsignalized intersections using tree search," 2019, arXiv:1902.01024. [Online]. Available: http://arxiv.org/abs/1902.01024

[36] U. M. Borghoff and J. H. Schlichter, Computer-Supported Cooperative Work-Introduction to Distributed Applications. Berlin, Germany: Springer, 2000.

[37] G. Araniti, M. Condoluci, P. Scopelliti, A. Molinaro, and A. Iera, ``Multicasting over emerging 5G networks: Challenges and perspectives," IEEE Netw., vol. 31, no. 2, pp. 80_89, Mar. 2017.

[38] H. Hartenstein and K. P. Laberteaux, ``A tutorial survey on vehicular ad hoc networks," IEEE Commun. Mag., vol. 46, no. 6, pp. 164_171, Jun. 2008.

[39] M. Elhadef, ``An adaptable inVANETs-based intersection traffic control algorithm," in Proc. IEEE Int. Conf. Comput. Inf. Technol., Ubiquitous Comput. Commun., Dependable, Autonomic Secure Comput., Pervasive Intell. Comput., Oct. 2015, pp. 2387_2392.

[40] W. Wu, J. Zhang, A. Luo, and J. Cao, ``Distributed mutual exclusion algorithms for intersection traffic control," IEEE Trans. Parallel Distrib. Syst., vol. 26, no. 1, pp. 65_74, Jan. 2015 .