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Sound Sensor Based Emergency Vehicle Preemption System using Microcontrolled Nodes

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ABSTRACT

Traffic congestion is diagnosed as principal problems in current urban regions, that have triggered an awful lot uncomfortable for the ambulance to journey. Moreover, road accidents in the city have been increasing and to bar the loss of life due to accidents is even more crucial because the range of automobiles grows hastily each 12 months, more and more traffic congestion happens, turning into a huge trouble for civil engineers in almost all metropolitan cities. Emergency Vehicle Pre-emption systems play a key role in reprioritizing signalized traffic intersections.

This role is essential for safe and minimal travel put off of Emergency vehicles (EV) passing through avenue intersections. This paintings especially objectives on presenting answer for the problem faced via ambulances which can be transferring toward the visitors sign for the duration of excessive density visitors.

1. Introduction

The IoT can join numerous manufacturing gadgets geared up with sensing, identity, processing, conversation, actuation, and networking competencies. Network control and management of manufacturing. This is carried out via the usage of detecting the frequency of the ambulance heading closer to the visitors signal through the usage of the sound sensors and tracking the ambulance to skip the respective visitors lane using Zigbee protocol. We are implementing the AARS system is referred to as (automated ambulance rescue gadget). The principle intention of this scheme is to offer an easy float for the ambulance to reach the hospitals in time. Enforcing this mechanism might manipulate automatically the site visitors lights within the course of the ambulance. The ambulance is managed by the imperative unit which furnishes the scantest path to the ambulance and also controls the site visitors mild in line with the ambulance area and for this reason reaching the hospital safely. This module is likewise tremendous on high priority motors including hearth disaster prevention automobiles, VIP automobiles and Police Jeeps which are heading closer to high density traffic signals.

System, asset and state of affairs control, or production technique manage permit IoT to be used for industrial applications and clever production. IoT intelligent structures permit fast production and optimization of recent merchandise, and fast reaction to product demands. Virtual manage structures to automate process controls, operator gear and provider records systems to optimize plant protection and protection are inside the purview of the IoT.

IoT also can be applied to asset management thru predictive renovation, statistical assessment, and measurements to maximize reliability. Business management systems can be included with smart grids, enabling energy optimization. Measurements, computerized controls, plant optimization, health and safety management, and other features are furnished by way of networked sensors.

2. Background

In this paper [1], A partial Lagrange multiplier method is used. It blessings from the total unimodularity of the prevalence matrix in the fashions . This method can be applied to efficiently solve the real-world stochastic vehicle routing problem. The demerit is, The MILP problem does need to be accurate as long as it is acceptable. In this paper [2], VTL Priority Intersection Control (VTL-PIC) protocol algorithm is used. It can detect the presence of an emergency vehicle. A low overhead with the main goal of high average travel time is the demerit. In this paper [3], the author uses techniques from multi-agent reinforcement learning for large traffic system. It Proposed Q-learning outperformed the fixed time method under different traffic demands. The disadvantage of this technique is that protocols tend to maximize the variation of remaining energy of all the nodes. In this paper [4], the author proposed the geometric fuzzy multiagent system (GFMAS) algorithm is used to improved efficiency and accurate fuzzy multiagent of the proposed architecture and the demerit is deriving the sensitivities of the objective and constraint functions with respect to the design variables. The writer implements [5], an agent-primarily based approach and its applications in exclusive modes of transportation, which include roadway, railway, and air transportation is used to manipulate and management systems improves the flexible and compatible. The size of traffic data for each road link will affect the computation efficiency is the drawback.

3. Proposed System

In a transportation system, traffic lights are signaling the devices positioned at road intersections to control competing traffic flows. In general, traffic light control includes two major parts: color phase and time duration. The color phase is a sequence of standard colors (i.e., red, yellow and green). The time duration describes the displaying periods of the color phases. In the unified traffic management framework, we propose two online traffic light control strategies. Both of the two strategies automatically set color phases and calculate the time duration of these phases on competing roads according to the amount of digital pheromone. The major difference between the two strategies is whether the concerned traffic light agent considers the downstream traffic. In both strategies, we assume that each traffic light agent by default has the knowledge of its direct upstream pheromone, which can be easily obtained from corresponding roadside infrastructure agents. Traffic light agent can obtain the downstream pheromone by communicating with the neighboring traffic light agents.

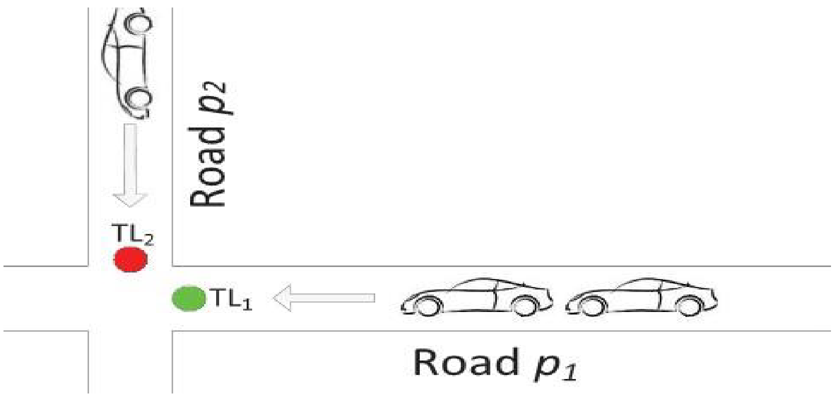

Figure 1.1. TLC Not Considering Downstream Traffic (TLC-NCDT)

Take above Figure 1.1., as an example, and suppose that the pheromone information on road links p1 and p2 is available when computing the duration for traffic lights T L1 and T L2. Also assume that p1, p2 are one-way roads, thus the two roads have the competing relationship, where only one of the roads can be switched to green traffic lights at any time point. Based on their pheromone, for example τ (p1,t + 1) > τ(p2,t + 1), road p1 should be assigned the green traffic light, and road p2 is red.

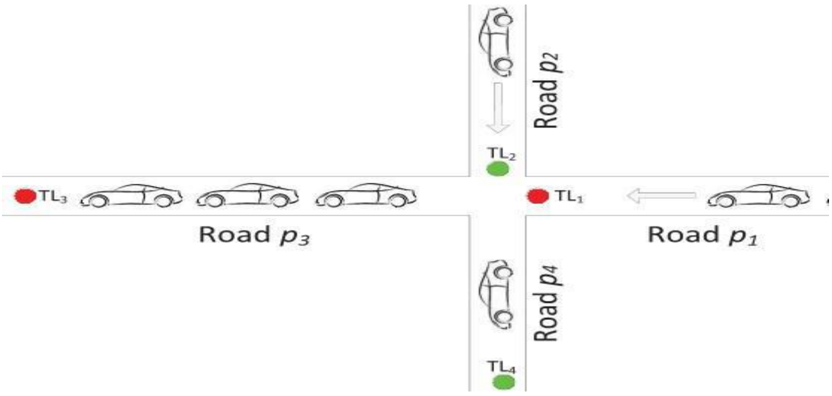

Figure 1.2. TLC Considering Downstream Traffic (TLC-CDT)

Take above Figure 1.2., as an example, and suppose that when regulating TL1 and TL2, the pheromone information on road links p3 and p4 can also be known through communication. To better illustrate the idea, we assume that vehicles on p1 and p2 respectively go straight to the road links p3 and p4 (e.g., not turning right or left). Since a concerned traffic light agent always controls whether the upstream vehicles should proceed to the downstream links, it will affect the traffic on both links. Generally, distributing vehicles to downstream road links without any restriction may deteriorate the traffic, especially if the downstream road is already congested. It is therefore ideal to additionally take the downstream visitors under consideration.

4. Flow Diagram

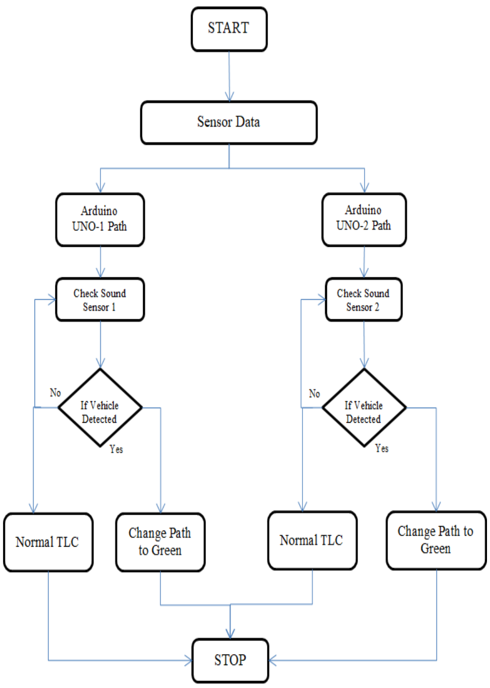

Figure 1.3. Flow Chart

5. Algorithm

Emergency traffic response Algorithm

Input:

G, road network; R , old routes; t, current time; l, vehicle selection parameter; k, number of paths; **Output:** Road network with new agent G;

➢ while #Sensor> 0 do Find road with maximum τ (p,t + 1); Get neighboring links path connected to road p according to l;

➢ for p do Get the vehicles which need rerouting on link p according to their original intentions to traverse p;

➢ for v ∈ do Compute path according to the global distance;

➢ Compute probability for each of the k paths according to local pheromone amount on the first l downstream links;

➢ Randomly select one path Set new route;

➢ Update pheromone;

➢ Update path;

➢ Delete the checked road;

➢ Output road network with new pheromone G;

6. Results and Discussions

The proposed method uses two sound sensors to detect the frequency of the ambulance heading towards the traffic signal. The sound sensor1 is attached to Arduino uno1 and sensor2 is connected to Arduino uno2. The connection among sesnor1 and sensor2 is done the usage of wireless Xbee protocol. When there's no ambulance detected at each the sensors, ordinary visitors operation keeps functioning. When the ambulance is detected at sensor1, the respective lane in which it is travelling is made green for duration of 10s for the ambulance to reach sensor2 position which is placed at traffic lights and the remaining lanes are made red.

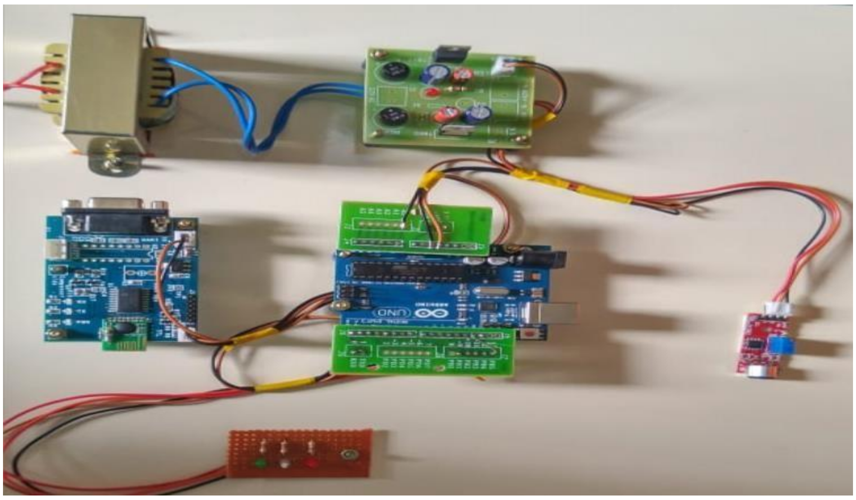

Figure 1.4. Hardware Output

7. Conclusion and Future Enhancement

In our paper, a novel multiagent pheromone-based traffic management framework is proposed for reducing traffic congestion, where we unify the vehicle rerouting and traffic light control for traffic congestion alleviation. In this framework, two different pheromones, i.e., traffic pheromone and intention pheromone are combined to model and predict the traffic condition. Once congestion is predicted, we first select vehicles according to the distance to the concerned road and their driving intentions, then we use one probabilistic strategy based on global distance and local pheromone to reroute those vehicles. At the same time, depending on whether or not they consider the downstream traffic condition, we develop two pheromone-based strategies to dynamically control traffic lights to further alleviate the traffic congestion.

Declarations

Source of Funding

This research did not receive any grant from funding agencies in the public or not-for-profit sectors.

Consent for publication

Authors declare that they consented for the publication of this research work.

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