



Intelligent Traffic Clearance System for Emergency Vehicles using Zigbee

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Abstract:

Traffic Congestion and control is a major challenge in the world today. Because of this traffic management is a critical issue faced in many metropolitan cities. Lack of efficient traffic control leads to loss of lives because of ambulance delay in case of getting stuck in traffic jams. To this issue, a framework is proposed which provides a smooth flow for the ambulance to reach the hospital in time. A new mode, "ambulance mode" which would control the traffic lights in the path of the ambulance is designed. The proposed approach is fully automated controlling the traffic lights thereby helping to reach the hospital in time. This is not preferred only for ambulance but can also be used for other emergency vehicles such as fire engine.

Keywords: Traffic control, Arduino, RF Transmitter, RF Receiver, Microcontroller

I. INTRODUCTION

Traffic congestion is considered as a major problem in most of the developing countries. Traffic signals need a good coordination for the smooth flow of traffic during the peak hours. Lot of techniques are available for speed monitoring say, laser and imaging, Radar etc. Also Global Positioning System (GPS) is also employed to monitor. Now a day, whenever an ambulance comes it is controlled manually at the traffic junction by a traffic officer. Our Proposed approach for traffic signal management uses RFID and zigbee to detect and control the traffic congestion and also passes emergency vehicles smoothly. RFID is a wireless technology that uses radio frequency electromagnetic energy to locate the objects from a distance. ZigBee is a transceiver module which operates at low-power to transmit and receive data from any standard CMOS/TTL source. The objective of the paper is to observe the traffic lights and density variation by applying suitable processing techniques. The paper targets the system design that would be adaptable to the existing conditions at the traffic junctions. This provides flexible traffic light system that ensures changes in traffic light density and reduces stress of traffic. Congestion of traffic creates no issues in the case of emergency requirements and reducing accidents. The paper is organized as follows. Section 2 describes the literature survey and their merits and limitations. Section 3 discusses about the current issue in traffic clearance for emergency vehicles and also how the proposed model will overcome this with the implementation details. Finally, section 4 concludes the paper with a highlight on the scope of the future work.

II. RELATED WORK

Police officer controls the traffic in early days. Now the traffic is controlled automatically by each lane 120 seconds of green light is set on by intelligent traffic management system. Yellow light flashes for 20 second, signifying to start your vehicle and be ready to go before the green

light. Disadvantages with the current system is it does not provide timing based on priority because of that people has to wait for long time even though traffic is not there and also does not prioritize and recognize the emergency vehicle. Khalil M. Yousef et.al [1] used the wireless sensors nodes and a control box to collect the traffic data and control the traffic. In [2], a priority based traffic lights controller is proposed using wireless sensor networks to provide clearance to any emergency vehicle by turning all the red lights to green in the path of the emergency vehicle based on the priority. Mohith and prerna [4] used programmable logic controller to measure the density of traffic congestion. Speed sensors are also placed to intelligent vehicle which communicates with other vehicles about weather conditions. In [5], data of each lane of traffic is collected by wireless sensor networks (WSN) and transferred to Intersection Control Agent (ICA) which are installed at every traffic light junction by Malik and Yi. Chen et al [6] proposed a strategy for recognizing vehicles using WSN. WSN's objective helped to implement the proposed strategy with RF transponder module. Pongpaibool et al [7] proposed a fuzzy logic for controlling traffic based on the vehicle speed. In [8] a laser scanner based technology is proposed by huiging et al for simultaneous localization and object mapping in a dynamic environment. Global Positioning System is utilized by direction oriented conclusion and is proposed in urban territories to help for global accuracy. RFID procedure manages multi-vehicle, multilane, multi-street intersection zone.

III. PROPOSED SYSTEM IMPLEMENTATION

In this proposed system, cost effective RF transponder is used for traffic clearance. we first control the normal traffic using sensor based density management. If any emergency situation occurs, then the swift movement is important to control the traffic congestion. The transmitter is mounted in the ambulance and receiver at the signal pole and a micro controller is programmed for controlling the interrupts and also

the RF modules.

Zigbee

ZigBee is a specification used to create personal area networks built from small, low-power digital radios. Its transmission distance is about 10–100 meters. ZigBee is commonly used in low data rate applications which require long battery life. ZigBee specification is simpler and less expensive than other wireless personal area networks (WPANs), such as Bluetooth or Wi-Fi. In this system, CC2500 is a RF module and has microcontroller. Rx is connected to Tx (RC6) of microcontroller. and Tx pin is connected to Rx pin of microcontroller (RC7). Other two pins are used to energize transceiver. It is used to transmit and receive the data at 9600 baud rate. Here, we uses CC2500 ZigBee module and it has transmission range of 20 meters.

Microcontroller

When compared with other series, Peripheral Interface Control (PIC) 16F series has a lot of advantages. It executes each instruction in less than 200 nanoseconds and easy to store and send UINs. This consists of 40 pins and has 8K program memory and 368-byte data memory. It is easy to store large number of emergency vehicles at the junction. It should satisfy all the conditions before switching to green. It is easy to switch any time and consumes less power and operates by vehicle battery itself without any extra hardware. In transmitter power supply is given through 12v battery. Then 12v voltage is converted to 5v by 7805 IC. 5v voltage is given as input to micro controller initially. Micro controller need to be reset which leads to 0 bit to all the ports. At port 3 all four switches are connected which will indicate that from which direction ambulance is coming and that direction is send to Zigbee serially to convert 5v signal to 12v

Traffic Clearance System

In this system, there are 2 major modules; first is ZigBee transmitter is placed in the emergency vehicle. The transmitter contains PIC16F877A microcontroller and ZigBee module. The microcontroller transmits the data to the ZigBee. Second module is the receiver, an ultra-sonic sensor is placed at traffic pole which also has the microcontroller and ZigBee module. Initially the traffic flow is monitored using sensor based density management. By default, the red and green light will set for 20 seconds. The actual connections of different components like RFID, GSM, ZigBee, interfacing different microcontrollers is shown in Figure1.

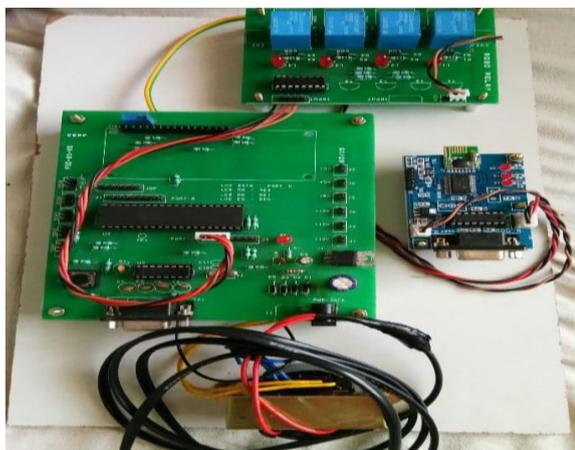


Figure.1.Hardware of Ambulance

When an emergency vehicle carrying ZigBee transmitter comes into the transmission range of ZigBee the ultra-sonic sensor recognizes the vehicle and the data will be transmitted from vehicle module to the control module.

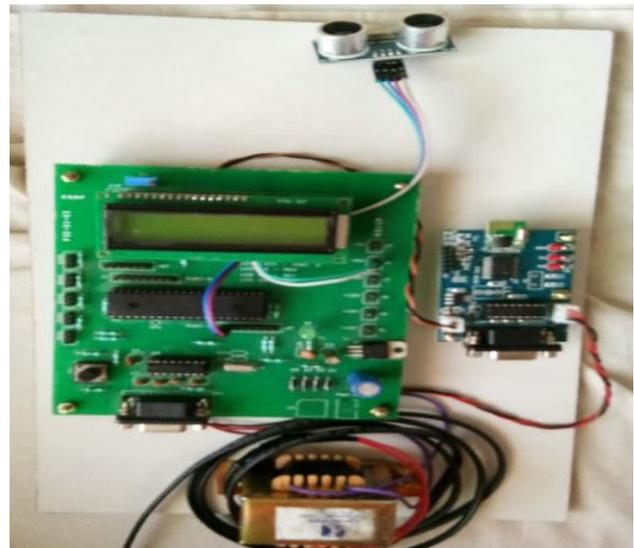


Figure.2. Hardware of control kit

If the captured signal matches the signal in stored data then Zigbee module in control unit will send a signal to traffic control unit and the traffic light turns to green then the traffic light will change to green till the receiver receives the signal.

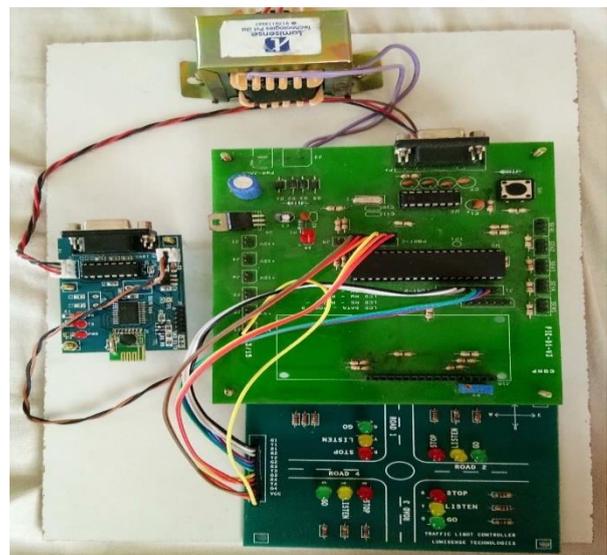


Figure.3. Hardware of traffic signal

IV. CONCLUSION

To reduce the blockage and undesirable time delay in traffic, a propelled framework is required. One such approach is the Intelligent traffic clearance using Zigbee. This system automatically senses the arrival of emergency vehicle and clears the lane by turning the signal to green which would drastically reduce the traffic congestion in big cities.

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