

INTELLIGENT TRAFFIC CONTROL SYSTEM FOR SMART AMBULANCE

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Abstract— Accidents have become common now a day. In emergency condition, each and every second is very important to save a patient's life. Also, the traffic congestion is the major problem. Due to the traffic, the emergency vehicles are delayed and the patients are not able to get proper treatment at hospitals in time. So we have proposed an IoT based "Intelligent Traffic Control System for Ambulance". The proposed system clears the traffic congestion by turning on an alert signal fixed to the traffic signal using ZigBee Module. Hence it provides a way to ambulance to reach its destination on time. The system consists of an android application installed at the ambulance end and the hospital end. At the ambulance end, the application will receive the data of the patient from the sensors such as temperature sensor and heartbeat sensor. These details of the patient along with its current location will be sent to the hospital end via a GSM module. The hospital end will thus receive this message about the patient and can do the necessary actions. The major role of this project is to control the traffic lights from the ambulance and make clearance for its way of path automatically without any disturbance of public. Hence, it acts like a lifesaver system as it saves the time and helps in achieving timely treatment for patients.

Keywords—ZigBee;GSM;

I. INTRODUCTION

India is the second most populous country in the world and is a fast growing economy. It is seeing terrible road congestion problems in its cities. Infrastructure growth is slow as compared to the growth in number of vehicles, due to space and cost constraints. Also, Indian traffic is non-lane based and chaotic. It needs traffic control solutions. Intelligent management of traffic flows can reduce the negative impact of congestion.

We can overcome these limitations by the emerging technology such as IoT i.e. Internet of Things. Various software implementations and hardware devices can be

connected with the help of wireless networking tools or wired tools. In IoT the components are connected and controlled by the internet. Thus the impact of IoT in today's era is significant as it helps to represent the object digitally and makes itself something greater than the object by itself.

The basic idea used for traffic management here is to detect and control congestion by using a decision making algorithm which determines how the traffic light operates based on the information collected from RFID devices.

This particular project is designed for the cities with heavy traffic. For example, in Bangalore the roads are jammed. Most of the time the traffic will last at least for 100 meters. In this distance the traffic police can't hear the siren from the ambulance. Then the ambulance has to wait till the traffic is cleared. So by this time anything can happen to the patient. This project avoids these drawbacks. In our system, if any ambulance comes near to any traffic post the traffic signals automatically stop the signals and give green signal for this ambulance. Health parameters such as ECG, Heart rate, body temperatures are calculated by hardware and further using serial communication are stored in PC present in ambulance through which they are transferred to hospital. For traffic controlling purpose RF communication is used.

Traffic congestion and tidal flow are major facts that cause delay to ambulance. To bar the loss of human life due to accidents we introduce a scheme called "Intelligent Traffic Control System for Smart Ambulance". The idea is to implement it to control mechanically the traffic lights in the path of the ambulance. The ambulance is controlled by the control unit which furnishes adequate route to the ambulance and also controls the traffic light according to the ambulance location and thus reaching the hospital safely. We use Bio-sensor in ambulance section so it find out the victim condition while travelling and send to the hospital using zig bee. GPS is used to find the accident spot and GSM Modem sends accident

location. When a RF transmitter is controlled and its traffic signal is made to be green for the ambulance to pass through without waiting, it is said to be in ON STATE.

II. LITERATURE SURVEY

1. "Survey Paper for Intelligent Traffic Control System for Ambulance" by Bhairavi Karale, Nikita Wasnik, Mansi Singh, Renuka Jawase -February 2018:

The paper presents the formatting instructions for the Proceedings of the intelligent Traffic control system for ambulance. The intelligent traffic control system provides green corridor for ambulance that are stuck in traffic and comprises of crucial emergency.

A "green corridor" is the synchronization of the green phase of the traffic signals. With a green corridor setup, a vehicle passing through a green signal will continue to receive green signals as it travels down the road. In addition to the green corridor path, the system will track an emergency vehicle like ambulance and fire brigades when they pass through a traffic light. Advantage of the system is that GPS inside vehicle does not require additional power. The biggest disadvantage of green corridor is that, when the wave is disturbed, the disturbance can cause traffic problems that can be exacerbated by the synchronization.

2. "Intelligent Ambulance with Automatic Traffic Control" by Saurabh Kapoor, Parul Gupta, Pooja Sharma, Prabhu Nath Singh- April 2017:

This paper includes the accident detecting, alerting and tracking mechanism with automatic traffic light controlling system such that the ambulance can achieve a free way in order to provide the first aid to patient as fast as possible. The main aim of the system is to design a Microcontroller based intelligent ambulance system which can change the traffic lights upon its arrival at traffic light junction using IR (Infrared) sensors.

This paper illustrates about a vehicle tracking system which is an electronic device installed in a vehicle to enable the owner or a third party to track the vehicle's location. The objects of the paper are: designing of a remote control. If a vehicle has met accidents, immediately an alert message with the location coordinates is sent to the Control center. From the control center, a message is sent to the nearby ambulance. Also signal

is transmitted to all the signals in between ambulance and vehicle location to provide RF communication between ambulance and traffic section.

3. "Intelligent Traffic Control System Implementation for Traffic Violation Control, Congestion Control and Stolen Vehicle Detection" by Dr. Roshani Ade and Swarup Kulkarni -2017:

The main aim of this paper is to actualize this framework is to distinguish Emergency vehicle like Ambulance utilizing RFID innovation and following stolen vehicle. In customary framework, they utilize image processing to recognize crisis vehicles. Inconvenience of this framework is amid terrible climate conditions. In stormy season or in windy season, picture captured by the camera gets bended. So it's hard to recognize required vehicle and hence we actualize Reliable RFID based framework which gives continuous system correspondence regardless of the possibility that the climate condition is bad.

4. "IoT Ambulance with Automatic Traffic Light Control" by S.N.Sivaraj, K.Vigneshwaran, S.Vigneshwaran, M.Vishnu Priyan- March 2017:

In this paper, the main aim is mainly based on communication between ambulance and various devices such as mobile phones, hospital computers and traffic signals so that the possibility for saving the life of the needy person will get increased. The Cayenne is a user defined application which is used to connect the sensors by Arduino and anyone can access the data with the user ID provided.

To make the happenings in the ambulance globally available and to help the ambulance to clear the traffic lights on its own. So the hospital belonging to the ambulance and the doctors all over the world can have access over the patient condition in the ambulance and provide their experience advice over the patient's condition. Other motto is to serve the rural people where there is no proper technologically developed hospital so that we can give them mini hospital at their place in high technological manner.

5. "Improved Traffic Control Systems for Emergency Vehicle Clearance" by Mrs.EShanthini, Sreeja- March 2016:

This paper states that the traffic management is the critical issue of the road. Traffic lights play an important role in the traffic management. The existing traffic lights follow the

predetermined sequence. So these lights are called static traffic lights. These traffic lights are not capable to count the number of vehicles and the priority of the vehicles on intersection point. As a result some vehicles have to wait even there is no traffic on the other side. The vehicles like Ambulance and Fire Brigade are also stuck in traffic and waste their valuable time.

The proposed system provides quality of service to Emergency vehicles and improves the accuracy of Automatic Traffic Light Violation Detection system as well as helps to trace out the stolen vehicles using RFID. 'Green wave' is the synchronization of the green period of movement signs. With a 'green wave' setup, a vehicle going through a green signal will keep on receiving green signals as it goes not far off. Around the globe, green waves are utilized to awesome impact. Frequently criminal or psychological militant vehicles must be recognized. Notwithstanding the green wave way, the framework will track a stolen vehicle when it goes through a movement light.

6. “A Novel Emergency Telemedicine System Based on Wireless Communication Technology—AMBULANCE” by Sotiris Pavlopoulos, Efthymoulos Kyriacou :

This paper provides early and specialized pre-hospital management contributes to emergency case survival and a portable medical device that allows teliagnosis, long distance support, and tele consultation of mobile healthcare providers by expert physicians. Many traffic control systems propose an autonomous solution which does not consider the future path of the ambulance. In this paper, the traffic control algorithm considers the current & destination location of the ambulance to control the traffic lights. This will help in optimization of the time taken by the ambulance to reach the hospital.

III. EXISTING SYSTEM

Ambulance service is a service that gets widely affected because of the traffic jams. If there is a delay in reaching of ambulance to hospital, a patient may lose his life. This is a very serious problem in case, if the patient is in very serious condition .But sometimes, the ambulance gets stuck in the traffic, which in turn wastes a lot of time. Hence to overcome all these situations a solution of “Intelligent Traffic Control System for Smart Ambulance” is proposed in this system. In the current system the emergency vehicle is given the privilege to jump the signal but due to a heavy traffic ahead it gets blocked and lives are at risk.

IV. PROPOSED SYSTEM

The main aim behind the project is to provide a smooth flow for the emergency vehicles like ambulance to reach the hospitals in time and thus minimizing the delay caused by traffic congestion. From the current problem section, it can be seen that, existing technologies are insufficient to handle the problems of congestion control, emergency vehicle clearance, stolen vehicle detection, etc. To solve these problems, we propose to implement our Intelligent Traffic Control System. It mainly consists of three parts. Here, each emergency vehicle contains ZigBee transmitter module and the ZigBee receiver will be implemented at the traffic junction. The buzzer will be switched ON when the vehicle is used for emergency purpose. This will send the signal through the ZigBee transmitter to the ZigBee receiver. It will make the traffic light to change to green. Once the ambulance passes through, the receiver no longer receives the ZigBee signal and the traffic light is turned to red.

The advantages are to provide the way to ambulance towards its destination on time. Also to smoothen the flow for the emergency vehicles like ambulance to reach the hospitals in time and thus minimizing the delay caused by traffic congestion

V. METHODOLOGY

- **ARDUINO UNO Controller:**

Arduino can be used as an open source physical computing platform based on simple microcontroller board. It provides a development environment for writing software. It is based on ATmega328 [14]. It has 14 digital input/output pins of which 6 can be used as PWM outputs, 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, an ICSP header, a power jack, and a reset button. It has everything that a controller needs .It is a simple procedure to connect it with USB port to power it with AC-TO-DC adapter to start. It features ATmega16U2 programmed as a USB to serial convertor. The ATmega328 has 32 KB (with 0.5 KB used for the boot loader). It also has 2 KB of SRAM and 1 KB of EEPROM. Each of the 14 digital pins on the Uno can be used as an input or output, using pin Mode (), digital Write (), and digital Read () functions. The Arduino software includes a serial monitor which allows simple textual data to be sent to and from the Arduino board. The RX and TX LEDs on the board will flash when data is being transmitted via the USB-to-serial chip and USB connection to the computer (but not for serial

communication on pins 0 and 1). Software Serial library allows for serial communication on any of the Uno's digital pins. The ATmega328 also supports I2C (TWI) and SPI communication. The Arduino software includes a Wire library to simplify use of the I2C bus.

- **GSM/GPRS –SIM900A:**

GSM/GPRS –SIM 900A modem has a built in RS232 which helps to connect it with PC as well as microcontroller. It is a dual band modem which works on frequencies 900/1800MHz. Baud rate is configurable from 9600-115200 through AT commands. The baud rate is nothing but the modulation rate in symbols per second. This modem also has an internal TCP/IP stack which makes it enable to connect with internet via GPRS (General Packet Radio Service). This is suitable for SMS, voice as well as data transfer applications in M2M interface. This modem also has on board regulated power supply that allows it to be connected to wide range of unregulated supply. This GSM modem is used to make audio calls, send and read SMS, attend incoming calls, internet, etc through AT commands.

- **Zigbee**

Zigbee is a wireless technology developed as an open global standard to address the unique needs of low-cost, low-power wireless IoT networks. The Zigbee standard operates on the IEEE 802.15.4 physical radio specification and operates in unlicensed bands including 2.4 GHz, 900 MHz and 868 MHz. The specification is a packet-based radio protocol intended for low-cost, battery-operated devices. The protocol allows devices to communicate in a variety of network topologies and can have battery life lasting several years.

VI. SYSTEM REQUIREMENT AND SPECIFICATION

Functional Requirements:

Functional requirements define a function of a system or its components, where a function is described as a specification of behavior between outputs and inputs.

1. Receiving Incident information from the caller.

When the request for ambulance comes to the operator, he takes information about the incident from the caller. This information is entered into the ambulance dispatch system. This information includes caller phone number, address (any combination of street name, zip code), description/nature of the incident, number of people involved in the incident. If the caller does not know the exact address of the patient, it is found using an external system. This external system

determines the incident address depending on the caller's phone number.

2. Dispatch of ambulance and resource

Once the ambulance is allocated to the incident, dispatcher will use the system to send the notification, incident information and the details of the nearest hospital to ambulance personnel. This information is also called "allocation information". A geographical search of the place around which the incident has taken place will help the dispatcher find the nearest hospital.

3. Finding the route to the incident

Once the allocation information is sent to the ambulance personnel, he can get the route information to the incident using an external GPS system. Ambulance personnel can view the route on his LCD screen inside the ambulance. Once the ambulance personnel reach the incident location, route to the nearest hospital is also shown on his LCD screen using external GPS system.

4. Tracking and monitoring of ambulance.

This functionality allows dispatcher to track the status of the ambulance. Once the job is completed, the system informs the dispatcher that the job has been executed. The status of each ambulance is then updated as required.

Non-Functional Requirements:

Non-Functional requirements define the behavior or operation of a system.

1. Usability

Ambulance Dispatch System shall provide mouse and keyboard navigation. Ambulance Dispatch System shall be easy to navigate by using clear words, menus and drop-down lists. The Ambulance Dispatch System shall be accompanied with a user manual.

2. Reliability

Ambulance Dispatch System shall be available 24 hours a day for application users.

ACKNOWLEDGMENT

We are grateful to many people. First, We whole heartedly express our gratitude to our respected Principal Dr M C Nataraja, Director Prof Y.Vrushabhendrapa, our HOD Dr Poornima B and Asst. Prof Mrs. Shilpa M Yadawad for

constant encouragement, valuable guidance and constant support. Finally, we thank GSSSIET, Mysuru for providing us this opportunity.

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