ELEGANT AND EFFECTIVE MANAGEMENT SYSTEM FOR EMERGENCY TRAFFIC CONTROL

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Abstract: Traffic congestion and tidal flow are major facts that cause delay to ambulance. 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. To implement ITLS (Intelligent Traffic Light system which would control mechanically the traffic lights in the path of the ambulance. The ambulance is controlled by the control unit which furnishes route to the ambulance and also controls the traffic light according to the ambulance location and thus reaching the hospital safely. The controller identifies the location of the accident spot through the sensor systems in the vehicle which determined the accident and thus the controller walks through the ambulance to the spot. Our system finds the accident spot, controls the traffic lights, helping to reach the hospital in time.

Keywords - ITLS, Traffic, Congestion, Sensor system

I. INTRODUCTION

The system controls the traffic lights using wireless communication system and selects short path with less congestion. All that to reduce the time taken by ambulance to deliver the patient to the hospital in optimal time. The wireless communication systems have been employed to send and receive data between the terminals. The most common used communication system is GSM. In the proposed system, the ambulances are monitored, tracked and guided by implemented algorithms at the data center. In addition, this algorithm selects the optimal path for an ambulance depending on crowed sensor readings fixed on the roads to offer the shortest and safe way to deliver the patient to the emergency department. The investigated system consists of two main parts, which are data center and ambulance. The ambulance includes the hardware equipment uses the microcontroller of Arduino added to GPS and GSM modules. The GPS module is used to obtain the current location of ambulance, while the GSM module is utilized to transfer the GPS readings the data center for processing and decision.

II. PROPOSED SYSTEM

In proposed system 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. The vehicle accident observed using vibration sensor, accelerometer sensor and in the control section it is received by the microcontroller and then the nearby ambulance is received from the PC and controller sends the message to the ambulance. The signal to Traffic signal section is transmitted through RF communication.

III. SYSTEM DESCRIPTION

Our system consists of three main units, which coordinates with each other and makes sure that ambulance reaches the hospital without any time lag. Thus our system is divided into following three units,

- ➢ Vehicle Unit
- ➢ Ambulance/control Unit
- ➢ Traffic unit

1. VEHICLE UNIT

The vehicle unit installed in the vehicle senses the accident and sends the location of the accident to the controller. According to our system, every vehicle should have a vehicle unit. The vehicle unit consists of a vibration sensor, accelerometer sensor, controller, GPS system and a GSM module. The vibration sensor used in the vehicle will continuously sense for any large scale vibration in the vehicle. The sensed data is given to the controller GPS SYSTEM inside the vehicle. The GPS SYSTEM finds out the current position of the vehicle which is the location of the accident spot and gives that data to the GSM MODULE. The GSM MODULE sends this data to the control unit.

BLOCK DIAGRAM OF VEHICLE UNIT
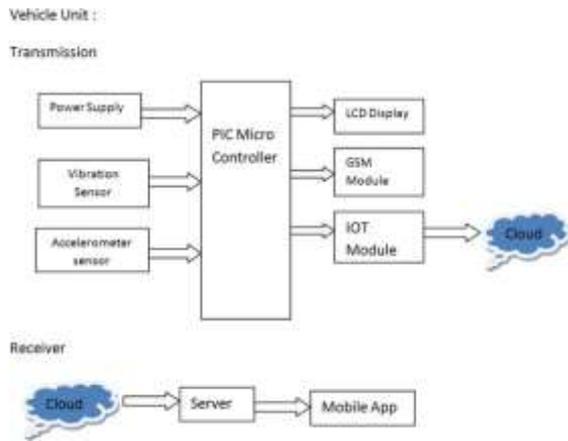
Fig.1 Block diagram of vehicle unit

If a vehicle has met accident, vibration sensor or fire sensor gives the electric signal to microcontroller through signal conditioner. Then GPS provides latitude and longitude information about vehicle location to control section through GSM.

2. AMBULANCE UNIT

The controller finds the nearest ambulance to the accident spot and also the shortest path between the ambulance, accident spot and the nearest hospital. The controller then sends this path to the ambulance. Also using this information the controller controls all the traffic signals in the path of ambulance and makes it ready to provide free path to ambulance, which ensures that the ambulance reaches the hospital without delay. At the same time, the ambulance unit turns ON the RF/Zigbee transmitter. This will lead to communicate with the traffic section.
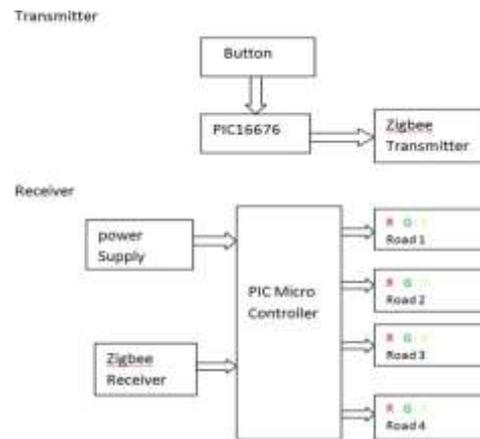
BLOCK DIAGRAM OF AMBULANCE UNIT
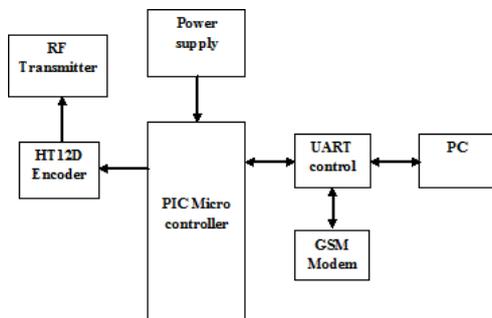
Fig.2 Block Diagram of Ambulance

In control section GSM modem receives message about accident and send it to PC. PC identifies the nearest ambulance and ambulance is instructed to pick up the patient. Control section transmits the control signal to all the signals in between ambulance and vehicle by RF/Zigbee transmission.

3. TRAFFIC UNIT

Whenever traffic signal section receives the information about accident, the RF receiver in this section is turned ON to search for ambulance nearing the traffic signal. Whenever the ambulance reaches near to the traffic signal, the traffic signal will be made to green through RF communication. Thereby the ambulance is recommended to reach the hospital in time.

BLOCK DIAGRAM OF TRAFFIC UNIT

Fig.3 Block Diagram Of traffic unit

Whenever the ambulance reaches near to the traffic signal, the traffic signal will be made to green through RF / Zigbee communication. Thereby the ambulance is recommended to reach the hospital in time.

A. PIC MICROCONTROLLER

The microcontroller is an integrated chip which consists of CPU, RAM, ROM, timers, and counters, etc. In the same way, PIC microcontroller architecture consists of RAM, ROM, CPU, timers, counters and supports the protocols such as SPI, CAN, and UART for interfacing with other peripherals. At present PIC microcontrollers are extensively used for industrial purpose due to low power consumption, high performance ability and easy of availability of its supporting hardware and software tools like compilers, debuggers and simulators.

Fig.4 PIC Microcontroller

The main features of PIC microcontrollers are RAM, flash memory, Timers/Counters, EEPROM, I/O Ports, USART, CCP (Capture/Compare/PWM module), SSP, Comparator, ADC (analog to digital converter), PSP(parallel slave port), LCD and ICSP (in circuit serial programming) The 8-bit PIC microcontroller is classified into four types on the basis of internal architecture such as Base Line PIC, Mid Range PIC, Enhanced Mid Range PIC and PIC18.

B. ARDUINO UNO

The Arduino UNO is a widely used open-source microcontroller board based on the ATmega328P microcontroller and developed by Arduino.cc. The arduino is the major control unit to detect or alert when an accident occurs. It collects the data from vibration sensor, GPRS and GSM modules and reflects the output either in display system or through a message. Here vibration sensor plays a major role. This vibration sensor will receive the vibrations of the vehicle which in turn acts as a accident detection module. Arduino gathers the information from all other modules and sends the message to the receiver though GSM module.

Fig.5 .Arduino Uno Board

C. GPS MODULE

GPS is used in vehicles for both tracking and navigation. Tracking systems enable a base station to keep track of the vehicles without the intervention of the driver where, as navigation system helps the driver to reach the destination. Whether navigation system or tracking system. When an accident occurred in any place then GPS system tracks the position of the vehicle and sends the information to the particular person through GSM by alerting the person through SMS or by a call. GPS module sends the data related to tracking position in real time.

Fig.5 GPS module

D. RF TRANSMITTER AND RECEIVER

The RF modules are 433 MHz RF transmitter and receiver modules. The transmitter draws no power when transmitting logic zero while fully suppressing the carrier frequency thus consume significantly low power in battery operation. When logic one is sent carrier is fully on to about 4.5mA with a 3volts power supply. The data is sent serially from the transmitter which is received by the tuned receiver. Transmitter and the receiver are duly interfaced to two microcontrollers for data transfer.

RF transmitter receives serial data and transmits to the receiver through an antenna which is connected to the 4th pin of the transmitter. When logic 0 applied to transmitter then there is no power supply in transmitter. When logic 1 is applied to transmitter then transmitter is ON and there is a high power supply in the range of 4.5mA with 3V voltage supply.

IV. RESULT AND DISCUSSION

A. NORMAL CONDITION

In normal condition the vibration sensor and fire sensor value will be less than the preset value.

B. ACCIDENT CONDITION

If a vehicle has met accident, vibration sensor gives the electric signal to microcontroller through signal conditioner. Then GPS provides latitude and longitude information about vehicle location to control section through GSM.

C. BEFORE AMULANCE REACHING TRAFFIC SIGNAL

Before ambulance reaching the traffic signal junction, the signal will be red. Control section transmits the control signal to all the signals in between ambulance and vehicle by RF transmission.

D. AFTER AMULANCE REACHING TRAFFIC SIGNAL

After ambulance reaching the traffic signal junction the signal will turn into green with the help of the RF signal.

V. CONCLUSION

Ambulance traffic light control system with optimal selecting of the path was presented. In addition, a complete navigation system to the ambulance was provided. The proposed system included two parts; ambulance and data center. The ambulance contained the hardware unit that collected the GPS signals and then sent them to the webpage of the datacenter in which they saved in database later. The data center implemented the changing of traffic light control algorithm that gives green signal when the ambulance being nearby. Additionally, the selecting of optimal path from patient to hospital locations and in the opposite direction has been performed at the data center depending on the crowd sensor readings fixed at the roads.

VI. REFERENCES

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