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A Green Path for Ambulance

N.Swetha
PG Scholar,
Dept of ECE,
Hyderabad, TS, India.

Mr.V.Pandu Ranga
Assistant Professor,
Dept of ECE,
Hyderabad, TS, India.

Mr.Kumar Sanjeev
Assistant Professor,
Dept of ECE,
Hyderabad, TS, India.

Abstract:
There is loss of life due to the delay in the arrival of ambulance to the hospital in the golden hour. This delay is mainly caused by the waiting of the ambulance in the traffic signals. The main theme behind this scheme 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. The idea behind this scheme is to implement ARSPTS which would 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. The controller identifies the location of the accident spot through the accelerometer in the vehicle and thus the controller walks through the ambulance to the spot. This scheme is fully automated, thus it finds the accident spot, controls the traffic lights, helping to reach the hospital in time.

Keywords: raspberry pi. ARM 7, zigbee, GPS

Introduction:

In today's world, traffic jams during rush hours is one of the major concerns. During rush hours, emergency vehicles like Ambulances, Police cars and Fire Brigade trucks get stuck in jams. Due to this, these emergency vehicles are not able to reach their destinations in time, resulting into a loss of human lives.

We have developed a system which is used to provide clearance to any emergency vehicle by turning all the red lights to green on the path of the emergency vehicle, hence providing a complete green bay to the desired vehicle. A 'green bay is the synchronization of the green phase of traffic signals. With a 'green bay' setup, a vehicle passing through a green signal will continue to receive green signals as it travels down the road. Around the world, green bay are used to great effect. In addition to the green bay path, the system is used to implement the concept of the green bay. Apart from this system will also provide patient monitoring from the hospital. Human life is affected due to delay in the arrival of ambulance. The ambulance is not able to reach the hospital in the golden hour. It gets stuck in the traffic signals.

It would be of great use to the patient if the traffic signals in the path of the ambulance are ON. There must be a system by which the ambulance would reach the accident spot and then hospital as soon as possible to carry out health services [1]. The existing systems are post accident detection systems. It has lack of intelligence. It fails to track the rear-end collision and pre-damage status. It depends on the way of monitoring people to be manual. It requires manual work to save human life which results in time delay and because of that first aid cannot be provided to the patient on time. This leads to loss of human life. The applications of powerful portable devices for human activities are described [6][7]. An automated mobile system for road safety services is described.

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It provides support to emergency service vehicles (EV) for accomplishing the mission faster. It is more reliable. The system must be based on standards, fully automated, flexible, intelligent and low cost. The availability of more pervasive and newer communication networks such as Zig Bee, WiMAX and mesh networks is more reliable. The objective of the system is to fulfill the needs of an error free and efficient emergency system. In case of an accident, it can accurately and quickly find the ambulance and send it to the accident spot without the requirement of manual work. It is made to reduce human errors, wrong data or treatment. The solution to traffic congestion problem and an advanced algorithm have been described to find the shortest path in car navigation system [8][9]. It is difficult for many drivers to find an efficient route. These systems can perform the task of determining the best path to the destination. The process of finding the shortest route from one point to another is called routing. A new algorithm is proposed in this paper. It is a modified version of dijkstra. These methods can improve used memory and run times because the visited edges and nodes are limited. Traffic congestion is a social problem that occurs because of the increasing number of vehicles.

Here, a pheromone model is applied to a traffic signal control to alleviate traffic congestion. It is spread by vehicles across the road. The amount of pheromone correlates to traffic congestion. The factors of traffic signals are controlled by the pheromone to reduce the inactive time in front of it. In the references [10][11], the emergency rescue system reliability on highway and intelligent ambulance have been described. To make sure, that the ambulance would arrive at the location of the accident on time and would reach to hospital as soon as possible to provide health services to the patient, the emergency rescue system started. It analyzed its structure on highway in three ways: rescue plan, incident detection and equipment management. The reliability of the system is discussed based on the travel time.

Then a mathematical model of the reliability of travel time is established. At last, a model example for the reliability of travel time is showed. The intelligent ambulance is designed for the wounded to maintain the level of self-balancing state. To detect the gravitational vertical stretcher, it works on the principle of gyroscope.

System architecture:

Currently there is no technology for accident detection. As it is done manually, there is loss of life in golden hours .The accident victim is dependent on the mercy of others to rush him to hospital. Many times accident goes unnoticed for hours before help comes in .Due to all these factors there is high rate of mortality of accident victims. In addition to this there is a delay in the ambulance reaching the hospital due to the traffic congestion between accident location and hospital which increases the chances of death of victim. In order to overcome the existing problem we implement a new system in which there is an automatic detection of accident.

A GSM, GPS, Accelerometer unit fitted in the vehicle detects the accident and sends the accident location to the main server unit and ambulance is rushed into accident spot which carries the patient to hospital and along with this controlling the traffic lights signals in the path of the ambulance to provide the clear path. This will minimize the time required to by the ambulance to reach the hospital. Automatic Ambulance Rescue System Our system consists of four 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 four units. The Vehicle Unit, Main Server, Ambulance Unit, Node Circuit. (Traffic Junction Unit). The vehicle unit installed in the vehicle senses the accident and sends the location of the accident to the main server. The main server finds the nearest ambulance to the accident spot and also the shortest path between the ambulance, accident spot.

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The server then sends this path to the ambulance. Also using this information the server controls all the nodes in the path of ambulance and make it ON, which ensures that the ambulance reaches the hospital without delay. The architecture of this system is shown in the fig 1.

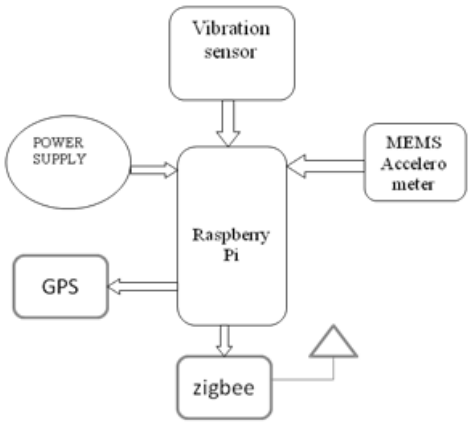

Figure 1:Vehicle Unit

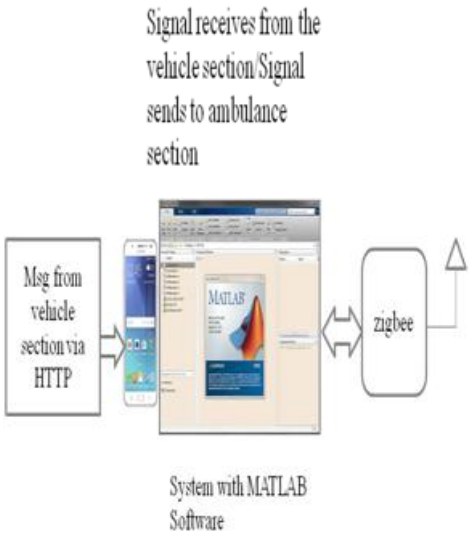

Figure 2: Main Server

According to our system, every vehicle should have a vehicle unit. The vehicle unit consists of accelerometer, controller, siren, a user interface, GPS system and a GSM module. On impact on the vehicle ,information about the accident is sent to the main server .this information consist of the location of accident detected by GPS module installed in the vehicle.

The GPS system finds out current position of vehicle (latitude & longitude) which is the location of the accident spot and gives the data to the GSM module. This information to the main server is conveyed by GSM module. There is also a provision of avoidance of accident by using accelerometer. Accelerometer alerts the driver and public by turning on the buzzer whenever the position deviates from the normal The GPS SYSTEM finds out the current position of the vehicle (latitude and the longitude) which is the location of the accident spot and gives that data to the GSM MODULE. The GSM MODULE sends this data to the MAIN SERVER whose GSM number is already there in the module as an emergency number. Whenever traffic signal section receives the information about accident, the controller in this section is turned ON to search for ambulance nearing the traffic signal. Whenever the ambulance reaches near to the traffic signal(approximately 100m), the traffic signal will be made to green. Thereby the ambulance is recommended to reach the hospital in time.

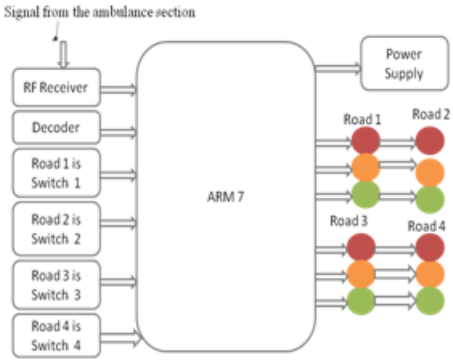

Figure 3: Traffic unit

Ambulance unit has a GPS SYSTEM and a GSM MODEM for transmitting GPS data to the Main Server. The server receives the GPS data sent by the ambulance at intervals of time. The server sends the co ordinates of all the nodes in the path to the ambulance. The server will indicate the accident spot and ambulance location respectively. The ambulance unit on receiving the co-ordinates plots them on to a map with the last two co ordinates as the accident spot and

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the hospital location to get the shortest path to the hospital.

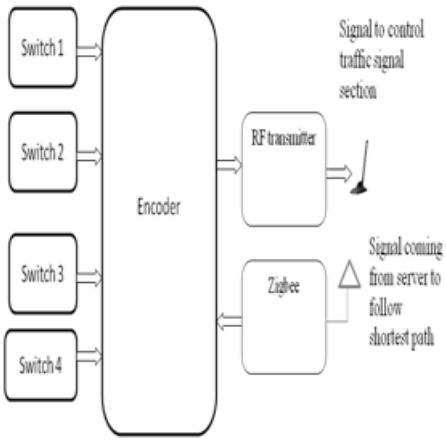

Figure 4: Ambulance Section

Raspberry pi:

A Raspberry Pi is a thirty five dollar, credit card sized computer board which when plugged into an LCD and attachment of a keyboard and a mouse, it is able to complete the functions of any regular PC can. Like a PC, it has RAM, Hard Drive (SD Card), Audio and Video ports, USB port, HDMI port, and Ethernet port. With the Pi, users can create spread sheets, word-processing, browse the internet, play high definition video and much more. It was designed to be a cost friendly computer for users who needed one. Here we are using Raspberry pi 3 model B. it uses 1GB LPDDR RAM and inbuilt Wi-Fi is there when compared to earlier versions.

Figure 4: raspberry pi

ARM 7 Microcontroller:

The ARM7TDMI-S is a general purpose 32-bit microprocessor, which offers high performance and very low power consumption. The ARM architecture is based on Reduced Instruction Set Computer (RISC) principles, and the instruction set and related decode mechanism are much simpler than those of micro programmed Complex Instruction Set Computers (CISC). This simplicity results in a high instruction throughput and impressive real-time interrupt response from a small and cost-effective processor core. Pipeline techniques are employed so that all parts of the processing and memory systems can operate continuously. Typically, while one instruction is being executed, its successor is being decoded, and a third instruction is being fetched from memory. The ARM7TDMI-S processor also employs a unique architectural strategy known as Thumb, which makes it ideally suited to high-volume applications with memory restrictions, or applications where code density is an issue.

MEMS:

MEM Solver is a powerful yet simple design and analysis tool for researchers, engineers and students working in the field of Micro Electro Mechanical Systems or MEMS. MEMS is a highly specialized inter-disciplinary field of engineering which engages in the development of micro mechanical sensors, actuators and other micro devices. Unlike some numerical analysis and finite element analysis software which require extensive programming skills and knowledge of the system to create a successful model, MEM Solver has readymade models and its associated mathematics wrapped up into one ME Solver is used in some of the most technically advanced nations and universities and also in some of the least known nations in the MEMS technology map. ME Solver attempts to deliver MEMS knowledge and technology at affordable rates.

Vibration sensor:

Vibration sensors detect the vibration of the ground soil in case of a debris flow. Prior to installing a vibration sensor, it is extremely important to determine what level of vibration is appropriate to activate the sensor in case of a debris flow. It is also important to keep in mind the risk of unintentional activation caused by earthquakes, as well as areas in which there

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is construction traffic and other vibration causes that may activate the sensor.

Zigbee:

The XBee/XBee-PRO RF Modules are designed to operate within the Zigbee protocol and support the unique needs of low-cost, low-power wireless sensor networks. The modules require minimal power and provide reliable delivery of data between remote devices. The modules operate within the ISM 2.4 GHz frequency band. The XBee modules maintain small buffers to collect received serial data, which is illustrated in the figure below. The serial receive buffer collects incoming serial characters and holds them until they can be processed. The serial transmit buffer collects data that is received via the transceiver that will be transmitted out to the UART. So, the zigbee can do the transceiver operation.

RF communication:

Radio Frequency, any frequency within the electromagnetic spectrum associated with radio wave propagation. When an RF current is supplied to an antenna, an electromagnetic field is created that then is able to propagate through space. Many wireless technologies are based on RF field propagation.

Transmitter:

The TWS-434 extremely small, and are excellent for applications requiring short-range RF remote controls. The TWS-434 modules do not incorporate internal encoding. If simple control or status signals such as button presses or switch closures want to send, consider using an encoder and decoder IC set that takes care of all encoding, error checking, and decoding functions. The transmitter output is up to 8mW at 433.92MHz with a range of approximately 400 foot (open area) outdoors. Indoors, the range is approximately 200 foot, and will go through most walls.

Fig3: RF Transmitter

Reciver:

RWS-434: The receiver also operates at 433.92MHz, and has a sensitivity of 3uV. The WS-434 receiver operates from 4.5 to 5.5 volts-DC, and has both linear and digital outputs. A 0 volt to Vcc data output is available on pins. This output is normally used to drive a digital decoder IC or a microprocessor which is performing the data decoding. The receiver's output will only transition when valid data is present. In instances, when no carrier is present the output will remain low. The RWS-434 modules do not incorporate internal decoding. If you want to receive Simple control or status signals such as button presses or switch closes, you can use the encoder and decoder IC set described above. Decoders with momentary and latched outputs are available

Fig4: RF receiver

Result:

The project **" A Green Path For Ambulance"** was designed to find the accident occurred vehicle with the help of GPS and sending messages to server and mobile number . Server finds the ambulance and send the location of near by hospital directing it through shortest route and clear the traffic path without waiting and reach the hospital in golden time.

Vehicle Section Detecting The Sensor:

In this vehicle section once the MEMS or Vibration sensor gets detected , it means that accident occurred and it sends the message to mobile.

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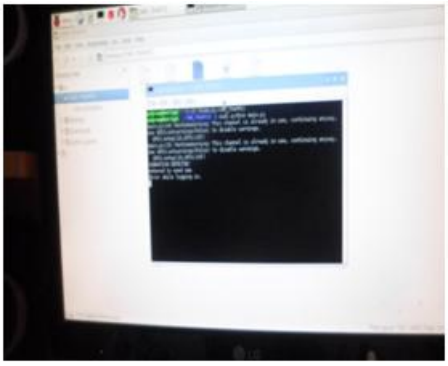
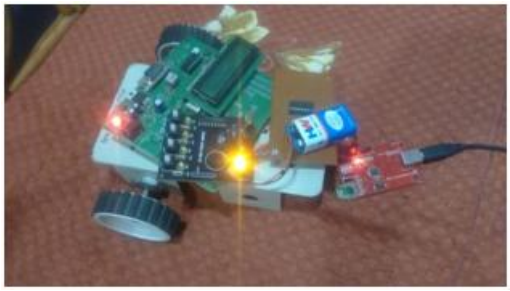


Fig. 5 Accident Vehicle Detection

Ambulance Section With Shortest Route:

An ambulance is guided with the help of server using Zigbee to follow the shortest route by using MATLAB as software.



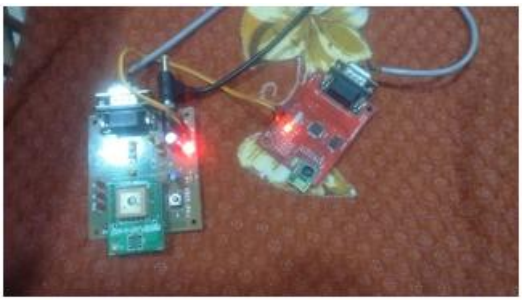


Fig. 6 Ambulance With Shortest Route

Ambulance Passing The Traffic Signal Path:

In this section ambulance will control traffic signal path with the help of RF module . Ambulance will be connected with RF transmitter and the traffic signal will be connected with RF receiver. Once the RF transmitter transmits the message by radio signal the receiver receives the signal and change LED as it requires. Once the ambulance passes away the path will be normally working.

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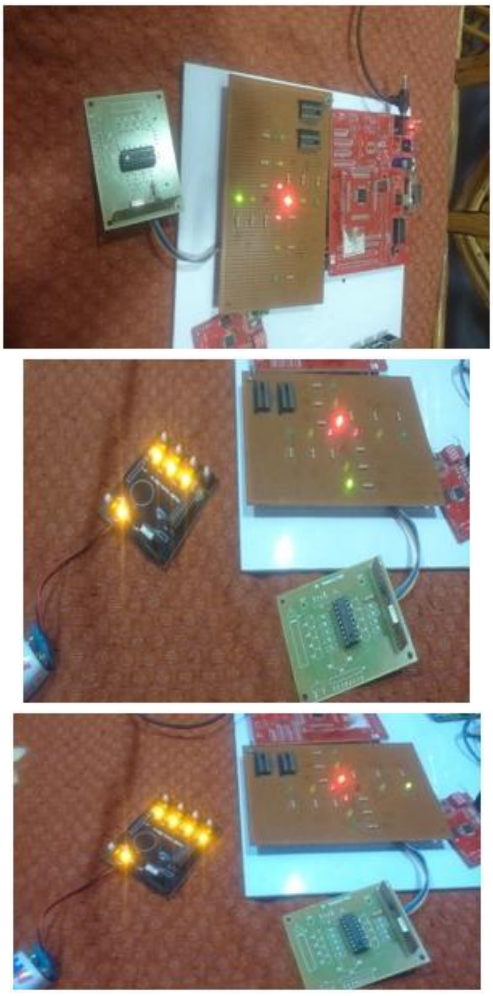

Fig 7 Ambulance Controlling Traffic Signal Path

Conclusion:

This system will definitely help to traffic police to give the way to the ambulance when there is heavy traffic on the road. Also the accident zone is detected and the location is sent to the controller, and the nearest ambulance is alerted and the message is sent to the police station. The design and implementation of this technique is directly targeted for traffic management so that emergency vehicle on road gets clear way to reach their destination in less time and without any human interruption. The main feature of this operation is the ability to communicate with purpose using GSM and GPS. It is very smart to find the location of emergency of VIP vehicle and the ambulance to clear path to pass on.

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