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Automatic Ambulance Rescue System Using Shortest Path Finding Algorithm

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Abstract: ***Traffic congestion and tidal flow management were recognized as major problems in modern urban areas, which have caused much uncomfortable for the ambulance. Moreover road accidents in the city have been nonstop and to bar the loss of life due to the accidents is even more crucial. To implement this we introduce a scheme called Automatic ambulance rescue system using shortest path finding algorithm. The main theme behind this scheme is to provide a smooth flow for the ambulance to reach the hospitals in time and thus minifying the expiration. The ambulance is controlled by the central unit which furnishes the most scant route to the ambulance and also controls the traffic light according to the ambulance location and thus reaching the hospital safely. The server also determines the location of the accident spot through the sensor systems in the vehicle which encountered the accident and thus the server 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: accident sense automatically, traffic light control, find victim status, avoid rash driving

1. Introduction

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. It would be of great use to the ambulance if the traffic signals in the path of the hospital are ON. Thus we propose a new design for automatically controlling the traffic signals and achieving the above mentioned task so that the ambulance would be able to cross all the traffic junctions without waiting. Every traffic signal will have a controlling the RF transmitter and RF receiver. This RF transmitter placed in ambulance and RF receiver placed in traffic signal. We use Bio-sensor in ambulance section so it find out the victim condition while travelling and send to the hospital using zigbee.GPS is find the accident spot and GSM Modem send 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 .Thus using these data the ambulance is guided to the hospital by the server through the shortest route. MEMS sensor indicates the rash driving.

2. 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,

- Vehicle section
- Ambulance section
- Signal section
- Hospital section

3. Vehicle Section

The vehicle unit installed in the crash sensor and MEMS sensor they can sense the accident and sends the location of the accident to the emergency centre and MEMS sensor is can sense rash driving. The NS2 simulator finds the nearest ambulance to the accident spot and also the shortest path between the ambulance, accident spot and the nearest hospital. The server then sends this path to the ambulance. Rest button is used for if accident is occur but person do not injured so automatically information passed to emergency centre. so rest button can avoid the further process. It has GPS and GSM unit GPS can find the accident location and GSM modem can send the information to emergency centre. MEMS is consider the acceleration vehicle is occurred over tiled indicator can be indicator. Vehicle section is contains ARM microcontroller reason for this microcontroller has two serial communication ports and that two serial communication devices are GPS and GSM. The architecture of this system is shown in the fig 1.

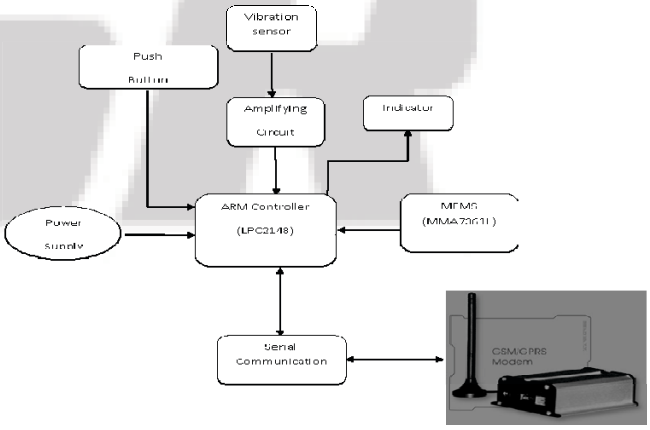

Figure1: Ambulance section

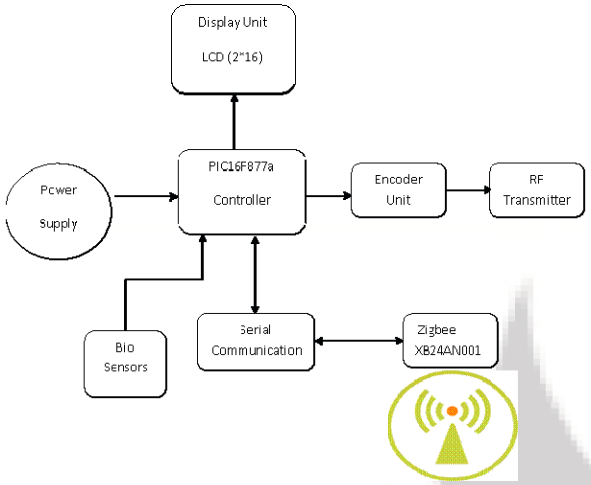

Figure 2

Ambulance section has Bio-sensor its can sense victim condition while accident spot to hospital travailing time. Then zigbee can send the victim condition to hospital .LCD display is used for display the nearest hospitals name and hospital specification. RF transmitter is controlled traffic signal up to certain distance.

4. Signal Section

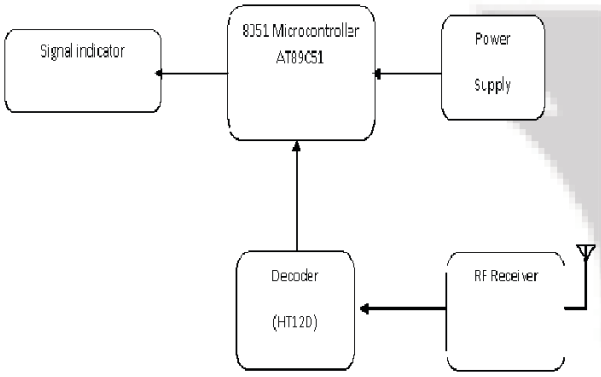

Figure 3

Signal section contains RF receiver, while crucial ambulance travailing RF transmitter will send message to RF receiver then RF receiver will provides green signal.

5. Hospital Section

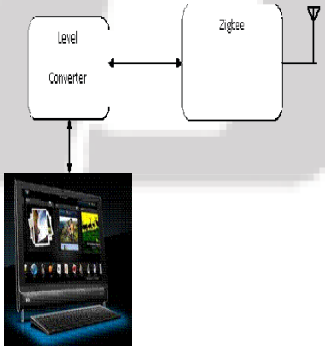

Figure 4

Hospital section has zigbee, it receives the victim condition in ambulance .level converter is convert the data for system.

6. Finding the Nearest Ambulance and Hospital to the Accident Spot

When a vehicle meets with accident, it immediately sends its GPS location to the Main server. The server main- tains a database of the ambulances available. The server selects the nearest ambulance to the accident spot using the database containing the details of free and busy ambulances at that point of time. Then the server scans the locations of the free ambulances in the database. It calculates the distance between the accident spot and each ambulance. Then it compares all the distances calculated and selects the nearest ambulance [2].

Therefore for performing the above functions, the server must have the following databases:

- An Ambulance database - contains list of free and busy ambulances at that time.
- A NODE database – The Main Server allocates a unique ID for each node and has a database to containing all the nodes' IDs, GSM numbers and their GPS co ordinates.
- A Hospital database - containing their locations (GPS coordinates) with their GSM numbers.

6.1 Shortest Path Using Dijkstra

As the nodes in the given region are fixed points and the distance between the nodes are predetermined, the shortest path between the nodes can be selected using the DIJKSTRA algorithm. Consider a case when the ambulance travels from accident spot to the hospital. The database in the server as said earlier contains the node and the distance between the adjacent nodes to which it is connected. The accident spot is taken as the source and the hospital is taken as the destination. The node next to the accident spot and the node in the path to hospital must be traced. So that accident node is taken as source and the hospital node is taken as destination and the DIJKSTRA algorithm is applied for these nodes. There may be several paths between these nodes and the algorithm finds the shortest path. There may be one way roads along this path, therefore this must be a vector quantity. The server finds nearest node from source and marks it as visited. Then that node is considered as source and the procedure is continued till the destination. Initially, the source doesn't know the distance to destination, so it will be infinite and after complete computation the shortest path along with the distance will be known.

6.2 Sending Coordinates to the Ambulance

The server will also find the nearest hospital and calculates the shortest path connecting the ambulance's cur- rent location, the accident spot and the nearest hospital. The shortest path will contain nodes in the path. The server takes the GPS co-ordinates of all the nodes in the shortest path from the NODES database and along with GPS co-ordinates of the accident spot and the hospital; it transmits it to the ambulance unit in a format specified below. The nodes' coordinates alone are sent to

the ambulance. The format for sending the nodes' coordinates is:

X1,Y1	X2,Y2	... ...	Xn-1,Yn-1	Xn,Yn

Figure 5

The last two coordinates (Xn-1, Yn-1) and (Xn, Yn) will indicate the accident location and the hospital location respectively.

7. Network Simulation

NS2 simulator can find shortest path between several nodes. Each area is considered to be a separate node. So easily find the shortest path between accident spot to hospital.

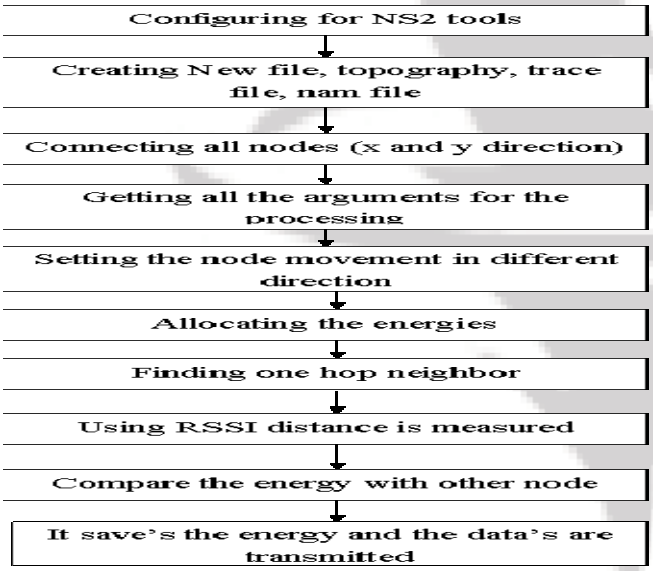

Figure 6

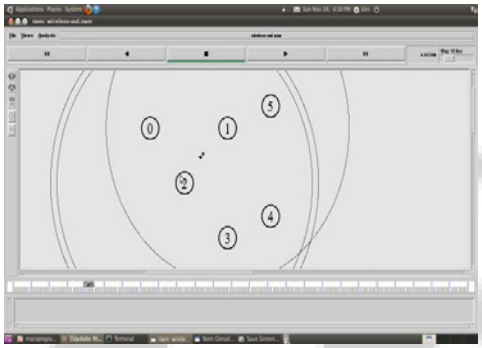

Figure 7

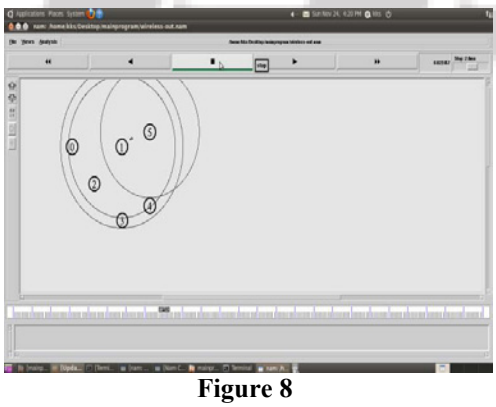

Figure 8

8. Results

The model of our ITS is developed partially to some extent. Considering the cost and time constraints the ambulance unit and the traffic junction have been developed and also we have just created a database using visual basic(10.0) in pc and we are in process of linking together the ambulance unit and the server. But for the prototype model we have linked the ambulance unit and the traffic junction using a RF transmitter.

The Figure 1 shows the vehicle unit consisting of GPS module which tracks the current position of the vehicle all the time. The unit has a controller which stores the actual coordinates of the locations (1km marking and the traffic signal node). When the GPS coordinates matches with that of the stored coordinates, it is said to have reached that place and then a signal is sent to the traffic junction (shown in Figure 7) using RF transmitter which works at 433 MHz .The GPS receiver have an resolution of 3m and transmits the data serially at a baud rate of 9600bps. The LCD HD44780 is installed in this unit to continuously display the positional values of the ambulance. The traffic junction has RF receiver which receives the signal (START signal) which are retrieved from it and displayed in the LCD by the controller.

The Figure 3 shows the traffic signal junction with the three way lane model. This unit consists of a RF receiver which also works at 433 MHz. The junction operates as per the data transmitted by the ambulance unit. The data received by the RF receiver is transmitted to the controller at the rate of 3kbps. When the data received is 0, it operates in the normal mode. When 1 is received, the traffic signal shifts to ambulance mode and the particular direction is made green. When 2 is received, it return backs to normal mode.

9. Conclusion

In this paper, a novel idea is proposed for controlling the traffic signals in favour of ambulances during the accidents. With this system the ambulance can be manoeuvred from the accident spot to the hospital without time lag. The AARS can be proved to be effectual to control not only ambulance but also authoritative vehicles. Thus automatic ambulance rescue system find shortest path algorithm if implemented in countries with large population like INDIA can produce better results. The AARS is more accurate with no loss of time. But there may be a delay caused because of GSM messages since it is a queue based technique, which can be reduced by giving more priority to the messages communicated through the server.

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