Intelligent Ambulance

Shruti Gotadki, Radhika Mohan, MazharAttarwala , Prof. M.P. Gajare

Abstract—**In this paper, a System has been developed that tracks the patient's health conditions. It measures health parameters such as body temperature, and electrocardiogram(ECG) and sends it to the hospital using the on board Zigbee unit. All these parameters are displayed in the hospital unit on a computer with the help of visual basic software. If the Ambulance encounters traffic on the way due to a traffic signal, RFID technology is used to control the traffic signals. The particular signal is made Green for some time and after the ambulance passes by, it regains its original flow of sequence of signaling.**

Index Terms—**Vital Sign Monitoring, Intelligent Ambulance, Traffic Light Control , Electrocardiogram.**

I. INTRODUCTION

In today's world health hazards are a major concern,especially people in the older age group are the victims and moreover the traffic conditions are worsening day by day which results in traffic jams.Many important jobs get delayed due to these traffic jams.Ambulance service is one of the major services which get affected by traffic jams. Traffic congestion problem is a phenomenon which has a huge impact on the transportation system in the country. This causes many problems especially when there are emergency cases at traffic light intersections which are always busy with many vehicles. Moreover, the situation is getting worse when emergency vehicles have to wait for other vehicles to give way at intersections with traffic lights. This causes a delay of time and may affect the emergency case. Besides, the collisions with other vehicles from other direction might occur at intersections when emergency vehicles had to override the red traffic lights. All these difficulties faced by emergency vehicles can be avoided using this traffic light control system developed in this paper. This system will reduce accidents which often happen at the traffic light intersections because other vehicles have to huddle to give way to the emergency vehicle. To solve this problem this paper has come up with the solution of Intelligent Ambulance

with automatic traffic light control system.This system

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measures the patient's vital health parameters. The health parameters such as body temperatureand electrocardiogram(ECG) are sent to the hospital using the on board Zigbee unit. This paper describes a prototype which measures the most important parameter ECG and body temperature. These two parameters are displayed in the hospital unit on a computer with the help of visual basic software. On the way to thehospital if the ambulance comes across a red signal RFID technology converts the red signal to green signal allows the ambulance to cross the signal uninterrupted. In this way the door to reperfusion time is minimized thereby helping in saving lives. When it comes to treating a potential heart attack victim, time is clearly of the essence. Providing an interface between emergency personnel and hospital emergency departments with the transmission of electrocardiograms wirelessly could mean one precious life saved. Direct clot removal in Heart attack patients in half the usual time becomes possible when this system transmits electrocardiograms directly to a cardiologist.

II. DESCRIPTION
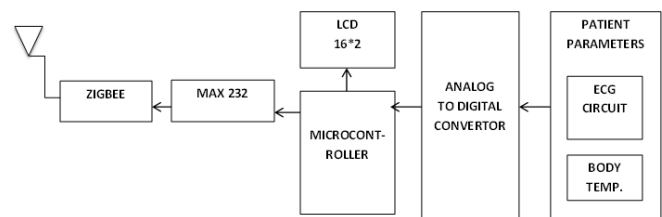
A. Ambulance Unit

Figure 1: Block diagram of ambulance unit

The block diagram shows that an Analog to Digital Converter (ADC), microcontroller, Zigbee and a device which interfaces these two units and adjusts the voltage levels (MAX232) so that the commands can be given to the Zigbee through the Microcontroller are used. ZigBee is used in applications that require a long battery life, and secure networking. ZigBee is best suited for periodic or intermittent data or a single signal transmission from a sensor or input device. ZigBee is a low-cost, low-power, wireless mesh network standard. The low cost allows the technology to be widely deployed in wireless control and monitoring applications. Low power-usage allows longer life with smaller batteries. Mesh networking provides high reliability and more extensive range. This system uses Zigbee PRO to transmit the data from the ambulance to the hospital unit. Repeaters may be used to increase its range. ECG is the first parameter which is very important for this discussion. It is being monitored by the ECG circuit. The ECG is then interfaced with the Microcontroller. Similarly regarding the temperature of patient a temperature sensor is being used. The temperature sensor used is linear and capable of sensing normal to high body temperatures. It also uses a

suitable signal conditioning unit as it gives the output in adequate form with respect to amplitude and accuracy. Thus all the parameters of the patient are then given to the microcontroller.In this paper the microcontroller is playing a vital role. Although another microcontroller at the signaling unit is being used the microcontroller in the ambulance is the heart of the entire system. Microcontroller mainly performs the following tasks: It reads the parameters of the Patient and displays them on the LCD in the ambulance itself. The above read parameters are prepared to be sent via Zigbee to the Hospital. Regarding the first task it is simple one as it displaying the parameter on the LCD in the ambulance unit. These parameters can be viewed by doctors in the ambulance to judge the patient's condition as well as it confirms whether the sensing circuits are working properly or not. Next task is sending these parameters through Zigbee. In this system controlling device is a Microcontroller. But it cannot be interfaced directly to the Zigbee. Hence a device which interfaces these two units and adjusts the voltage levels so that the commands can be given to the Zigbee through the Microcontroller is needed. This need is fulfilled by the MAX232 which is normally used to interface Zigbee to any other controlling unit. An analog-to-digital converter is a device which converts continuous signals to discrete digital numbers. Typically, an Analog to digital circuit is an electronic device that converts an input analog voltage (or current) to a digital number proportional to the magnitude of the voltage or current which is required to convert the data into digital so that it can be given to the microcontroller for processing. This process of transmission of biological or physiological data wirelessly to a remote location that has the capability to interpret the data and affect decision making is called Biotelemetry [6]. Biomedical telemetry is a special field of biomedical instrumentation that often enables transmission of biological information from an inaccessible location to a remote location site. Telemetry is a process by which transmission of objects or environments characteristics via different transmission channels is conducted. Air, space for satellite application, coaxial cable or fiber optic cables are used as transmission channels. Wireless telemetry systems are used when the measurement point is far from the monitoring place or there is a risk for work safety. Wireless telemetry systems are preferred at biotelemetry application because of the fact that biological signals can be observed in natural living surrounding. Large electrical signals are formed when heart spasm at the same time. Electrocardiogram is the electrical activity of the heart over a period of time as detected by electrodes attached to the surface of the skin.P, Q, R, S and T waves depicts electrical vibrations of the atrium and ventricles. ECG is used to diagnose different heart diseases. Measurement of ECG constitutes reference for the other measurements. The cardiologists look at the time interval, amplitude and polarity of ECG waves for diagnosis. The cardiologists check the heart beat that changes between 60 and 100 beat per minute. If the heart beat is lower than 60 beats per minute, it is called bradycardia, if the heart beat is higher than 100 beat per minute it is called tachycardia.When ECG waves are irregular it is called arrhythmia. If P-R interval time is higher than 0.2 seconds SA(Sino-Atrial) node is said to be congested. Although a health person's heart beat changes according to desires of body. ECG values must be in nominal range.

B. Traffic Signal Unit

The traffic light system designed by Levi L. Rose [1] used only for emergency vehicle. Sensor is used to transmit signal that has been installed in every emergency vehicle to the receiver which has been placed at every traffic light intersection. When emergency vehicle reach at the traffic light intersection, the signal code will be sent information of frequency modulation to the receiver. The receiver demodulates the received code and the red traffic light will trigger at all the junctions. Thus, emergency vehicle will have special route from other vehicle to reach the destination.

The traffic light system designed by M. R. Smith et al [2] provided early warning of the approaching an emergency vehicle to find a way out from traffic congestion and lead the emergency vehicle to the destination. The emergency vehicle also may take control of traffic light at an intersection. A transmitter placed on an emergency vehicle transmits a signal to the receivers positioned at the traffic lights whenever it is on emergency mode. The received signal is then processed by a master controller which in turn pre-empts the sequence of the traffic light to control the traffic flow at the intersection which taken by the emergency vehicle. The master controller also provides an output which display signs to indicate that there is an emergency vehicle to the other road users from other direction at the traffic light intersection. Additionally, the display system indicates whether the emergency vehicle has passed through the intersection or not.

W. L. Mitchell has designed a traffic light control system [3] which had overcame the traffic congestion problem and provided an emergency path for the emergency vehicle where the radio transmitter and antenna placed on the emergency vehicle. The radio will transmit the signal to the other vehicle that nearby. The radio receiver had been placed at four junction traffic light will receive the emergency signal from emergency vehicle that passed by the junction. The first signal code contains a frequency for emergency vehicle while the second signal code contains a frequency for other vehicle. The transmitted signals provide miscellaneous traffic light pole in normal condition or emergency. When the receiver received the signal from emergency vehicle transmitter, traffic light system for emergency vehicle will be activated.

W. E. Brill introduced an emergency vehicle detection system [4] for alerting a driver of an approaching emergency vehicle includes a sound signal-producing unit mounted on an emergency vehicle, a sound signal detection unit mounted on a non-emergency vehicle, and a display unit remotely located on the non-emergency vehicle. The sound signal-producing unit has a sound generator for producing and transmitting a sound signal. A switch is used for controlling the operation of the sound generator in combination with a siren.

A traffic light control system presented by Carl J. Obeck [5] consists of two-way communication between emergency vehicles approaching a busy intersection with one or more traffic lights. The system temporarily pre-empt the sequence of the traffic light and provides the most effective method of routing the vehicle through the intersection while redirecting general traffic. As part of the invention, the traffic light control system will inform the emergency vehicle which it has received the transmitted signal. The stored preset traffic patterns may in one representation is responsive to manual intervention from a dispatching center or to time-of-day conditions. The traffic light control apparatus may be operated under control of data or voice transmitted from the

emergency vehicle's regular two-way voice communications system to a central control station.
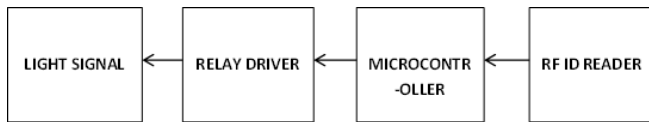

Figure 2: Block diagram of traffic signal unit

The block diagram as shown in Fig. 2 shows that a relay driver, microcontroller and an RFID reader is used to control traffic signals in the prototype of this project. The RFID readers will be present on the traffic signal and the tags will be mounted on the ambulance. A relay driver is basically an Integrated Circuit (IC) chip with a highvoltage/high current Darlington transistor array. It enables TTL signals to be interfaced with higher voltage/current loads. The chip essentially takes low level signals (TLL, CMOS, PMOS, NMOS - which operate at low voltages and low currents) and behaves like a relay, switching on or off a higher level signal on the opposite side. A TTL signal operates from 0-5V, with everything between 0.0 and 0.8V considered as "low" or off, and 2.2 to 5.0V being considered "high" or on. Hence a relay driver is used for the interaction between the light signal and the Microcontroller. The microcontroller is loaded with the program that controls the signals. It controls the entire process of the changing of signals to make way for the ambulance carrying the critical patient. Consider a Road Crossing the lane through which the ambulance is coming is given a green signal while all others are made red. After the ambulance passes by, the break in the link is observed and the signal is disturbed. Hence it is brought back to its original flow   of sequence of signaling. RFID recognizes tags attached to objects which in this case is the approaching ambulance. The tags will be fixed on the ambulance.
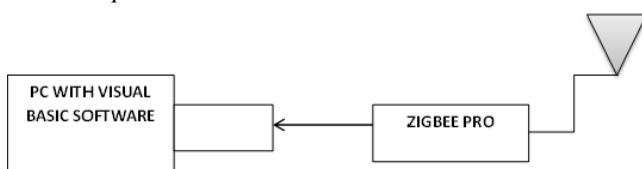
C. Hospital Unit

Figure 3: Block diagram of hospital unit

The hospital unit consists of a computer with visual basic software. It displays the patient parameters that it obtains in the form of waveforms via zigbee to the hospital personnel.The hospital personnel can begin the preparation for diagnosis even before the patient has arrived at the hospital.

III. CONCLUSION

This paperlends credence to the recommendation that patients and families should call for an ambulance, as opposed to driving themselves to the hospital, when they're experiencing heart attack symptoms. By breaking any existing communications barriers and cutting the time a patient spends in the emergency department triage system, the ambulance team can wirelessly save their lives.

IV. FUTURE SCOPE

The ambulance unit with the hospital unit can be used by doctors to monitor conditions of certain patients at any given time and the data recorded over a long period can be stored and studied. Facility to store details of several patients over long periods of time can be provided. Also RFIDs can be placed on more traffic signals thereby increasing connectivity and routes. We can also measure blood pressure, heart rate and blood sugar level in the ambulance in the future.

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