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Intelligent Ambulance with Health Monitoring System

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ABSTRACT: Many resources are now being delayed due to traffic congestion, especially in large cities. Ambulance service is one of the most important delays. Sometimes seeing doctors are not available, so the patient does not get immediate medical attention. To overcome this situation the paper describes an "Intelligent Ambulance with Health Monitoring System" solution which includes a health monitoring system. In the health monitoring system, patient health parameters such as Heart Rate, Pressure and Body Temperature are considered. Heart rate measurement was performed using photoplethysmography method. LM-35 is used to measure a patient's body temperature. Risk is detected using a vibration Sensor and Accelerometer (MEMS) These components are sent to the PC by ambulance via multiple communications and this data will be sent to the hospital server. The connection is made using the LoRa -Ra-02 module to transfer the scene of the accident and the health limits to the hospital server.

KEYWORDS: Accident detection, Smart Ambulance, Health Monitoring system, LoRa Module.

I. INTRODUCTION

Embedded Systems is a special purpose computer program designed to perform one or a few volunteer tasks, usually with real-time computer barriers. Frequency is embedded as part of a complete device including computer and machine components. In contrast, a standard purpose computer, such as a personal computer, can perform many different tasks depending on the system. Installed programs are very important today as they control many of the devices we use. As the embedded system is dedicated to specific tasks, design engineers can improve, reduce product size and cost, or increase reliability and performance. Some of the installed programs are mass-produced, benefiting from the standard economy. Embedded systems range from portable devices such as digital clocks and MP3 players, to large static installations such as robots, industrial controllers, or systems that control nuclear power plants. Weight varies from low, with a single microcontroller chip, to very high with multiple units, equipment and networks installed inside a large or enclosed chassis. In general, "embedded system" is not a specific word, as most systems have some structural features. For example, handheld computers share features with embedded systems such as applications and microprocessors that enable them but not actually embedded programs, as they allow various applications to be loaded and hardware connected.

In this paper, it proposes a system which efficiently uses the benefits of Embedded Systems and the long-distance coverage of LoRa module. LoRa module can transmit and receive data over a distance of up to 20 kilometres. LoRa provides secure, Bi-directional, Low power communication. So, the communication is done in an efficient way. By incorporating this technology long distance communication is achieved which will be very useful to detect the accident happened over a long distance. In this proposed model there will be two sections one is vehicle unit and the other is Ambulance unit or Healthcare unit. Accident is detected by the vehicle unit with the help of in-built sensors and the location where the accident happened and the condition of the victim is sent to the ambulance unit using LoRa.

II. LITERATURE REVIEW

In [1], There are two systems namely, Vehicle unit and a junction unit. In Vehicle unit there will be a RFID tag and a Stroboscopic light. The Junction unit is to control the traffic signal. RFID receivers are placed near every traffic signal. The Stroboscopic light in the ambulance will be glowing all the time. Whenever the RFID reads the ambulance's RFID tag it immediately sends the signal to the junction box and also there will be a sensor to sense the Stroboscopic light. These two actions performed simultaneously or independently as well. Whenever the junction box receives the signal it

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turns the ambulance's traffic signal to green and the rest to red. After the Ambulance crossed the junction, the strobe detect sensors will be turned off and the junction box stops receiving signal and thus it will turn back to the normal state.

Detecting the strobe light in day time is practically difficult. Installing RFID receiver in every traffic junctions is a tedious process and cost ineffective. This model will come in to action only after picking the victim. The time gap to pick the victim is as important as to reach the hospital, the ambulance should be called in time.

In [2],monitors the health limits of an ambulance patient and transferring them to the hospital and at the same time the robots being controlled by the ambulance driver to get to the hospital as soon as possible. Health parameters such as ECG, heart rate, heart rate is calculated and continuously using serial communication is maintained internally
The PC is present in the ambulances referred to the hospital. For the purpose of traffic control RF communication is used. Traffic congestion is also considered when developing a robotic control algorithm.

In this model, the ambulance driver can control the traffic signals manually by themselves using a keypad installed in the ambulance. Controlling of traffic signals is done using RF communication. RF receivers are placed in traffic signals and RF transmitter is placed in the ambulance. But there are many external factors which may affect the communication between RF transmitter and receiver. Installing RF receivers in all traffic signals will be cost ineffective and the model won't be helpful if the ambulance driver is not aware of manipulating the traffic signal.

In [3], The proposed system eliminates congestion by turningall the red lights turn green on the way to the ambulance, which is whyto help clear traffic and provide directionthe end. The System contains an Android appregistering an ambulance on its network. If it happensan emergency, if an ambulance stops its course,the application sends an urgent command to the traffic signalserver and the destination where it wants to gowith this current position with the help of GlobalPositioning System (GPS). The nearest signal is visibledepending on the current position of the ambulance. And that a certain signal is turned green until the ambulance passesand then later returns to its original control.

This model uses an android application to send the emergency signal. So, every ambulance driver should be provided with an android device. This app should require a proper internet connection to transmit and receive data. If the traffic signal server got crashed, the entire model won't help anymore.

III. SCOPE OF THE RESEARCH

- To reach the patient without any delay by avoiding the traffic congestion.
- To provide necessary medical supplies and doctor (if needed) in ambulance itself depending upon the patient's health status.
- To make a cost-efficient intelligent ambulance system which uses GPS to get the exact location of accident spot and helps the driver to navigate to the destination.

IV. PROPOSED METHODOLOGY

The whole system is developed for the providing the first aid facility to the patient in case of emergency an early stage.

1. Accident Detection system: (Vehicle Unit)

Here the System consist of Accident detection sensors such as Accelerometer (MEMS) and Vibration sensor, Health monitoring system and LoRa transmitter. Health monitoring system (1.2) consist of Heartrate measurement sensor, Pressure sensor and a Temperature sensor. Whenever an accident is occurred, vibration sensor will get triggered, then it will check for change in the vehicle's axis using accelerometer (MEMS). If both sensors got triggered the Accident detection system will extract the victim's health parameters such as heart rate, blood pressure and body temperature and it will also extract the current location where the accident happened with the help of GPS module. After extracting necessary parameters, the system will transmit the information to the nearest Ambulance unit / Hospital server through LoRa module.

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2. Ambulance Unit:

This system will have a LoRa receiver which receives the location where accident happened along with the health parameters transmitted by the accident detection system. On the way to the accident spot or to the hospital, ambulance may take some time to reach the destination. Since we are living in society with massive population and with heavily crowded roads, so to overcome this traffic jams or to take the patient to hospital at early this system helps a lot.

1.2. Health Monitoring system:

1.2.1 Heart rate:

At this point, very little work has been done to systematically identify which biomedical signals (and signal qualities) actually are necessary for specific telemedicine procedures in EMS. More research directed to the aspect of signal delay would drastically improve the support a telemedicine system can offer to a physician who has to decide for a treatment method that heavily relies on the availability of biomedical signals within a certain maximum delay; this very specific maximum delay then defines real-time for the case at hand, which can automatically be assessed by the telemedicine system.

The activity of the heart is characterized by rhythmical contractions of ventricles and atria, allowing the oxygenation of the body organs. This regular functioning is due to electrical impulses that stimulate the muscular mass of the heart cavities to contract. With the passing of time, the cardiac activity can suffer from possible faults. Heart rate measurement gives the rate at which blood is pumped from the heart per minute by human cardiovascular system. This technique demonstrates how to measure the heart rate by sensing the change in blood volume in the finger blood vessels. It consists of an infrared LED that transmits an IR signal through the fingertip of the subject, a part of which is reflected by the blood plasma. The reflected signal is detected by a photo diode sensor. The changing blood volume with heartbeat results in a train of pulses at the output of the photo diode, the magnitude of which is too small to be detected by a microcontroller.

1.2.2 Body Temperature:

IC LM35 is used as a temperature sensor with an output voltage (10mV=1°C) linearly-proportional to the Centigrade temperature. The LM35 device has an advantage over linear temperature sensors calibrated in Kelvin, as the user is not required to subtract a large constant voltage from the output to obtain convenient Centigrade scaling. The LM35 device does not require any external calibration or trimming to provide typical accuracies of ±¼°C at room temperature and ±¾°Cover a full −55°C to 150°C temperature range.

1.Vehicle unit (Accident detection unit)

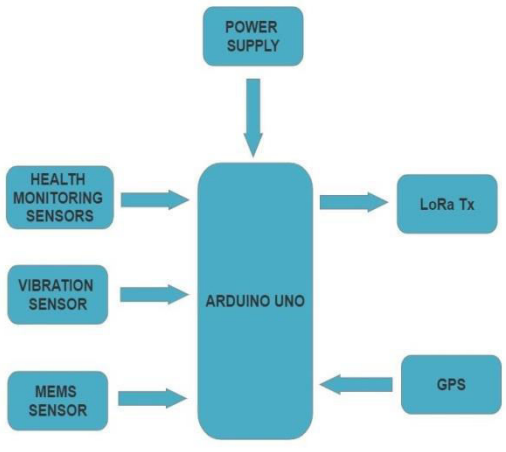

fig 1.1. refers to the Block diagram of the vehicle unit

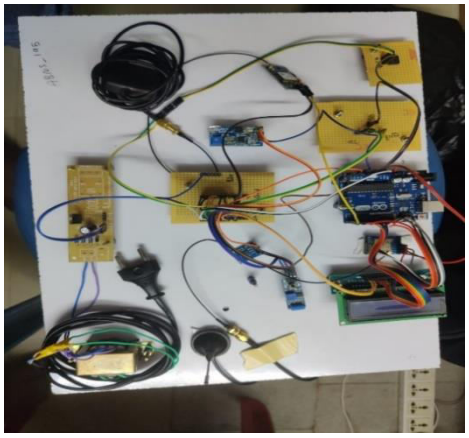

fig. 1.2. refers to the Hardware setup of the vehicle unit

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2.Ambulance Unit

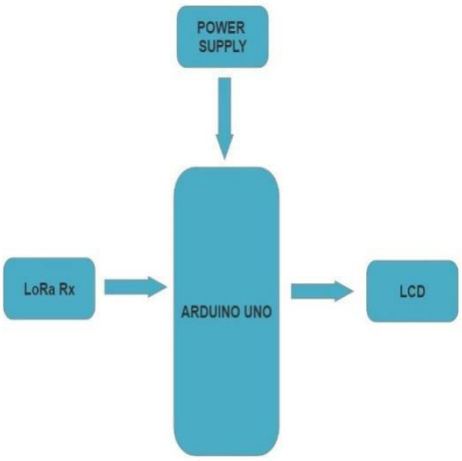

fig 2.1. refers to the Block diagram of the ambulance unit

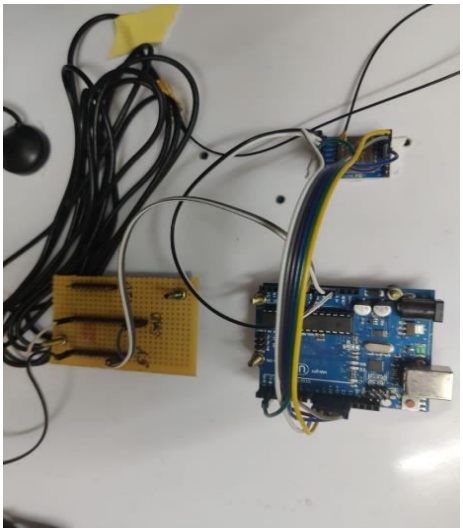

fig 2.2. refers to the hardware setup of the ambulance unit

V. RESULT AND DISCUSSION

the vehicle Unit / accident detection system (transmitter) which will continuously display the health parameter of the victim. Whenever the accident is occurred, the accident detection system / vehicle unit (transmitter) will extract the victim's health parameters such as heart rate, blood pressure and body temperature and it will also extract the current location where the accident happened with the help of GPS module. After extracting necessary parameters, the system will transmit the information along with an alert message "vibration Detected" to the nearest Ambulance unit / Hospital server.

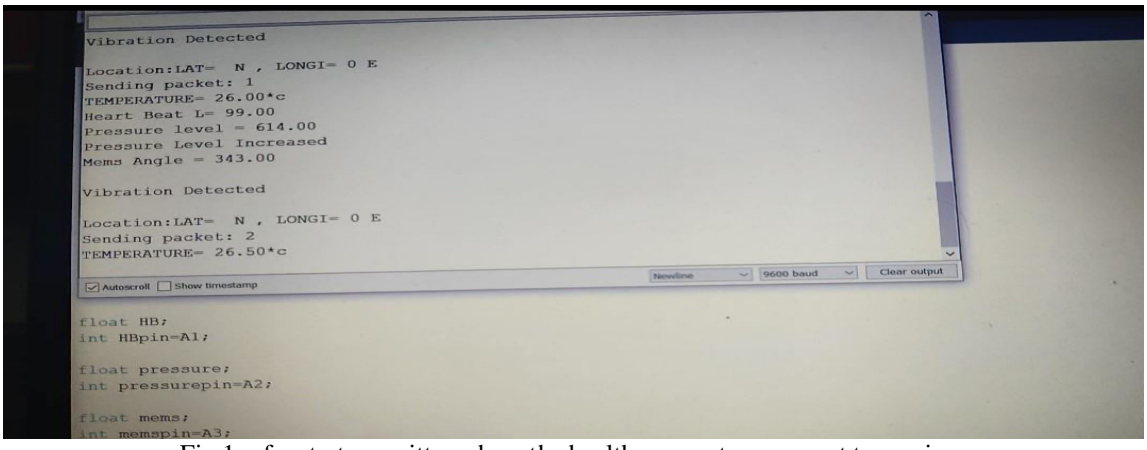

Fig 1 refers to transmitter where the health parameters are sent to receiver using LoRa module if accident occurs.

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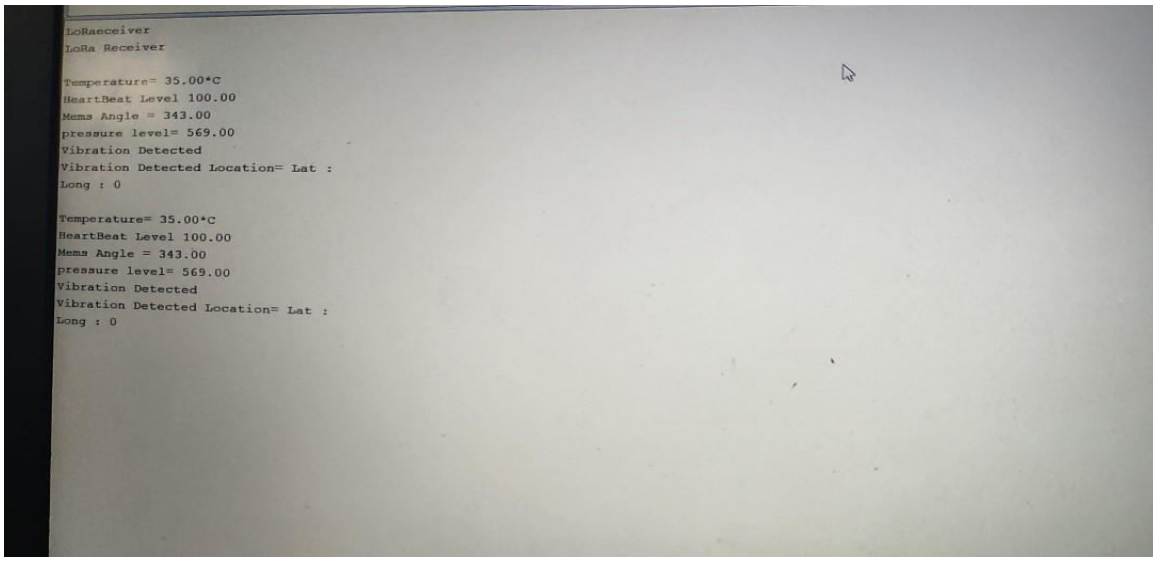

Fig 2 refers to receiver where the health parameters along with exact location is received using LoRa module if accident occurs.

VI. CONCLUSION

New technologies were put together and used in the automotive system. It can provide medical assistance to people injured in road accidents, reduce time delays and increase data transfer time. It can overcome previous errors. This program is easily accepted by the public. This program is integrated with the LORA transceiver collision sensor. In easily used LORA data can be transferred up to 20kms without the need for any network module. As a result, this paper can save souls from wasting and use in dangerous situations.

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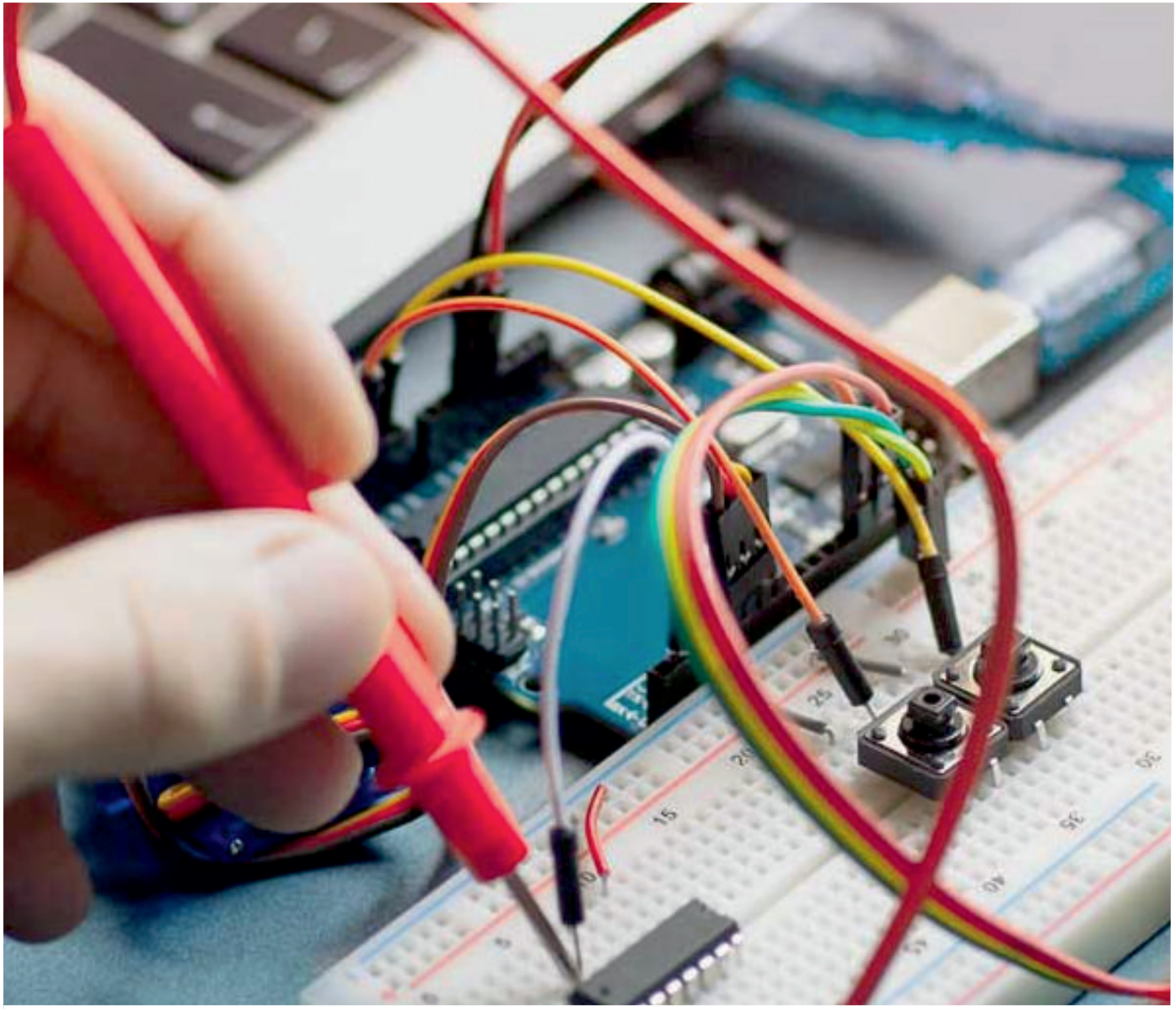

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