LoRa Based Network for Accident Detection and providing Quicker Ambulance Services for Medical Assistance

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***Abstract*— In today's scenario the usage of vehicles have increased at a larger scale. The increased vehicular traffic, has also increased the traffic hazards and the road accidents take place frequently which causes huge loss of life and property because of the poor emergency facilities. Due to huge traffic, emergency vehicles like ambulances are not able to reach their destinations in time, resulting into loss of human lives. This project will provide an optimum solution to this draw back. Coverage includes accident detection, emergency ambulance transportation (including wait time and treatment at the scene) by a licensed ambulance service from the location of the sudden accident to the nearest hospital where Emergency health services can be performed. For this purpose we have implemented an effective ambulance system by using GPS, GSM, and along with LoRa technology. Along with this the traffic is also cleared in the route that the ambulance is travelling, for this to happen the GPS location of the accident vehicle is sent to the traffic control cell, where the traffic in the route of the ambulance is cleared and thus the vehicle arrives as earliest as possible.**

Keywords—Accident detection; emergency ambulance transportation; Long Range (LoRa) Technology; traffic control;

I. INTRODUCTION

Along with the advent in the medical field, admission of the patient to the hospital at the right time is required to save one's life. Many systems can be used to implement the smart ambulance transportation, we have developed a cost effective system with the LoRa Technology, Global system for mobile communication (GSM) modules, GPS modules and latest high speed microcontrollers to achieve the desired results. The primary objective is to identify the accident, for this we implement a vibration sensor and a mems sensors in the vehicle, the accident is detected and using the Lora technology it sends the location of accident to the control unit and the control unit send this information to the nearest hospitals in the 10Km boundry around the accident location. From the hospital an indication is sent to the other hospitals that an ambulance has been sent for the assistance so that multiple ambulances dispatching from different hospitals is avoided. One ambulance dispatches at the same time the GPS location of the accident is sent to the traffic control cell and hence the traffic is cleared in the route between the ambulance and the location until the ambulance reaches the destination and reaches back to the hospital.

II. MOTIVATION

Although different governmental and non-governmental organizations all around the world carry out workshops and other training programs to make people aware of the effect of careless driving, yet this whole process has not been very successful till the day we live. In Our Country, deaths due to traffic accidents became a major problem adding to those emergency actions by hospitals or police that are not provided at the place of accident at required time, ignoring the fact that these people's lives could have been saved. Basically, in the event of a road accident, the ***"LoRa Based Network for***

Accident Dectection and Providing Quicker Ambulance Services for Medical Assistance", proposed can intelligently inform the site of accident through a wireless interface, reporting it to the proper authorities.

III. RELATED WORKS

Reference [1] is a system which creates a Real Time Traffic Accident Detection System (RTTADS) using Wireless Sensor networks(WSN) and Radio Frequency Identification (RFID) Technologies. Reference [2] aims to alert the nearby medical center about the accident to provide immediate medical aid. The attached accelerometer in the vehicle senses the tilt of the vehicle and the heartbeat sensor on the user's body senses the abnormality of the heartbeat to understand the seriousness of the accident. Thus the systems will make the decision and sends the information to the smartphone, connected to the accelerometer and heartbeat sensor, through Bluetooth.

Reference [5] is a traffic flow control system that uses Wireless Sensor Networks (WSN) to control the traffic flow sequences. WSN is used as a tool to instrument and control traffic signals while an intelligent traffic controller is developed to control the operation of the traffic infrastructure supported by the WSN.

IV. PROPOSED SYSTEM

In this proposed system we use various sensors like Vibration sensor and MEMS sensor to detect the occurance of accident, and use GPS and GSM modules for vehicle-to-hospital and hospital-to-hospital communication. LoRa is used for long distance communication. The block diagram and its working are as given in next sections.

A. Vehicle Side

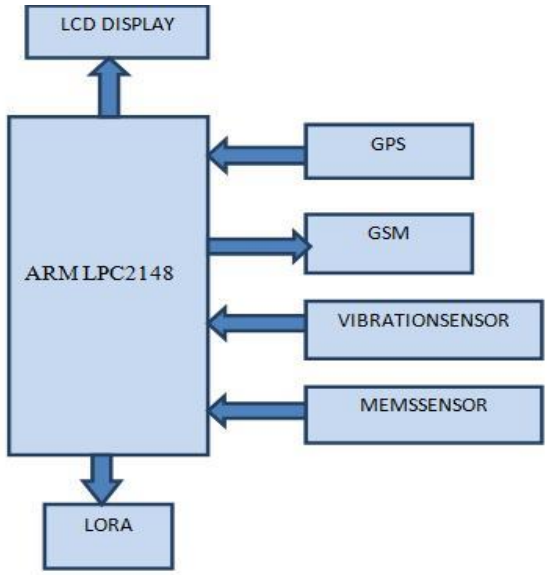
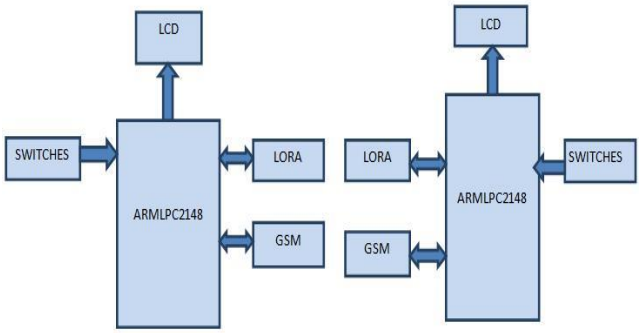


Fig: Block diagram of vehicle side operation

Working- The system comprises of a Lora transmitter, Lora transmitters are embedded inside the dashboard of the vehicle during the manufacturing of the vehicles. Along with this a vibration sensor, a MEMS sensor, GPS and GSM modules are also embedded in the design of the vehicle. At the time of accident, the vehicle exhibits abnormal vibrations and also it gets tilted (the position of the vehicle gets changed both horizontally and vertically) these abnormalities are sensed and sent to the ARM7 microcontroller. The vibration sensor senses the vibrations and the mems sensor senses the tilting of the vehicle and detects the occurance of the accident, once the accident is detected using the GPS module the current location of the vehicle is recorded. GSM sends this recorded accident location to hospitals in the SMS format. Lora which stands for “Long Range” is used for far distance communication, with coverage of 10 kms. Thus the location of the accident through SMS is sent to the nearby hospitals within 10 kms range.

B. Hospital Side



Working- At the hospital side the Lora transceiver is implemented. It receives the location information sent by the LoRA transmitter placed on the vehicle and checks if the ambulance is available at the hospital, if present the ambulance will dispatch and travels to the obtained location of accident, to avoid multiple ambulances at the accident site the sending hospital use switch and sends a code to the other hospitals that the ambulance is being sent from this hospital. Before the ambulance could dispatch at the hospital from the hospital an alert is sent to the nearby traffic control cell using the switch for clearing the traffic in the route between the ambulance and the accident location. In addition, we might have seen many cases where patients arrive at the hospital in a very emergency state, but due to lack of facilities of handling such cases or due to any other reason they will be told to move to another hospital which consists of better facilities, in such cases, anything might happen to the patient while travelling from one hospital to another. To avoid this, by using the same hardware which is implemented at the hospital side a code is sent to another hospital to which the patient was prescribed to go, all the details of the patients like the health conditions are sent even before the patient arrives there, and once they arrive immediate treatment can be provided without any delay in time.

V. CONCLUSION

Here the main objective is to save life by providing communication from the site of accident to the hospital without human interface. From the study and work done in this regard the system serves to be very helpful in saving lives. The current system also makes use of the latest technology. From the experiments carried and observations done, system is considered to be reliable and accurate. The results obtained are consistent and works under different conditions. This project serves as a base for further developments.

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