

An Automatic Wireless Multimedia Communication System to Detect Accident of Vehicle and Mobile Telemedicine System

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ABSTRACT: The road accidents in most of the modern developed countries are increased to uncertain level. The human life ends due to this reason in most of the circumstances. Traffic congestion and slow movement of vehicles, delays the emergency vehicle to reach the hospital at right time. To avoid this serious loss of life, a new smart wireless automatic alarming system (SWAAS) is proposed and developed. The proposed system pre-checks the driver's health conditions like pulse rate, alcohol detection, once he enters into the vehicle using different sensors. Then eye blink condition is checked once vehicle starts moving. If any of the condition exceeds the threshold value, the vehicle automatically slow down the speed and stop moving. Further, if vehicle is met with an accident, the vibration sensor which is placed inside the vehicle, sense the impact and send the signal to Microcontroller. Microcontroller in turn communicate with GPS to get the location details, send it to nearby registered hospital and also SMS is sent to family member regarding the incident. Hospital which gets the information about accident, arrange an emergency vehicle to reach the spot without any delay. Emergency vehicle which is equipped with GPRS enabled high quality of mobile camera takes the picture of patient and send it to hospital PC for early medical assessment and necessary medical resources to be arranged well in advanced before patient reach to hospital. The proposed system also monitors the traffic signal using RF transmitter placed in the emergency vehicle and RF receiver at traffic signal. So that receiver takes the emergency signal indication from the emergency vehicle even with 100mts of distance and traffic signal to go green in that lane, then allow the emergency vehicle to move without any delay.

KEYWORDS: SWAAS, Sensors, GPS, SMS, GPRS, RF transmitter, RF receiver.

I. INTRODUCTION

Nowadays the density of vehicles is increased in most of the countries due to high population. This in turn increase Road Traffic. Congestion of vehicles leads to many problems, one such is road accident, which is the most serious issue. Traffic congestion and slow movement of vehicles delay the emergency vehicle to reach the accident spot at right time to save the accident victim. Due to this lack of emergency services at the early stage most of the people lose their lives. So some serious measures and new technology have to be developed to fulfil this lose. By exploiting the advantage of [1] wireless automatic accident detection system, the accident spot can be detected and arrangement can be made for emergency vehicle to reach the spot using wireless multimedia communication technology. An emergency vehicle that initially leaves the hospital, to attend the accident patient includes only one physician. In a smart emergency telemedicine [2] system, the emergency vehicle i.e. ambulance is equipped with GSM (Global system for mobile application), along with GPRS (General packet radio service) with 3G, WiMAX or a satellite mobile communication system, used for wireless transmission of images, videos, cardiographs and pulse information of the accident patient to the emergency section of the hospital.

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This enable the physician in the emergency clinic to examine the physiological condition of the accident victim in advance and arrange for medical resources well in time, which decreases the actual time required for treating the patient and helps in saving the life.

II. RELATED WORK

A survey is carried out on varies methods for automatic accident detection and rescue with ambulance.

1. In reference [3] a method was proposed, which automatically detects the accident, speed of vehicles is reported to the information centre. In case of emergency, medical assessment help service is provided to the victim. The system also detects the traffic jam, but cannot control the traffic signal for smooth move of emergency vehicle to reach the hospital. System further cannot find the driver condition whether he is eligible to drive by checking and monitoring his health condition to avoid early damage to life.
2. Head movement based driver drowsiness detection to avoid accident by Ajay Mittal, Kanika Kumar et. [4] was proposed, which works with driver head movement based drowsiness detection to avoid serious issues related to loss of life. Driver exhaustion is one of the most common reason for road accidents in many circumstances. The technique which works with driver drowsiness is developed based on head movement pattern build, that in turn is compared with the normal pattern to detect the drowsiness. Many other various pattern of abnormalities with respect to person are considered like subjective, behavioural, physiological etc. are compared. Beside this behavioural method is easy to analyse the person without disturbing his work.
3. Automatic accident detection and rescue with ambulance using wireless sensor network by Hossan M. Sherif, M. Amer shedid et. [5] proposed the existing system wireless sensor network topology is used to automatically detect the accident and to control the traffic flow in sequence. Wireless sensor is placed on the lanes to detect the speed of the vehicle, number of the vehicle in turn automatically will registered and reported to the police station. Using this wireless sensor network method need lots of investment and maintenance in the lane to detect the severity of accident.
4. Sergio Cicalo, Matteo Mazzotti, Simone Moretti et [6,7] proposed a new system of multiple video delivery in m-health emergency application in this context the multiple transmission of health related video from ambulance to hospital, which improve the efficiency of telemedicine [8] consultation service. In this application a large bandwidth is needed to meet the desired quality, which is not always guaranteed by mobile network. In this proposed novel optimization framework, it automatically selects the best stream of video to be sent to doctor for further medical assessment for the patient. The system work in that concern in emergency situation for better treatment by the medical field by giving end-to-end quality of video for diagnostic and for further related assessment. In this proposed system the main drawback is the multiple use of cameras for capturing videos, which needs to be maintained and cost wise, it is high to install multiple cameras.
5. G.J. Mandellos, D.K. Lymperopoulos et proposed a novel idea on mobile telemedicine [9,10] system. It mainly works on telemedicine once accident victim is taken into the ambulance. The system works like pre-hospital for patient treatment inside ambulance from accident site or from moving site, using GSM mobile phone network. The physician receives the patient data, decide the medical treatment and provide direction to handle the patient until arrival to the hospital. The complete system works once patient enter into the ambulance but have some drawbacks like it cannot detect the accident automatically and driver health condition is not monitored and reported to avoid accident meant by him.

The above existing different methodologies discussed, gives a brief idea on direct or indirect method of detecting the accident automatically using different components, sensors, smartphones etc. But this exiting system has some drawbacks which have to be updated with new technology. So a new smart wireless automatic collision detection and mobile telemedicine system is proposed and designed to overcome all the above drawbacks and builds a new protocol in telemedicine system.

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III. PROPOSED METHODOLOGY

In this proposed system, a wireless automatic accident detection and driver monitoring unit is placed in a vehicle. The automatic wireless system checks the pulse rate, alcohol is detected if the driver is drunk and eye blink condition is continuously compared with the threshold value, for further smooth start of vehicle.

Further, if the vehicle is met with an accident the vibration sensor sense the impact, checks the severity, by using GPS get the location and details, send it to nearby registered hospital and also SMS is send to family member regarding the accident using GSM modem requesting for emergency vehicle to spot.

The Emergency vehicle reaches the accident spot as soon as possible with the available information given by the GPS. Emergency vehicle is equipped with GPRS enabled mobile with high quality of camera. The continuous streaming of video will be sent to the hospital PC mobile telemedicine system [2] and according to that the doctor will guide the physician and also they will arrange the necessary step to be taken in the hospital in advance. Traffic signal is also monitored using this wireless automatic device by using RF transmitter at emergency vehicle and RF receiver placed at traffic signal pole to go green when emergency vehicle comes in the lane. So that emergency vehicle reaches the hospital without any delay.

The proposed system consists of three main units, which coordinates with each other and allow the emergency vehicle to reach the hospital without any delay.

A. Vehicle Unit

The main unit in the proposed system is vehicle unit which consist of vibration sensor, heart beat sensor, alcohol detection sensor and eye blink sensor used to sense the driver health condition for safe driving. All these sensors work together to monitor the person(driver) inside the car. If any of the sensor exceed the threshold value, then LCD will display the condition, in turn vehicle slow down the speed and stop. Vehicle unit also modelled with GPS to get the vehicle location in terms of latitude and longitude and by using GSM message is send to concern hospital, family member and police station regarding the accident. The vehicle unit is show below in block diagram.

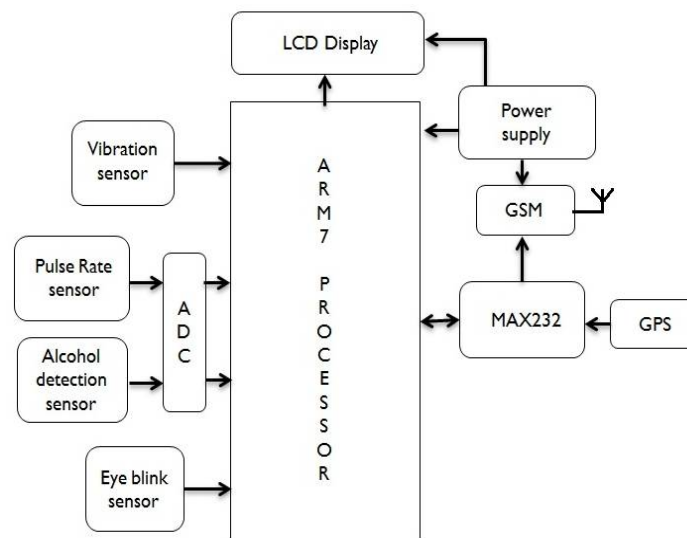


Fig 1: Block diagram of vehicle unit

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B. Ambulance Unit

Next is, the emergency vehicle ambulance in the proposed system consist of RF transmitter along with microcontroller, LCD display, power supply unit and GPRS based high quality mobile camera to capture the image of accident victim which in turn will be send to hospital computer for early mobile telemedicine system.

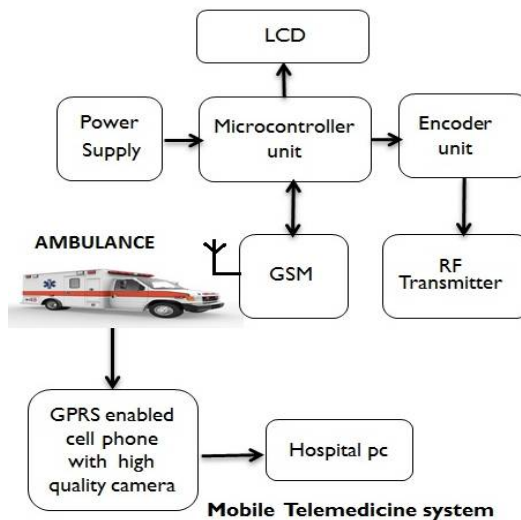


Fig 2: Block diagram of Ambulance unit

C. Traffic Signal Unit

Traffic unit consist of RF receiver which receives the signal from emergency vehicle to indicate that ambulance is approaching the traffic junction. In turn microcontroller will receive the signal from RF receiver and change the traffic signal to go green with some delay to allow the ambulance to move in that lane.

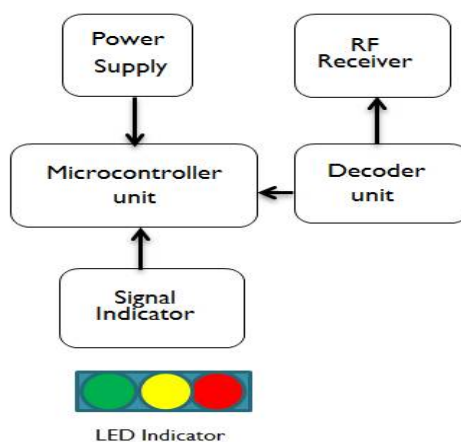


Fig 3: Block diagram of Traffic signal unit

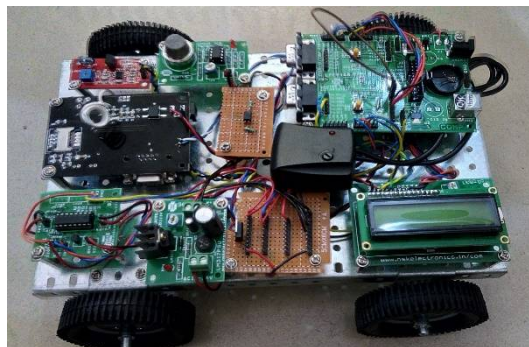
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IV. EXPERIMENTAL RESULTS

According to the proposed method followed, the schematic of the project is designed and then proceeded to build the hardware circuit. The project is tested to work in real time. Result for the entire system is obtained and observed with more accurate values and proposed system follows user friendly architecture.



The experimental result of the proposed system is obtained based on the sensor output.

- 1) Vibration sensor activate when severe impact on the sensor is experienced, the output is compare with the threshold value, if exceed the value indicate with message “ACCIDENT OCCURRED”,” STOP VEHICLE”.
- 2) GPS tracking system gets the geographical details of the vehicle like “LATITUDE AND LONGITUDE”.
- 3) GSM modem communication system send the “ALERT MESSAGE-ACCIDENT OCCURRED” to emergency unit, police and family member.
- 4) Ambulance receive the alert message from hospital indication “ACCIDENT OCCURRED LATITUDE & LONGITUDE “of vehicle and alert to reach the spot.
- 5) Mobile Telemedicine system inside ambulance, high resolution camera used to capture patient image and send to physician of hospital “IMAGE AND PATIENT DATA”.
- 6) Ambulance reach the spot, receive the accident victim, RF transmitter send a signal to RF receiver “AMBULANCE ON THE LANE-TRAFFIC SIGNAL GO GREEN”.

V. CONCLUSION AND FUTURE WORK

In this paper, a lifesaving architecture is proposed to reduce road accidents by implementing an embedded system domain approach. The proposed system continuously checks the driver health condition, to make sure the person eligible to drive, otherwise vehicle slow down to stop and alert with SMS. Further, if vehicle met with accident, the system detects and by using GPS tracking and GSM technology, an alert message with latitude and longitude of accident vehicle is send to nearby hospital and user defined family mobile number. The system is designed to control the traffic signal for smooth move of ambulance to reach the emergency clinic without any delay and provides mobile telemedicine service to the accident victim to reduce the loss of life. This system is easy to implement, cost-efficient and works more accurately without any delay. For Future enhancement, mobile can be replace with high resolution camera in ambulance unit for better capture of image of patient in mobile telemedicine system to send more information like X-Ray, ECG etc. to reach the physician for better treatment.

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