Research Paper on Airbag Deployment and Accident Detection System for Economic Cars

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***Abstract*— Now a days the road transport facilities are increasing with respect to the number of users and proportionally the possibility of accidents as well. Probability of death is also increasing eventually. One of the reasons being inadequate safety tools present in the vehicle especially in low budget cars. In these type of cars neither airbag system available for protecting the drivers nor notification system available to show actual position of car after an accident. Due to this problem there isn't any communication between relatives and injured persons after accident. It is possible to increases the survival after accident only when the medical services reach to the place of accident immediately after occurrence of accident. This is done by making an automatic indicator which detects traffic accidents automatically.**

In this paper such system is designed which automatically detects accident spot and send a text message to the family members of injured person, which send coordinates of actual position of accident spot. All this job is done by ARM7 controller.

Keywords*— *ARM LPC2129, Shock Sensor, GPS transmitter, GPS receiver, GSM Module.

I. Introduction

When a car crash happens it is need to provide some help for the injured persons. Todays, wireless innovation has more succeed like never before. In today's high cost vehicles some survival technologies are available for the survival from an accident includes Air-bag system which protects person from accident [1]-[2]. In some vehicles also there is accident alert system is available which produces an alert message to patrolling department [3]-[5]. But these facilities are only available to the luxurious vehicles like BMW & MERCIDIES BENZ.

In this paper includes the details about accident of automobile emergency alert situation for the economically low cost or old vehicle. In this paper Air-bag system is linked with GSM as well as a GPS module incorporating a shock sensor to report occurrences of accident automatically via the GSM communication platform (using SMS messaging or recorded voice call) to owner of car or its relatives [6]-[8]. GPS module gave the exact position of the spot where the crash had occurred [9]-[10]. These type of technologies require number of components are as follows ARM LPC2129 controller, shock sensor, temperature sensor, GPS transceiver module(MR87), GSM module(SIM900), buzzer, Airbag deployment system etc. These technology provides a fast recue of accident victim [11].

II. Detailed Decription of System

A shock sensor used here for detection of the accelerations or vibrations during accident. It is the main sensor which will detect accident and send analog electric signal to the ARMLPC2129 using GPIO port. In this work two ARM processors are used. First ARM is uses CAN protocol for communication between two ARM cores. 2nd ARM uses same CAN protocol to receive signal from ARM1 and deployed the Air Bag.

First ARM that is Node-I is situated in car's bonnet, two sensors interfaced with Node-I (Shock Sensor 801S and Temperature Sensor LM35). 2nd ARM is connected with Air bag release system, GPS Module MR-87, GSM Module SIM-900, and LCD Module. All circuitry of Node-II is situated internal side of dash board of car.

Whenever accident happens shock sensor will senses shock waves or vibrations and produce electrical response to Node-I through GPIO port [12]. On-chip ADC convert signal in the digital form and provide to ARM core it will transmit information to Node-II using MCP2551 CAN Controller which is high speed, fault tolerant [13]. As the signal received from Node-I, Node-II activate Air Bag Release System [14]. Simultaneously GSM module activated and produce a calls to the relatives. And GPS module sends the co-ordinates of position to Police Patrolling department automatically.

After an accident sometimes temperature of main engine increases and it is possible to catch fire. If temperature exceeds its required level temperature sensor LM35 produce such electrical signal and this information shows the warning on

LCD screen. Buzzer is situated at Node –II will be activated simultaneously with Air Bag Release system [15]. And active still user cannot press reset button to disable it.

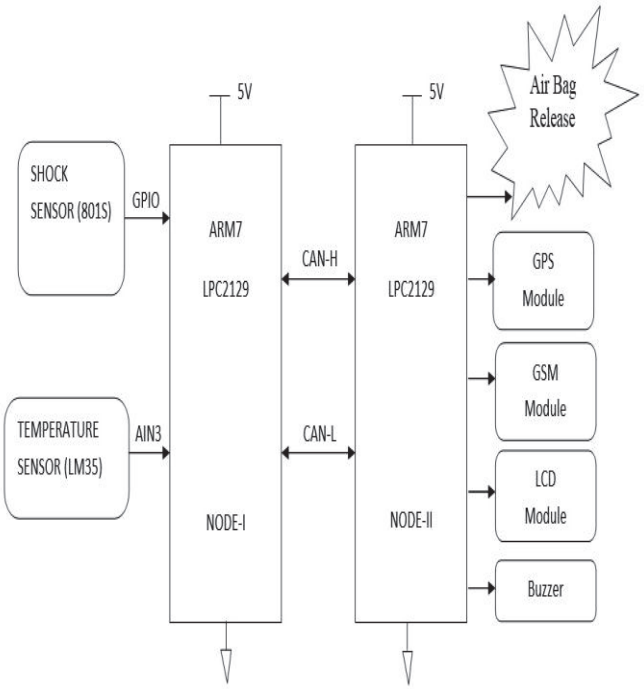

Fig. 1. Block Diagram of whole system.

This system is mainly based on the CAN bus. It will used as the transmitting media between two ARM core [14]. UART ports are used for the connection between ARM core and GPS / GSM module. Whole system is worked on the +5V to +12V supply voltage which is available from the battery supply of car.

III. Material Requirements and Methodology

Requirement of system development or the material requirement is as follows,

The advantage of LPC2129 used here is, having inbuilt CAN controller. There is no need to use separate CAN controller for CAN bus interface. Shock sensor serves the purpose of detecting the collision between two vehicles. The basic principle of operation of Shock sensor is that it will detect vibration if there is any collision. In this paper a GPS module is used. In other words a small GPS modem is used, it works based upon the communication protocol like NMEA 0183 protocol. [4] The data can be taken into the controller by using UART protocol. Then this data can be analyzed and find out the longitude and latitude of the current location [7]. SIM900 used for physical interface to the mobile application is done as a 68-pin SMT pad, which can provide all hardware interfaces between the modules to customer's board. [4][8]

The Control Area Network supports distributed area network with very high level of security. Its applications ranges from high speed networks to low cost multiplex wiring. In this paper two ARM'S are connected using CAN with bitrates up to 1 Mbps [14]. CAN is also a cost effective protocol to build into vehicle chassis or body. In this paper the LM35 series Integrated Circuit sensor is used which is actually proportional to the Celsius (Centigrade) of temperature. LM35 thus has an advantage temperature sensors calibrated in Kelvin, as the users didn't required to subtract a large constant voltage from its output voltage for obtaining convenient Centigrade scale[15].

The software flow of required system is shown in figure bellow. There are two parts of flow chart one is transmitter side and another receiver side. Working of transmitter side is, initially initialize the CAN controller. Prepare the data frame for send. Read the data frame and then send data frame through CAN protocol and stop the transmitter. If in any case collision occurs again read the data frame from Analog to Digital Converter and repeat the procedure till data frame is send.

The receiver side start with initialize CAN controller for reception. Check if buffer is empty and ready to receive the message then receive the message and stop. If buffer is not ready then repeat the stage till buffer is not empty and ready then stops procedure.

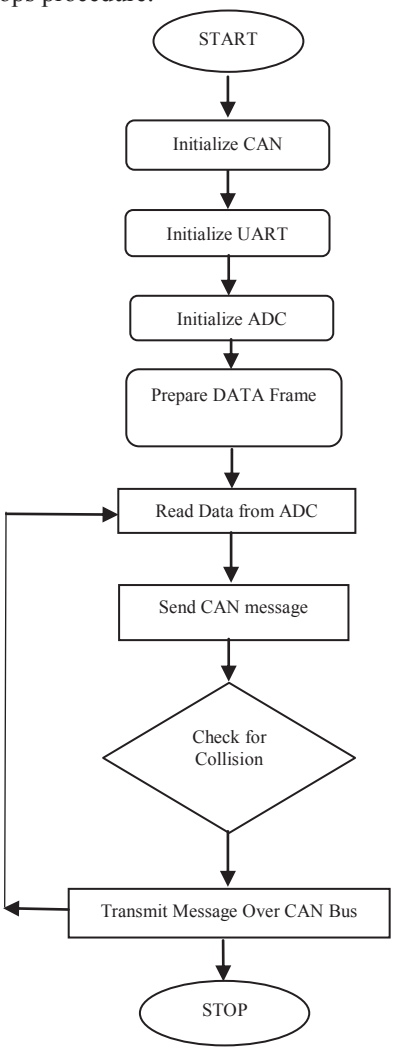

Fig. 2. Software flow of transmitter side of system.

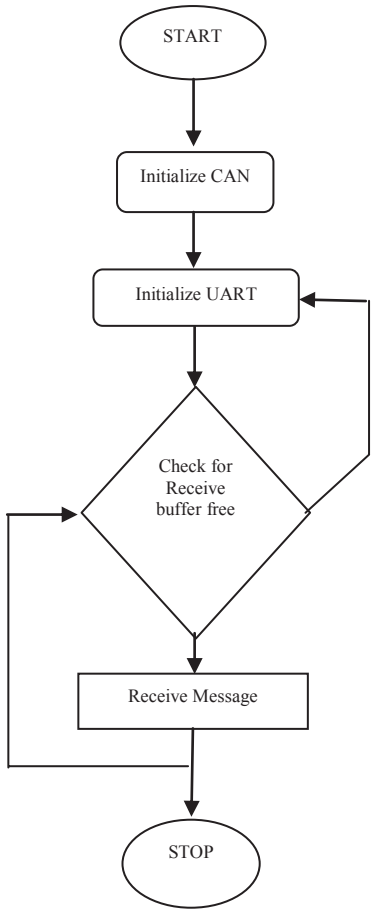

Fig. 3. Software flow of receiver side of system.

IV. RESULT AND ANALYSIS

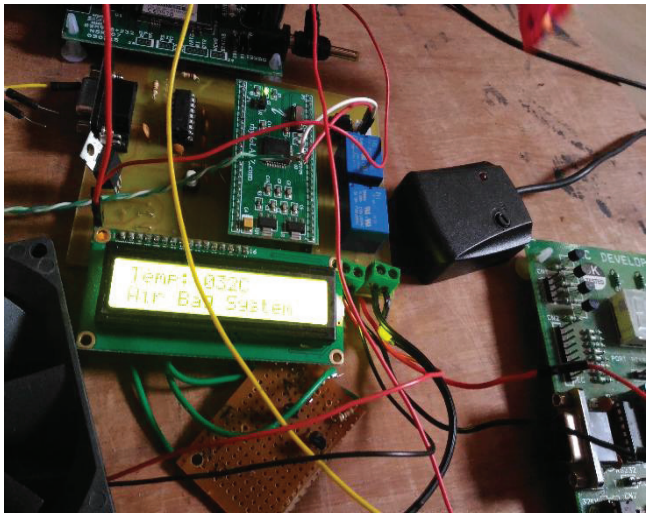

Fig. 4. Photograph of whole system.

Fig. 5. Photograph Receiver side of system.

In above Fig. 4 and Fig. 5 shows the actual photo graph of the give system. The system includes ARM LPC2129 development board, Impact sensor, LDC display which shows the current position of the system in this figure shows the initial or starting position of the given system. And it displays a message on screen “Air Bag System”.

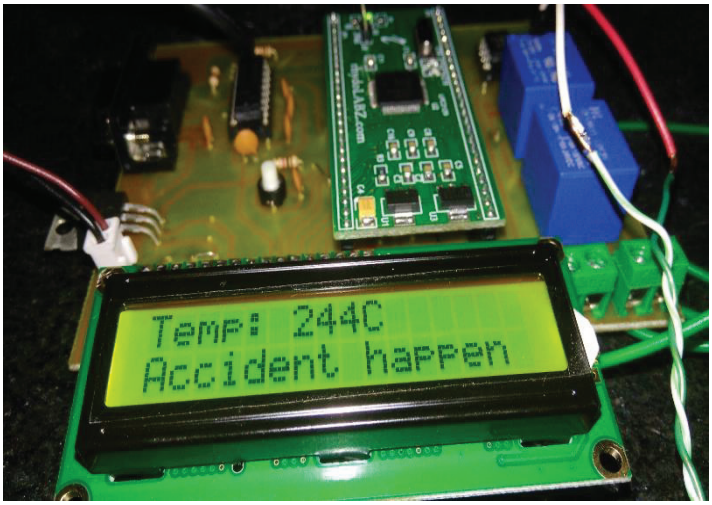

Fig. 6. Photograph of system after accident.

In Fig. 6 shows the actual photograph of the system after the temperature is exceeded the value 240 degree celsius. Here for practical purpose temperature is set to the 240 degree. If temperature exceeds the given set value then LCD display shows a message “Accident Happen”. It will notify the current position of the system after an accident. If there is any strike on impact sensor then air bag deployed and it will show message on LCD screen is, “Airbag Deployed”.

Fig. 7. Screenshot of mobile message window, notification after accident.

Fig. 7 is simply a screen shot of a mobile screen on which message is received regarding the accident is happened. It will display "Car Accident is happened please track the car location" and actual location with longitude and latitude is shown. This message is suddenly send by a system after impact sensor got the readings of collision on it and the airbag is deployed. Speed of message sending depends on the user network available at accident spot, so in this project recommend to use 2G enable sim card inside the system. If network is not available at the time of accident then system will retry again and again until message is send. Another function of system is a buzzer. In most of the cases people avoids the accident spot and no one come forward quickly to help. The buzzer of system is buzz after accident till someone come forward and press the reset switch to switch off the buzzer. In this way the overall system is works.

V. Conclusion

This Low Cost Airbag Deployment and Accident Alert System for Budget Vehicles, is simply accident alert system for cost effective vehicles or old vehicles. After an accident, responder immediately detects the accident spot, it can reduce mortality rates. This is in-vehicle accident detection & notification systems, which more effects to reduce the time gap of responders reach to scene. These systems are cheap and may suitable in all type of vehicles like car SUV SAV SIDAN or Trucks etc. This system can be used to indirectly detect accidents through sensors, such as shock sensors.

VI. Future Work

This system can be enhanced by adding few more sensors in future such as- alcohol detector, drowsiness detector, heart rate detector, etc. Security sensors to detect entry of theft can also be added as a new feature. It can be programmed in such a way that to switch off the ignition of vehicle automatically and track its position if theft a vehicle. Ultimately with the aid of technology, ease and protection to human life will increase.

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