

Security System in Automobile Vehicles using ARDUINO

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Abstract—This research entitled ‘Security System in Automobile using ARDUINO’ provide high security, accident detection and prevention in automobiles and also ensures passengers safety. This system is based on Arduino controller with GSM and Sensor networks. In many instances, the car is parked at an unfamiliar location where securing them is must. The existing systems which are used are now obsolete, where siren is the only way for alerting the owner which can be easily turned off. Older system does not trigger the alarm if there’s a break in through window and the human movement is detected using the PIR sensor and the Tilt sensor. The limit switch will provide the condition of the door which is open or closed. Thus the system triggers an alarm detecting the presence of the person or towing vehicle or opening the door in a specific interval of time and the GSM call to user gets activated. Second important aspect is safety of driver for prevention of accident. Driver’s drowsiness is one of the important factor which leads to accident. Eye blink detection technique helps to prevent this by controlling the vehicle’s speed and also helps in informing the family about the accident along with the location of accident.

Index Terms -gps, gsm, arduino, sms, a.o.c.s

I. INTRODUCTION

Nowadays there is common need of security at home, industries and public places. In market various vehicle security systems are available but due to advanced technology this security systems can be tampered easily. They are not capable for providing real time analysis of the scenario. Sirens which are been used can be easily disabled. So real time analysis is mandatory for advanced security purpose. This real time system avail us the feature of calling as well as provide us with vehicles location. In the proposed paper, Accident Detection and Messaging System informs the Ambulance and Police of the accident site so that arrangements for necessary steps to control the situation can be fitted in the vehicle and its execution is simple as the system makes use of GSM and GPS technologies. GPS takes the coordinates of the site of the accident and GSM sends the coordinates to cell phones. To make this process possible, all the controls are made using Arduino. Being concerned with the vehicle security system and driver’s safety, this project was taken by us for upgrading existing vehicle security system with this upgraded new technology.

II. CONCEPT AND METHODOLOGY

The security and safety in automobile vehicles can also be ensured by introducing A.O.C.S. which stands for Automatic Over speed Control System on which this system is based. It basically controls the speed of the vehicle by continuously checking it through sensors which sends the signal to the input of Microcontroller. The Microcontroller is a small computer on a single integrated circuit containing a processor core, memory, and programmable input/output peripherals. Whenever the speed is increased above the predefined critical speed, the Microcontroller through its logic circuits sends the signals to the actuators via its output pins. The actuators apply necessary force on the brakes and reduce the speed to its safe value. This concept consists of three major systems: - Sensor, Microcontroller and Actuators (Stepper Motor).

The sensor used in this system is optical type infrared sensor. It consists of an emitter and receiver. The circuit is completed whenever the signal sent by the emitter is struck by an object and is reflected back to the receiver. The receiver sends the signal to the Microcontroller for further Processing. The Arduino Uno is a microcontroller board based on the ATmega328. Arduino has an 8-bit architecture. It acts as brain to the system such as CPU of the Computer and controls all the actions of the system such as sensing and actuating .The Actuators here are Stepper motors in which output of Microcontroller is connected. A stepper motor is a brushless DC electric motor that divides a full rotation into a number of equal steps. The motor's position can then be commanded to move and hold at one of these steps without any feedback sensor, as long as the motor is carefully sized to the application. In the proposed paper, Accident Detection and Messaging System informs the Ambulance and Police of the accident site so that arrangements for necessary steps to control the situation can be fitted in the vehicle and its execution is simple as the system makes use of GSM and GPS technologies. GPS takes the coordinates of the site of the accident and GSM sends the coordinates to cell phones. To make this process possible, all the controls are made using Arduino. Being concerned with the vehicle security system and driver’s safety, this project was taken by us for upgrading existing vehicle security system with this upgraded new technology.

III. HARDWARE IMPLEMENTATION

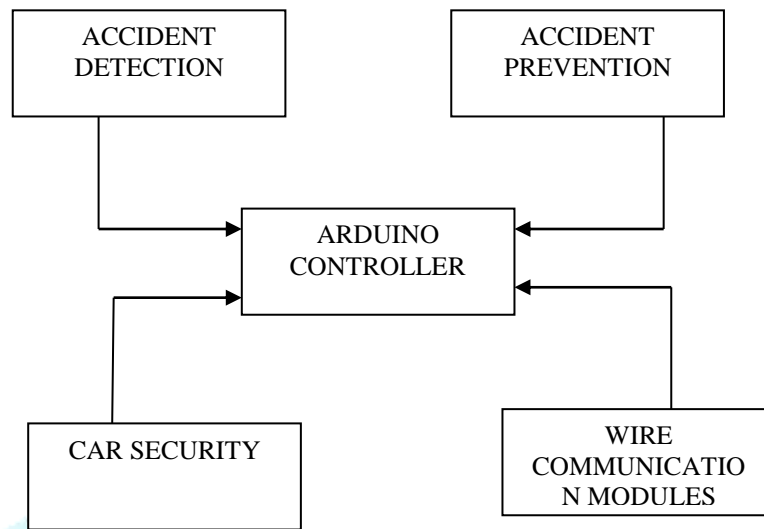


Fig. 1. Block model for Car security.

The paper is divided into 3 different sections:

- A. Automobile security
- B. Accident Prevention
- C. Accident Detection

A. Automobile Security:

In his model Car security against external threat is achieved by using Limit Switch for Car door opening detection, PIR sensor is used for Intruder's presence and Tilt sensor is used for Towing of car. The activated signals from these sensors are given to Arduino and user is alerted against threat via SMS.

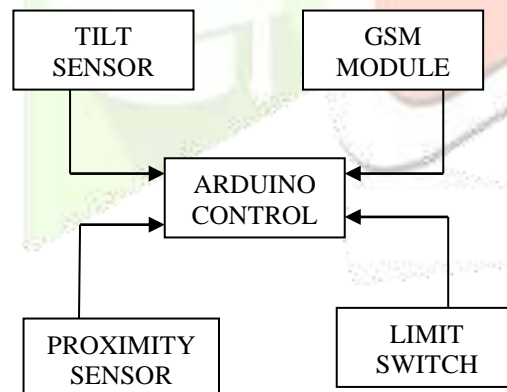


Fig. 2. Block model for Car security.

- **Autoomile door opening detection:**

Limit switch is used as safety interlocking device and whose operation depends on the motion of the object. There is an actuator which is linked with mechanical contacts and comes to operation when any object comes in contact with it and breaks the electrical signal. In this way the limit switch will endow with the position of the door. If any object comes in contact with this actuator the device makes or breaks the electrical connection. The system triggers an alarm on detecting opening of the door and initiates a GSM call.



Fig. 3. Limit Switch



Fig. 4. PIR Sensor



Fig. 5. Tilt Sensor

- **Intruder detection:**

Pyro electric (“Passive”) Infrared sensor is used to detect the motion in the sensors range. PIR sensor is used to detect motion (change) and not the average IR levels. The output of the PIR sensor is connected to digital pin of the Arduino controller. Digital output is provided by the PIR sensor. When the controller receives signal GSM call program is initiated. GSM call program is initiated after receiving the controller signal within the sensors proximity.

- **Automobile Vehicle Towing:**

Tilt sensors are used to detect the inclination or the orientation. The Automobile Vehicle towing is detected by means of tilt sensors and informed to the car owner to avoid theft or damage of vehicle. It is made up of two cavities and a conductive free mass inside the hollow space. One end of the cavity has two conductive poles. The ball is made of mercury because mercury is dense enough and switch is not susceptible to the vibrations. When the sensor is oriented in a way that the end is downwards the mass rolls on to the poles and conducts them and acts as the switch throw and simultaneously sends sensed value to the Arduino controller and controller is programmed to initiates a GSM call.

B. Accident Prevention:

In our model Accident Prevention is achieved by using Eye Blink sensor which recognises whether driver’s eye blink is normal or he is sleepy. The activated signals from the sensor are given to Arduino and actions are taken to control the speed of the car.

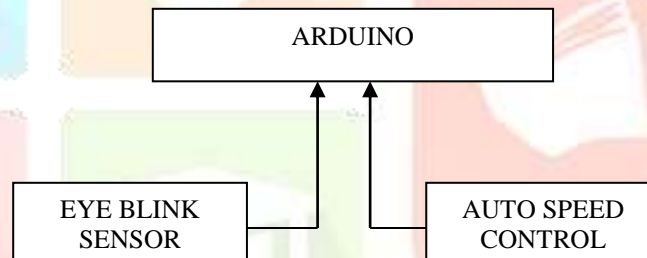


Fig. 6. Block model for Accident Prevention

Inadequate driving leads to vehicle accidents. This happens if the driver is drowsy or if he is alcoholic. An important factor recognized in vehicle accidents is driver’s drowsiness. This system detects the eye blink which significantly helps in preventing accidents by alerting the driver. Infrared transmitter emits infrared rays and these emitted infrared rays are received by an infrared receiver. Generally called IR transmitter and IR receiver. They should be aligned in Line of sight. When IR transmitter is given a high signal the IR LED is conducts and emits infrared rays. These transmitted IR rays are received by IR receivers. A Comparator is connected to the IR receiver. The LM358 operational amplifier is used to construct the comparator. In the comparator reference voltage is given to the inverting terminal and the non-inverting terminal receives signal from IR receiver.

When there is an interrupt between IR transmitter and receiver the IR receiver is in non-conducting state. Interrupt here is the eye blink of the driver. So the non-inverting input terminal voltage of the comparator is higher than its inverting input voltage. This sensed analog value feeds as the analog input of the Arduino controller and necessary steps for speed control of the vehicle is initiated. We say “Prevention is better than cure”. A security system as a whole must also work on accident prevention issue. Keeping this in mind the following system is implemented. For detecting eye-blink (driver’s drowsiness) the high input is given to controller and controlling the car by lowering the speed or finally halting it and alerting via alarm.

C. Accident Detection:

In our model Accident detection is achieved by using vibration Sensor. The activated signals from the sensors given to Arduino and user is alerted against threat via SMS.

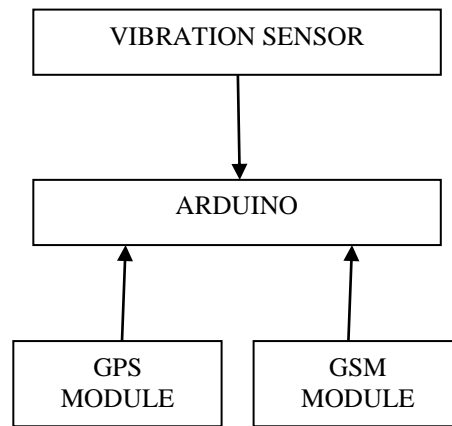


Fig. 7. Block model for Accident Detection.

This system detects the accident taken place using vibration sensor and sends the location of that place via SMS using GSM GPS system. Vibration sensor detects the vibration due to car accident. The vibration module based on the vibration sensor SW-420 and comparator LM393 to detect if there is any vibration beyond the threshold. The threshold can be adjusted by the on-board potentiometer. When there is no vibration, this module output is logic low, this indicates there is no accident taken place.

For Accident Detection we use Vibration Sensor which on detecting vibrations generates a voltage using piezoelectric effect. Due to the vibration, a counter weight inside the sensor applies pressure on the piezo-electric element. This pressure creates an electric charge in the piezoelectric element and is the sensor's output. This system informs the ambulance, relatives and the police. This system is fitted in the car and when the accident takes place and it informs the ambulance or any numbers which are input in the system and accordingly sends the GPS locations. It makes use of GSM and GPS technologies. GPS tracks the coordinates of accident location and GSM is used to send these coordinates via SMS.

IV. CONCLUSION AND FUTURE SCOPE

Modern security solutions are need of the time to protect the vehicle against Accident, Theft and Unauthorized Access which we can eliminate by implementing effective solutions. A combination use of GSM and GPS technology lets the user know immediately about the malpractices carried on his vehicle and in case of accident or theft it provides the exact location of the vehicle for immediate action by concerned authorities. This project provides reliable security system for a vehicle which helps in safeguarding the vehicle. It involves wireless communication for real time monitoring of the vehicle with low power consumption. In today's world securing vehicle is a long-term ongoing research. GSM can also be used for sending other information related to vehicle like the total distance covered by vehicle in last 24 hrs, the top speed to which it was driven, the amount of time for which it was in motion and ideal.

V. ACKNOWLEDGMENT

We would like to express our special thanks of gratitude to Raajdhani Engineering College, Bhubaneswar to motivate us to do research and development works on Arduino based Embedded system.

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