Ilkogretim Online - Elementary Education Online, 2020; Vol 19 (Issue 3): pp. 4549-4558
http://ilkogretim-online.org
doi: 10.17051/ilkonline.2020.03.735607

# Autonomous Crash Responder System

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**ABSTRACT:**
India has the largest road network of about 5.5 million km and a total of90% of India's road traffic uses these roads for transportation. India also ranks inthe top place in road accidents count. An article states that "there is one deathevery four minutes due to a road accident in India. One of the major issuesin accidents is that it is not informed as soon as one takes place and on the otherhand as the incident is not informed to rescue units and the delay in medicalassistance is also an inevitable cause for loss of life.As a solution for this problem we have proposed an autonomous crashresponder device which is enabled with a fusion of sensors and will be able todetect if the vehicle is met with an accident. If accident occur then message with the exactlocation and the count of total passengers along with last detected force acted onthe vehicle will be sent via SMS to nearby rescue units, police station and thepersonal contacts. If drowsiness was detected the motor under the seat vibratethe driver to wake him up. Our device is also enabled with an alcohol sensor toprevent drunken driving and if the driver is found to be drunk an alert message swill be sent to preregistered numbers.

**KEYWORDS :** crash responder, location, force, number of passengers, alcoholsensor, eye-blink sensor.

## I. INTRODUCTION

India is one of the developing countries and the 7 th largest country in theworld and it has a rapid increase in its population as per statistics India has 1.3billion people in its home[1][2][3].The increased population has a huge impact on the need for transportation[4][5][6].Because of improper roads and unpaved roads,public transport and the transportation of goods are highly affected[7][8]. Now it is acrucial condition for the Indian government to provide better roads, due to thehuge size.Main reason for road accident is Bad Roads,Drowsiness,Overspeeding.The objective of project is to autonomously monitor the vehicle impact andsend the geolocation, passenger count and last reported force acted upon thevehicle via SMS.

## II. HARDWARE COMPONENTS:

**1.ARDUINO UNO:**

Figure1 is Arduino Uno is a microcontroller board based on 8-bit ATmega328P microcontroller. Along with ATmega328P, it consists other components such as crystal oscillator, serial communication, voltage regulator, etc. to support the microcontroller. Arduino Uno has 14 digital input/output pins (out of which 6 can be used as PWM outputs), 6 analog input pins, a USB connection, A Power barrel jack, an ICSP header and a reset button.

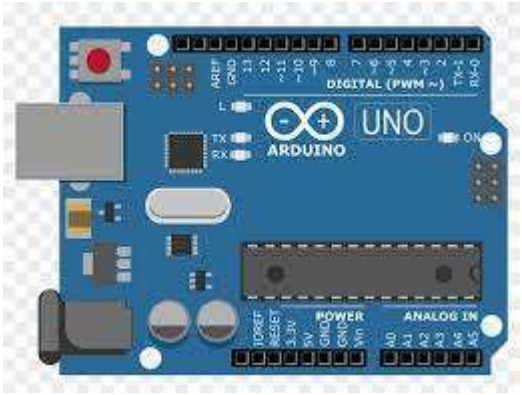


Figure1:Arduino Uno microcontroller board based

**2.VIBRATION SENSOR:**

Figure 2 is the Vibration module based on the vibration sensor SW-420 andComparator LM393 to detect if there is any Vibration that beyond the threshold.The threshold can be adjusted by the on-board potentiometer. When there is novibration, this module output logic LOW the signal indicate the LED light, And vice versa

.

Figure 2:Vibration module based on vibration sensor

**3.IR SENSOR:**

This project uses IR sensor to count the number of passengers or in otherwords to count how many seats have been occupied in the vehicle which is shown in Figure 3.So, that wecould have the approximate count of passengers inside a vehicle which is a crucialinformation in case of an accident because it will help the medical assistance teamto provide required ambulance and

personal depending on the count. And thisdata will also benefit the law enforcement team in investigating the case ofaccident.


**Figure 3:IR Sensor**

**4.GPS:**

To get the location data GPS module NEO-6m is used and this data is usedto provide the location link that is to be included in the message sent to thecontacts in case of an emergency. This module gives us the latitude and longitudedata which can be placed in a standard link template to provide the exactgeolocation of the device.

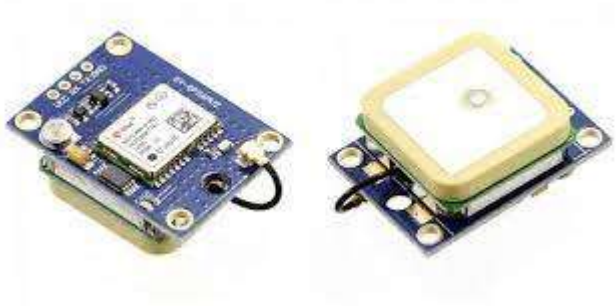

**Figure 4:GPS Module**

**5.GSM:**

The GSM module sim-800C is a compact and efficient tool to send and receive SMS and calls and it is one of the crucial parts of the project as its role is to send the collected sensor data to the pre-registered contacts. It requires a sim card and a constant 12V supply to keep it live.GSM module is shown in Figure 5.

**Figure 5:GSM module**

**6.EYE-BLINK SENSOR:**

The transmitter transmits IR rays into the eye of the driver. Depending on whether the eye is closed or open, there will be high output for closed eye and low output for open eye. The transmitted signal is captured by the IR receiver. This receiver is connected to the comparator.The eye blink senor shown in Figure 6.

**Figure 6:Eye blink sensor**

**III.SOFTWARE REQUIREMENT:**

**1.ARDUINO IDE :**

The Arduino Integrated Development Environment (IDE) is a cross-platform application (for Windows, MacOS, Linux) that is written in functions from C and C++. It is used to write and upload programs to Arduino compatible boards, but also, with the help of third-party cores, other vendor development boards.Figure 7 shows Arduino Integrated Development Environment.

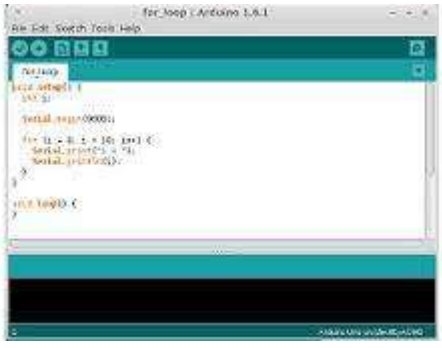

**Figure 7:Arduino Integrated Development Environment**

**IV.FLOW CHART:**

**1.PRE-ACCIDENT DETECTION:**

**i)ALCOHOL DETECTION:**

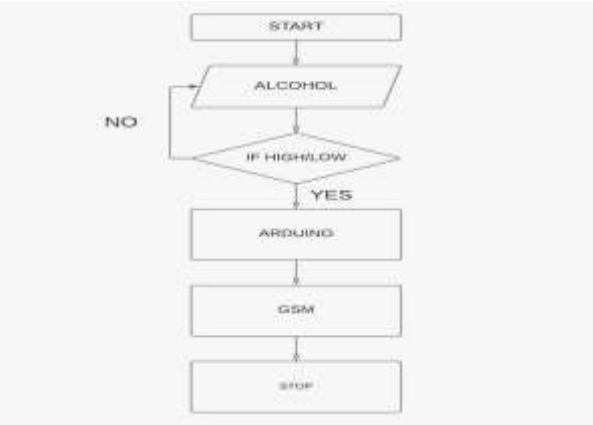


**Figure 8:Flowchart for Alcohol detection**

**ii)DROWSINESS DETECTION:**


**Figure 9:Flowchart for drowsiness detection**

**2.POST-ACCIDENT ALERTNESS:**

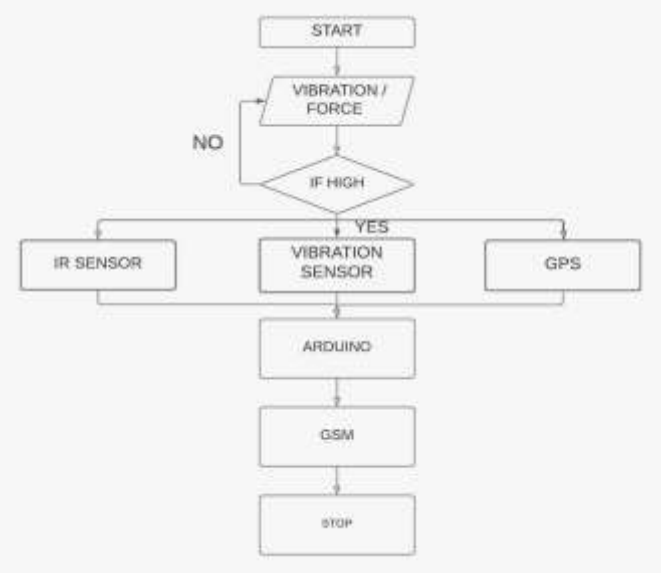


**Figure 9:Flowchart for Post Accident Alertness**

**V.WORKING METHODOLOGY:**

This project has three actuator mechanism which will trigger the wholeprocess of collecting information sending message to pre-registered numbers andemergency contacts. One of the actuating mechanisms is the Alcohol leveldetecting sensor this is an analog sensor which gives output of the range 0-5Vand it is converted to a digital value ranging from (0-1023) and if the value fromthis sensor is found to be above a threshold value it will trigger a message topersonal contacts and to the law enforcement contacts if the driver is drunk thiswill help the companions of the driver to spot their location and go collect thembefore they get hurt, and it will help the law enforcement team to spot the vehicleand to take necessary action against the drunked driver.Figure 10 shows the proposed block diagram of autonomoues crash responder system.

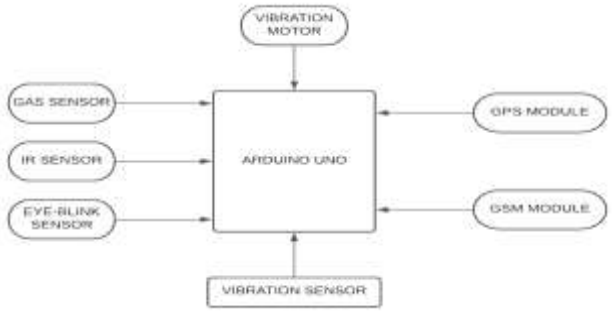


Figure 10: Proposed block diagram of Autonomous crash responder system

**Drowsiness detection** – eye-blink sensor is used to detectthe drowsiness level of the driver. If drowsiness was detected the Arduinotrigger the vibrator motor under the seat of the driver, to wake up him.Figure11 shows the architectureof the autonomous crash responder system.

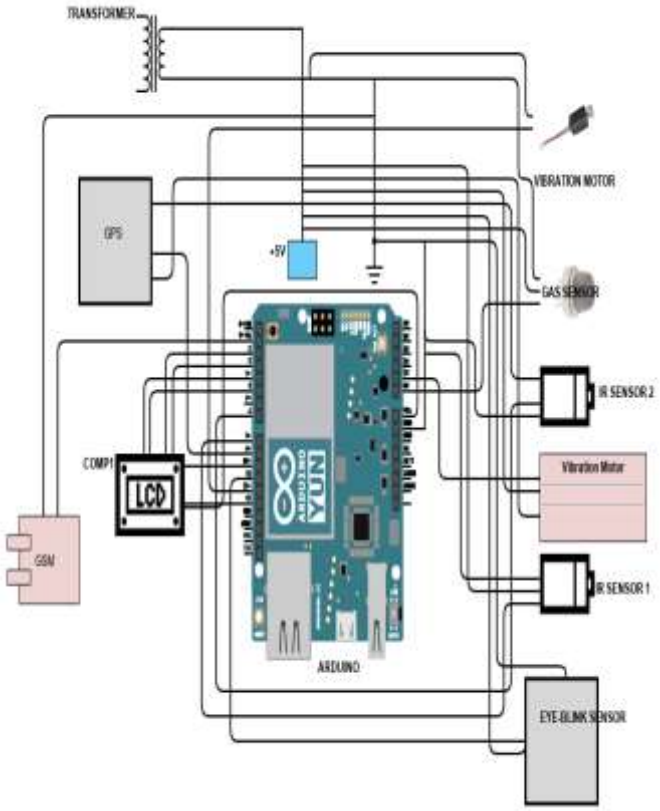


Figure11:Architecture of the autonomous crash responder system

**Crash sensor-** This will be the impact detector in case of an accident if this switch is triggered then all sensor information will becollectively sent as a message on passenger count, location and last acted force onthe vehicle.

Figure 12 shows the screenshot of the alert message given to authority when it senses the alcohol consumed by the driver,accident location using lattitude and longitude with force act on the vechicle during accident.

**VI.RESULT:**

The ARDUINO controls all the sensors and the modules. It continuously receives value from alcohol, eye-blink and crash sensors. An alert message is sent to the registered mobile number if either the alcohol or crash sensor detects any value above the threshold. If the eye-blink sensor sense drowsiness then the Arduino trigger the vibrator motor to wake up the driver.

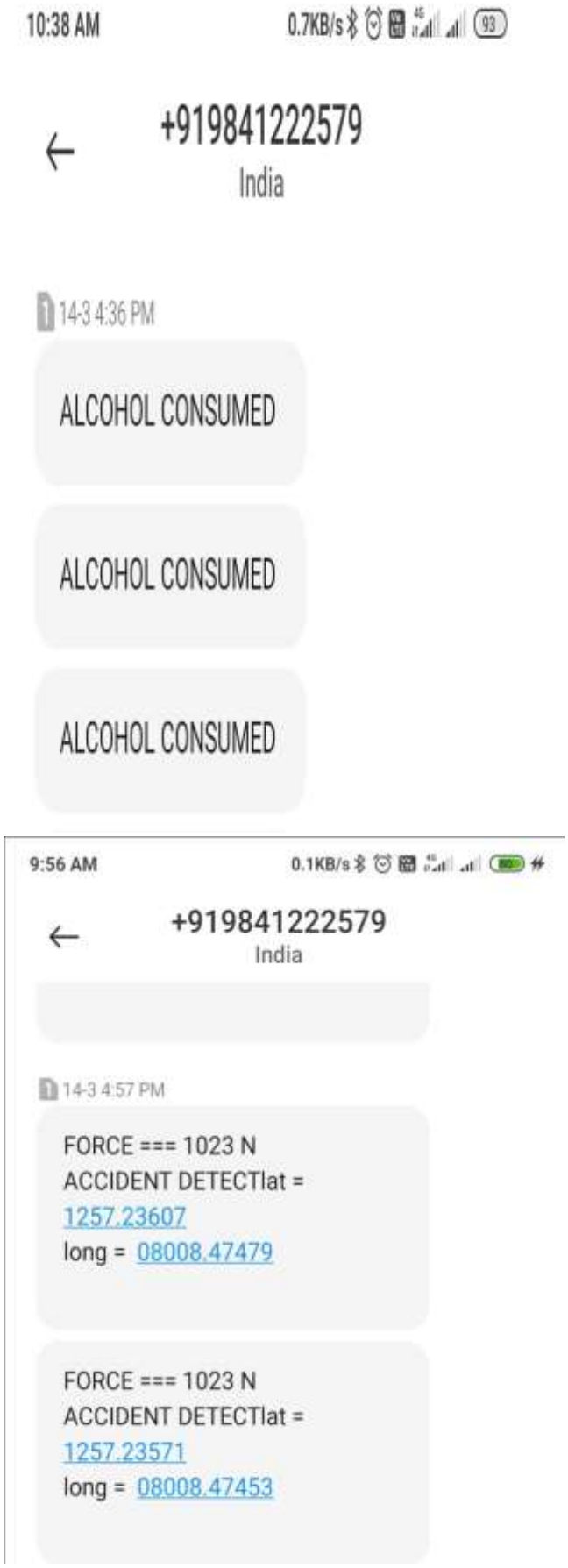


**Figure 12: Alert message received to the mobile**

## VII.CONCLUSION:

Without proper action at the proper time, danger awaits us with a biggerface. Due to a lack of information about the accident, the death rate of accidentsgets increased. The proposed system can be useful in common situations wheretimely assistance can be a major game-changer.Since alcohol is the main cause of accidents. This system will send an alertif the odour of alcohol is detected. So, that we can be sure that the driver hasdrunk and he may be saved or stopped from hurting others by driving while beingdrunk. This system also wake up the driver from drowsiness by using eye-blinksensor this will avoid the accidents occurred due to drowsiness.When there is an accident a package of information which consists of thecurrent location of the vehicle, passenger count, force acting on the vehicle is sentthrough an SMS. So, medical assistance will be provided as soon as possible. Asthe force data is provided a general idea on the status of the vehicle and itspassengers will be delivered to the contacts receiving the message.

## VIII.FUTURE ENHANCEMENT :

As an advancement of this project the location of the crash will be sharedwith the personal contacts, emergency contacts along with that to a traffic controlsystem which will analyze the fastest route from the nearby hospitals to the crashsite and will identify the traffic stops through the route and will request a greenlight from the traffic control center so that the route towards the crash site is clearfor the medical team to reach faster which will increase chances of survival forthe victims. To make the system more efficient sensors with higher accuracywill be installed replacing the prototype thus increasing the level of informationsshared.

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