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Smart Assistance for Safe Driving

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Abstract:
An accident is a life changing, shocking, abrupt, and unexpected external action which occurs at an instance and at any place, with no apparent fault or deliberate reason but with major impacts. Carelessness of the driving force is the major factor of such accidents. The traffic authorities provide a lot of instructions to the vehicle operators. But many of them don't obey the principles. In today's day of age ensuring that riders follow safety protocols is much more difficult than anticipated for the government to track and regulate. But still the principles are being violated by the users. so as to beat this we introduce an intelligent system, Smart Helmet, which automatically checks whether the person is wearing the helmet and has nonalcoholic breath while driving. Here we've a transmitter at the helmet and therefore the receiver at the bike. there's a switch wont to sure the wearing of helmet on the top. The switch is in ON condition ensures that the helmet is placed and safely secured by the rider. An alcohol detecting sensor is placed near to the mouth piece of the rider at the inside of helmet to detect the presence of alcohol. The data to be transferred is sent using LoRa Module from transmitter on helmet. The receiver at the bike also receives the data through LoRa. Theengine should not be able to turn ON if any of the two conditions is violated. Main control unit has complete control over the function of relay and thus control over the ignition, it is able to control the engine via a relay and an interfacing circuit.

Keywords: Transmitter, Receiver, LoRa Module, GPS module,GSM Module, Piezoelectric sensor, Ultrasonic Sensor.

I. INTRODUCTION

Detecting whether the rider has worn a helmet or not, as well whether he has consumed alcohol or not is the main Task. The support system that we have introduced to design helps us tackle this very problem. Our project makes it compulsory for the rider to wear helmet in order to start the vehicle and also, he shouldn't have any alcohol present in the rider's breath. If the rider fails to do so then the vehicle won't start. This technique also provides security to the vehicle as every bike will have an individual helmet and without which the bike will fail to start. This project is installed at the helmet body and an integrated electronic system deposited in the helmet. It is operated through a wireless system. The components of this project are significantly small and rigged to fit in the helmet, making sure that the helmet remains light and durable. Moreover, the components of this project are placed evenly about the helmet to provide even weight distribution to promote overall comfort, balance and safety

II. RELATED WORK

Several projects have been done to improve a rider's safety. In [1] the author specially developed this project to improve the safety of the bikers. The objective of this project is to study and understand the concept of RF transmitter and RF receiver circuit. The project uses ARM7, GSM and GPS module. The project also uses buzzer for indication purpose. Whenever the accident will occur then accident spot will

be note down and information will send out on the registered mobile number. The major disadvantage of this project is they are not using any display device for showing the current status. Also the cost of helmet is still high since helmet is designed for only one purpose. In [2] the author has discussed on the speed of the vehicle. In this application the project will be monitoring the areas in which the vehicle will be passing .On entering any cautionary areas like schools, hospitals, etc. the speed of the vehicle will be controlled to a predefined limit. LCD is used for showing the various types of messages after wearing the helmet. The author has worked only on the phenomenon of accident which is generally happens due to drink and drive. But as we know that the accidents in do not happens only due to consuming alcohol but also other parameters like high speed, condition of road are also responsible.

In [3] the main objective of author is to force the rider to wear the helmet. In this competitive world one of the surveys says that the death trolls due to motor bike accidents are increasing day by day out of which most of these casualties occurs because of the absence of helmet. Traffic police cannot cover remote roads of city. That's why over primary objective is to make the usage of the helmet for two wheelers "compulsory " .Thus ,no one other than the owner himself ,who doesn't have "password" which would have been created by the owner, can use the bike. In this author has proposed the feature that the bike will not start unless the bike rider does not wear the helmet .The other this module basically deals with the checksum of rider if he is wearing the helmet or not on first place to achieve this ultrasonic sensor is been used based on this the signal are been sent to the next module which is voice recognition module used for authentication purpose. Arduino is also used in this project which is an open source tool for making computer that can sense. In [4] the author has proposed the smart helmet because of growing bike accident. People get injured or might be dead because of not wearing helmet. Continuously no one follows road rules .So to overcome these problem this helmet is been designed. The middle class families prefer to buy motor bike over four wheelers, because of their low prices, various varieties are available in the market. Author has also used encoder IC that receives parallel data in the form of address bits and control bits the other author has used smart system for helmet. But in this project author have not focused on the major issue that will occur in future regarding the alcohol and many others. In [5], Chiverton proposed an approach which uses geometrical shape of helmet and illumination variance at different portions of the helmet. It uses circle arc detection method based on the Hough transform. The major limitation of this approach is that it tries to locate helmet in the full frame which is computationally expensive and also it may often confuse other similar shaped objects as helmet. Also, it oversees the fact that helmet is relevant only in case of bike- rider. In [6], Chen et al. proposed an efficient approach to detect and track vehicles in urban traffic. It uses Gaussian mixture model along with a strategy to refine foreground blob in order to extract foreground. It tracks a vehicle using Kalman filter and refine classification using majority voting.

III. MICROCONTROLLER

A microcontroller is a small and low-cost microcomputer,which is designed to perform the specific tasks of embeddedsystems like displaying microwave's information, receivingremote signals, etc. The general microcontroller consists ofthe processor, the memory (RAM, ROM, and EPROM), Serial ports, peripherals (timers, counters), etc.

The ATmega328 is a single-chip microcontroller created by Atmel in the mega AVR family (later Microchip Technology acquired Atmel in 2016). It has a modified Harvard architecture 8-bit RISC processor core. The Atmel 8-bit AVR RISC-based microcontroller combines 32 KB ISP flash memory with read-while-write capabilities, 1 KB EEPROM, 2 KB SRAM, 23 general purpose I/O lines, 32 general purpose working registers, three flexible timer/counters with compare modes, internal and external interrupts, serial programmable USART, a byte-oriented 2-wire serial interface, SPI serial port, 6-channel 10-bit A/D converter (8channels in TQFP and QFN/MLF packages), programmable watchdog timer with internal oscillator, and five software selectable power saving modes. The device operates between 1.8-5.5 volts. The device achieves throughput approaching 1 MIPS per MHz.

SENSORS USED

This project uses different sensors which are are used to collect data on both transmitter and receiver. Some important sensor with their application in this project is listed below:

A. MQ3 Gas Sensor

MQ3 sensor is fitted in helmet to detect alcohol in rider's breath. It is a part of transmitter unit.

B. Piezoelectric Sensor

This sensor is used to detect any collision/contact with any other object while riding. It is connected to receiver unit.

C. Ultrasonic Sensor (HC-SR04)

This sensor is used to avoid any possible collision while driving. It is used to calculate the distance between two objects, in this case bike and any other incoming object like other vehicles or and other object on road.

D. Vibration Module

This sensor senses any vibration on helmet and it is used to detect if helmet is loose on rider's head. Possible cause can be untied helmet strap.

V. DESIGN OF TRANSMITTER

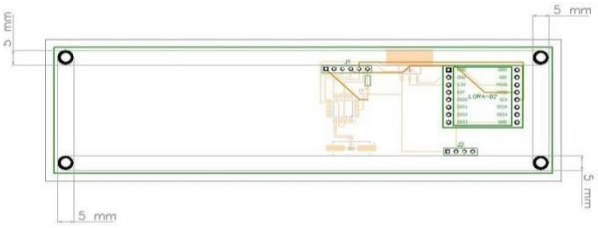


Figure 1: PCB Design (Transmitter)

This project is installed at the helmet body and an integrated electronic system deposited in the helmet. It is operated through a wireless system. The components of this project are significantly small and rigged to fit in the helmet, making sure that the helmet remains light and durable. Moreover, the components of this project are placed evenly about the helmet to provide even weight distribution to promote overall comfort, balance and safety The PCB designed is shown. The transmitter includes MQ3 Gas Sensor for alcohol detection in rider's breath. Limit switch to detect the helmet is worn by rider or not it also has 0.3 inch OLED display which display alert messages like when rider is found to be alcohol positive or alert him about any possible collision and LoRa module is also used to provide this chip communication capabilities with receiver. Transmitter also has a small buzzer which is used to alert the rider in case the helmet is not properly worn, the Vibration module is used to detect if helmet is loosely worms, the buzzer produce very less sound and for very short time, to minimize the disturbance to rider while driving. This module activates only when bike is powered ON.

VI. DESIGN OF RECEIVER

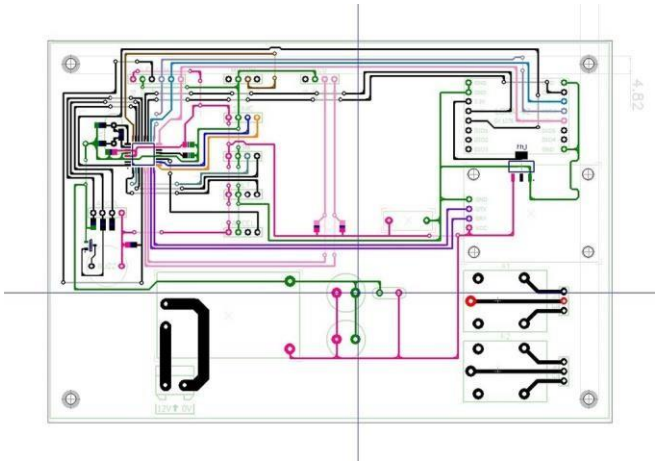


Figure 2: PCB Design (Receiver)

The second part of this project includes the receiver chip. The design is shown in figure 7. The receiver chip contains GPS Module for location tracking and anti-theft. It also contains GSM module for external long distance communications, also it has LoRa Module to receive data from transmitter, data like presence of alcohol in rider's breath and weather the rider is wearing helmet or not. It is also connected to bike ignition control to control the start/stop of bike's engine in case of rider being alcohol positive it will not allow bikes engine to start. It is also connected to a HC-SR04 (distance sensor) to detect the possibility of accident and warn rider for any possible collision with the help of buzzer attached with transmitter. To detect any contact/accident it also uses piezoelectric sensor.

VII. WORKING

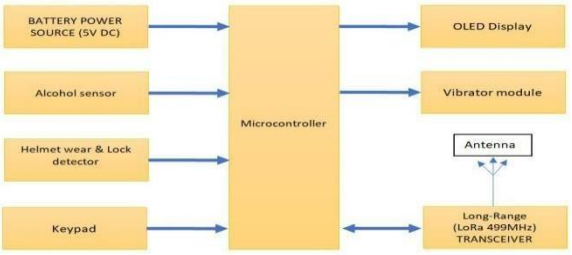


Figure 3: Block Diagram Transmitter Unit

The whole system consists of two units namely Transmitter unit shown in figure 10 and Receiver Unit shown in figure.

The rider has to put on the helmet with transmitter fitted on it and then as the riders inserts the keys and tries to turn on the engine, the system gets activated. The limit switch is used to for detection of helmet on riders head and then MQ3 sensor analyses rider's breath and then if rider clears the alcohol test then engine can be turned ON in normal way, otherwise the bike's engine cannot be turned ON and this message will be displayed on the small OLED screen placed inside helmet, this OLED screen in placed in such a way that it does not interfere with rider's vison to provide maximum safety and this gets activated only when bike is not moving.

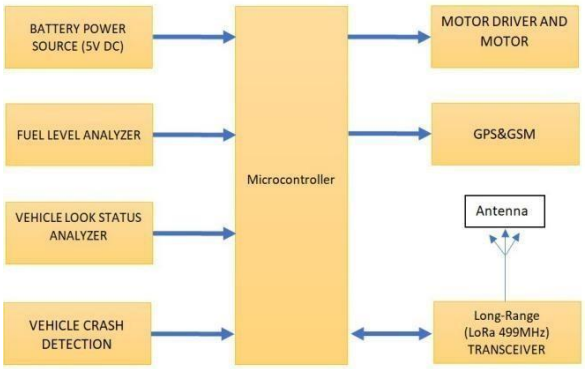


Figure 4: Block Diagram Receiver Block

VIII. GPS MODULE

The GPS module is used to obtain location and in this project it is used in receiver module, for getting the location in case of any accident and also it is used in anti-theft system, as it can be programmed in such a way that its location can be freeze and then any slight movement can be detected. This feature gets automatically activated while bike is parked.

GSM MODULE

This module provides cellular capabilities to this project which are used in this project to communicate with emergency contacts in case of accident which are preloaded while this system is designed and can be altered. Also it is used to alert rider for any thief attempt. This module uses AT commands. The GPS module is used to track the position of bike and while bike is parked then GPS position is locked and then in case of any thief attempt (change in bike position) the rider is notified with the help of GSM module.

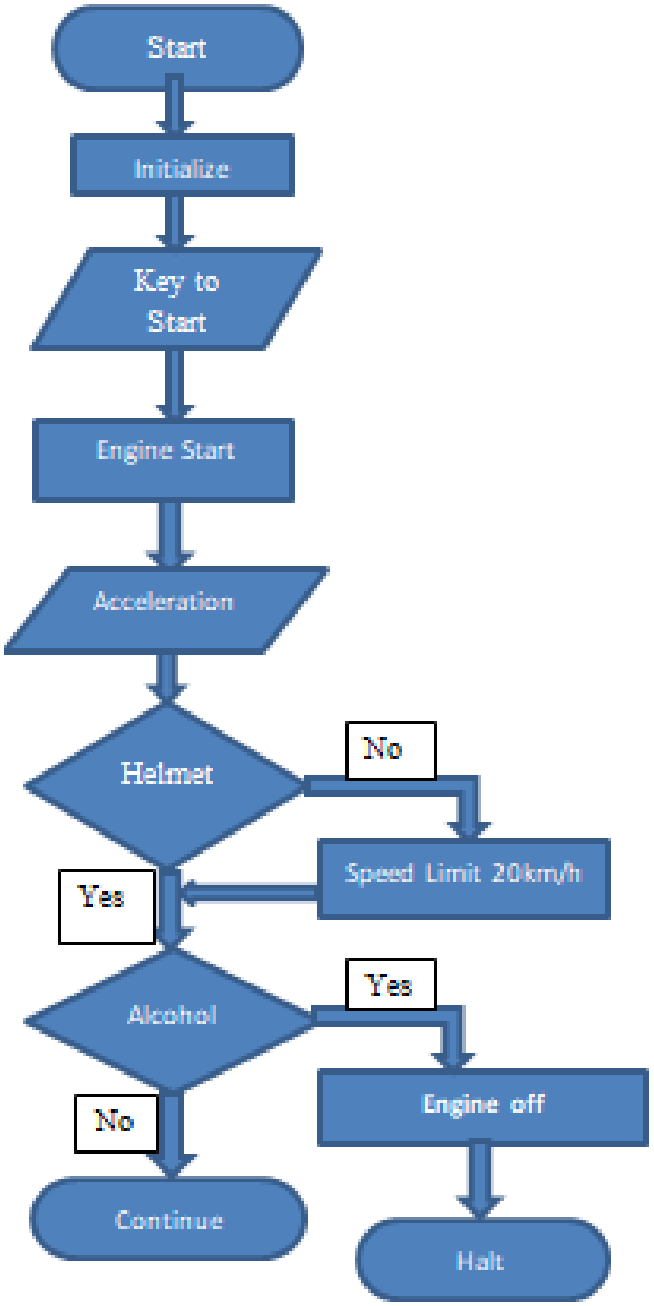
The Ultrasonic sensor (HC-SR04) is used to detect any possible chance of collision while driving and buzzer attached to transmitter is used to alert the rider, the sound of this buzzer in intestinally kept low for maximum safety and also a Piezoelectric sensor is attached on receiver, both Ultrasonic sensor and piezoelectric sensor are used to detect any physical contact with bike during ride and also they are used to detect/confirm the accident and the SMS alert is sent to the emergency contacts which are pre-loaded.

In both transmitter and receiver LoRa module to communicate between each other this consumes very less power and have multiple modes of operation with very long range.

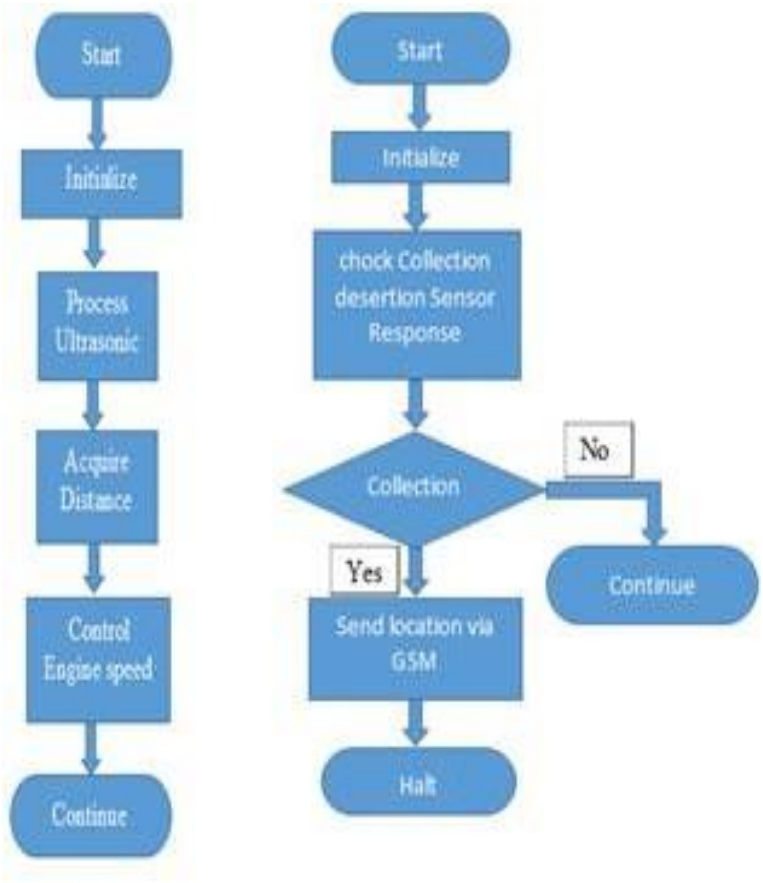
It is to be noted that only transmitter unit gets turned OFF when bike is parked while receiver unit is always ON, this isimportant for anti-theft system to function properly.

X. Result Flow Chart

This flow chart explains the application of safe drive, herethe compiler checks if the helmet is placed on the head of the user as well as if there is a presence of alcohol in the riders breath. If the terms are fulfilled then the program continues to execute else will fail to start the engine



This flow chart explains how the system alerts the rider if objects are in a certain range from the vehicle to avoid collision; at first the objects are detected by the program andthe indicated o the rider in order to avoid collision.



XI. Result and Discussion

As engineers when we come across problems in our day to day life, we feel that it is our responsibility to find a solution to the occurring problem. So we have identified a problem that has affected us and many others, and come up with a solution that we think might help and improve the society such as our project can be used in bikes which have only basic features: This system will help vehicles which have only basic features to auto adjust their headlights as well as get the information about the pothole's location which helps to improve the vehicle's efficiency The project is used to secure and avoid the road accidents.

Data for Government survey: The data we collect can be shared to the government who can resolve the problem and give suitable solutions, which can improve the development of the nation It can be used as part for automation of s or Public Transportation.

Smartphones/ smart systems: Smart systems can gather the data and can be used in various fields where we transmit and communicate with other devices with respect to the problem.

Features can be actively updated\installed over time, Sensors play an important role in automotive. This enables a wider scope of vehicle automation and futuristic designs & consideration. For example, at manufacturing units, sensitized robotic arms are used for painting car bodies and measuring the thickness of the coatings being applied. Manufacturers can simply supervise the thickness of the coat of paint being sprayed on instruments, airbag claddings and various internal parts of the vehicles using sensors.

Sensors keep a track of vehicle engines, fuel consumption and emissions, along with protecting and aiding drivers and passengers. These allow car manufacturers to introduce cars that are safer, more fuel efficient and comfortable to drive. Our project will easily be integrated to accustom all such sensors. Replicating the concept of complete control and tracking of vehicles of a country can be easily established.

Figure 5: Final model

The final result of our system is as follows:
Alcohol Detection: Sensors present in the helmet will detect the presence of alcohol on the riders' breath if so the alcohol check pass will reduce the vehicle speed to 20 km/hr.

Vehicle accident detection: The system will check the mechanical vibration of the vehicle if there is abnormal acceleration changes found, if true the acquired gps data will be sent via sms to the designated predefined numbers.

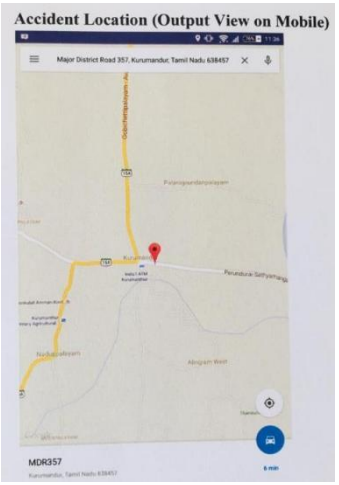


Figure 6: Output view on cell phone

Auto breaking system: When the vehicle reaches an abnormal distance with another vehicle, the vehicles auto breaking system will be activated. When distance is <3mtrs breaks will be applied with the computation of current speed.

Figure 7: Auto breaking system

Here the speed of the motor is gradually reduced once an object is placed in front, the closer the object gets the more the speed of the motor reduces.
Vehicle locking using the helmet: Possibility to lock the vehicle via helmet done by ignition blocking if the rider doesn't put on the helmet.
Here once the helmet is worn and the rider sits on the bike is only when the bike is able to start and continue to function. For an emergency situation where the helmet isn't around the bike will start but

have regulated speed of 20 km/hr.
Fuel level & helmet monitoring display: a separate indicator has been installed in the helmet to display low fuel level or any other informalities.

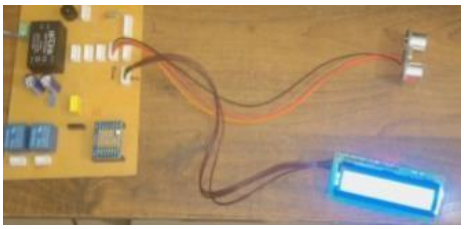


Figure 8: Indicator displaying fuel level

XII. Conclusion & future scope

Here by we conclude that this project is very easy to install on a current system, low cost and durable, ensures maximum safety to passengers and public, the driver gets all information about the safety without distracting him from driving, driver gets all information even in bad weather conditions, low power consumption. This project is further upgraded by automatic speed control when the vehicles get any hazard signal from outside environment. In the near future, this project can be implemented for the safety monitoring and automation of 4-wheel drives as well as heavy duty vehicles. Along with the implementation in cars , effective and efficient methods to reduce the costs , space and sensors for 2 wheelers are to be done .

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