DESIGN OF ARDUINO & RF MODULE BASED EMBEDDED SYSTEM -SMART HELMET

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Abstract—Design of *Smart Helmet using Arduino and RF module, sole objective is to increase road safety among motorcyclist. Most of the accidents occurring today are due to the lack of safety as well as driver being drunk. So, in order to overcome, this proposed embedded system will ensure whether that the driver has worn the helmet or not and also at the same time checkout whether driver has consumed alcohol.*

Key Words: **Rider safety, Alcohol detection, Sensors, Rider safety, RF transmission, Arduino IDE**

1. INTRODUCTION

In recent times, helmets have been made compulsory in many parts of the world. Traffic accidents e.g., in India have increased year by year. As per Section129 of Motor Vehicles Act, it is required for every single riding a two-wheeler to wear protective headgear following to standards of the BIS(Bureau of Indian Standards).In India drunken driver case is a criminal offence of The Motor Vehicle act 1939. Which states that the bike rider will get punish. In existence, bike rider easily gate escaped from law. These are the three main issues which motivates us for developing this embedded system. The first step is to identify the helmet is wear or not. If helmet is wear, then ignition will start otherwise it will remains off till helmet is not wear. For these we use FSR sensor. The second step is alcohol detection. Alcohol sensor is used as breath analyser which detect the presence of alcohol in rider breathe if it is exceeds permissible range ignition cannot start.

Another major challenge is accident and late medical help. An accelerometer is integrated in the bike unit of proposed embedded system. Due to these mechanism in place, we detect the accident occurs or not.

The aim of this research work is to make a protection system in a helmet for a good safety of bike rider. The smart helmet that we made is fixed with sensors which act as to detect wear helmet or not. There are two different microcontroller is used in this embedded system. Each unit has used a separate microcontroller, for bike unit we use Arduino Lily pad and for helmet unit we use ARM7 lpc2148.

2. BLOCK DIAGRAM

2.1 Helmet section

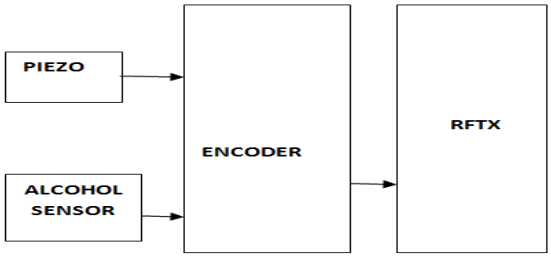

Fig -1: Helmet Section

2.2 Bike section

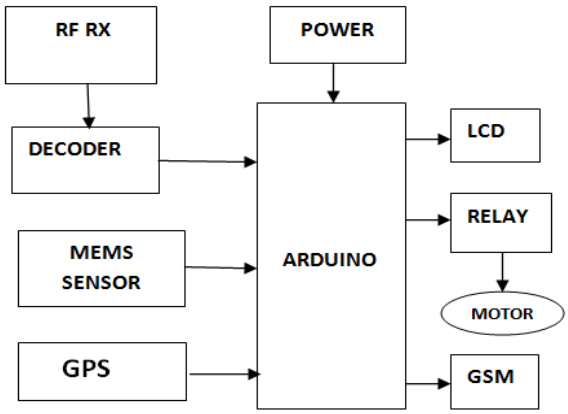

Fig -2: Bike Section

Block diagram consist of two sections mainly:

1. Bike section
2. Helmet section

These modules have their specific functions Helmet section has Piezo sensor, Alcohol sensor, Encoder, RF transmitter. We also have A/D converter, External battery in complete hardware section Bike section consist of different modules such as Arduino, LCD, Relay circuit, Motor, GSM module, GPS module , MEMS sensor , RF receiver, Decoder. .The inputs from different sensors are given to Arduino unit and which is analyzed by the Arduino and given to the RF transmission. The power supply is given to the bike unit.

3. DESIGN OF PROPOSED SYSTEM

It is already mentioned that the proposed system is divided into two units namely helmet and bike. In helmet unit, also called the transmitter unit. The force sensing resistor is placed on inside upper part of the helmet where actually head will touch with sensor surface. And alcohol sensor is placed on in front of rider's mouth so that it can sense easily. And the battery and regular circuits were fixed inside the helmet. Secondary controller and RF transmitter circuit were also placed inside the helmet. Antenna is located outside the helmet. The receiver unit is placed in the bike. The RF receiver accepts all the data from the helmet (i.e transmitter) unit. Depending on the conditions, if true, the ignition starts and bike moves. The GSM can continuously send the location information of the bike. If any accident occurs, the vibration sensor gets activated and sends the location information to the registered mobile number.

4. WORKING PRINCIPLE:

The first step is to identify the helmet is wear or not. If helmet is wear then ignition will start otherwise it will remains off till helmet is not wear. For these we use FSR sensor. The second step is alcohol detection. Alcohol sensor is use as breath analyser which detects the presence of alcohol in rider breath if it is exceeds permissible range ignition cannot start. It will send the message to register number. When these two conditions are satisfied then ignition will start.

The third main issue is accident and late medical help. If the rider met accident with him he cannot receive medical help instantly, its big reason for deaths. Around every second people die due to late medical help or the accident place is unmanned .In fall detection, we place accelerometer at the bike unit. Due to these mechanism we detect the accident occurs or not.

The smart helmet that we made is fixed with sensors which act as to detect wear helmet or not. There are two different microcontroller is used in our work. Each unit has used a separate microcontroller, for bike unit we use Arduino Lilypad and for helmet unit we use ARM7 lpc2148. Signal transmission between the helmet unit and bike unit is using a RF concept.

4.1 Flow chart:

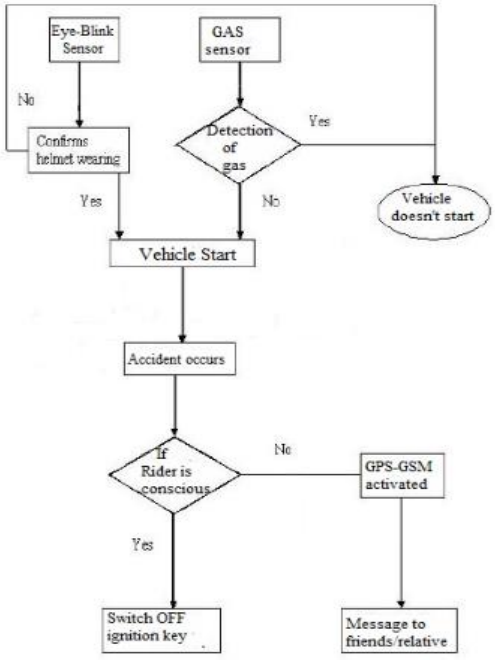

Table -1: Used Components in Smart Helmet

S.NO	COMPONENTS	UNITS
1.	Arduino uno	2
2.	Alcohol sensor	1
3.	FSR	1
4.	RF Transmitter	1
5.	RF Receiver	1
6.	ENCODER	1
7.	DECODER	1
8.	GPS MODULE	1

5. DESIGN AND IMPLEMENTATION:

Designing of Smart Helmet is very simple. Smart Helmet hit the ground, these sensors sense and gives to the microcontroller .then controller extract GPS data using GPS module then timers start counting up to 10 min. If the person is not capable to driven bike up to 10 min then automatically sends massage to ambulance and parents. This project is mainly to detect the alcohol drunken people. Here we are using microcontroller which is interfaces to alcohol sensor.

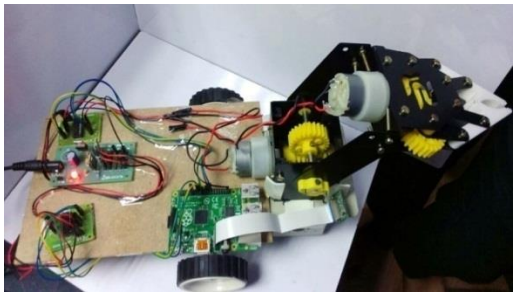

Fig -3: Proposed Prototype of Smart Helmet

Alcohol Sensor is a sensor that measures the amount of alcohol that is present in surrounding environment. If any drunken person came, alcohol sensor senses it and passes it to controller through ADC.

Advantages:

- Low power consumption
- More reliable
- More compatible
- Less cost

Applications:

- This project can be very useful to track when your vehicle is stolen.
- We can implement this project in two-wheelers as well as in four wheeler vehicles.

6. FUTURE SCOPE:

We can make further modifications to this project for more use cases like:

- By adding microphone and speaker for seeking directions or sending messages without using mobile
- Biometrics for authentication. Thefts can be avoided.
- Speed regulation or Speed alerts can be generated if speed exceeds the required limit.
- Solar panels can be used as power supply for self-charging

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