Intelligent Helmet

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Abstract As the bikers in our country are increasing, the road mishaps are also increasing day by day, due to which many casualties, most of them are caused due to most common negligence of not wearing the helmets, and also many deaths occur due to lack of prompt medical attention needed by the injured person. This motivates us to think about making a system which ensures the safety of biker, by making it necessary to wear helmet, as per government guidelines, also to get proper and prompt medical attention, after meeting with an accident. The proposed system is an intelligent helmet. A module affixed in the helmet, such that, the module will sync with the module affixed on bike and will also ensure that biker has not consumed alcohol. Additional feature of accident detection module will be installed on the bike ,which will be able to detect accident and will be able to notify quickly the accident to police control room and in case if the accident is minor, rider can abort message sending by pressing the abort switch.

Index Terms — *Arduino, accelerometer, sensors, helmet, RF transceiver, helmet, bike*

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1 INTRODUCTION

THERE is an alarming increase in the morbidity and mortality due to two wheeler road traffic accidents. This has been a matter of great concern globally. In India, it is estimated that one accident takes place every 2 minutes. Data from the National Crime Records Bureau indicates that deaths and injuries related to road traffic accident has increased two and four fold respectively during the period of 1991–2005. Reportedly 98,254 persons were killed in 2005 on Indian roads [1]. The occupants and riders of two wheeler vehicles are among the majority to be affected in road traffic accidents. Two wheeler accidents have also been shown to have maximum case fatality in accidents.

Despite of the safety rules made by the government, many riders fail to abide by them. The riders in India often bypass the prime rule of wearing the helmet while riding bike. This leads to fatal injuries to the rider in case of accidents. Apart from manual checking, there needs to be a system that could enforce this rule upon the riders and hence prevent them from bypassing it.

One of the prime reasons that leads to accidents is "drunk and drive". Due to drinking and driving two wheeler riders often get into accidents. Almost 70% of the accidents in our country can be prevented if the riders stop consuming alcohol before riding.

The people involved in the accidents need to be taken care of and immediately taken to the emergency room. But there is a lag in handling the aftermath of road accidents in the country. The nearby police station needs to be notified immediately about the accidents so that they can be taken to the hospitals immediately.

2 LITERATURE SURVEY

2.1 Smart Helmet Using Arduino [2]:

This is a report about a smart helmet which makes motorcycle driving safer than before. The aim of this project is to give information at accident to ambulance N family members. This is implemented using Arduino. This smart helmet was implemented by placing vibrations sensors in different places of helmet where the probability of hitting is more which are connected to arguing board. When the date exceeds minimum stress limit then the GSM module sends message to family members automatically. The hardware used in this system is Arduino board, Bluetooth module, vibration sensor and mobile phone.

2.2 Smart Helmet for Indian Bike Rider [3]:

This paper presents the smart helmet that makes sure that the rider cannot start the bike without wearing it. This helmet replaces the cable connections for wirelessly switching on a bike, so that the bike would not start without both the key and the helmet. A LED indicator is used to demonstrate the working of the model. The system is a simple telemetry system, which is activated with the help of a pressure that is applied to the inner side of the helmet when the rider wears it. The framework model uses a DPDT electromechanical relay and hence there is some time lag in wearing the helmet and switching on of the circuit.

2.3 Smart Helmet Using GSM & GPS Technology for Accident Detection and Reporting System [4]:

A smart helmet is an innovative concept which makes motorcycle driving safer than before. It uses the GPS and GSM as its core technologies. The mechanism of this smart helmet is very simple, vibration sensors are placed in different sections of helmet where the chances of hitting is more which are connected to microcontroller board. So when the rider crashes and the helmet hit the ground, these sensors sense and provide it to the microcontroller board, then controller extract GPS data using the GPS module that is integrated to it. When the data goes below the minimum stress limit then GSM module automatically sends alerting message to ambulance or family members. The hardware used in this system is alcohol sensor, GSM, GPS, microcontroller, pressure sensor and vibration sensor.

2.4 Alcohol Detection Using Smart Helmet System [5]:

The system automatically checks whether the person is wearing the helmet and has non- alcoholic breath while driving. There is a transmitter at the helmet and a receiver at the bike. There is a switch used to sure the wearing of helmet on the head. The data to be transferred is coded with RF encoder and transmitted through radio frequency transmitter. The receiver at the bike collects the data and decodes it through RF decoder. MCU controls the function of relay and thus the ignition; it controls the engine through a relay and a relay interfacing circuit..

3 PROPOSED SYSTEM

The proposed system is an intelligent helmet. The system ensures the safety of the biker, by making it necessary to wear the Helmet, as per the government guidelines, also to get proper and prompt medical attention, after meeting with an accident.

A module is affixed in the helmet, such that, the module will sync with the module affixed on the bike [2], [3]. The system will bear following functionalities:

● It will ensure that the rider has worn the helmet. If he fails to do so, the bike won't start.

● It will also ensure that biker has not consumed alcohol. If the rider is drunk, the bike won't start.

● An accident detection module will be installed on the bike, which will be able to detect accident and will be able to notify quickly the accident to police control room and in case if the accident is minor, rider can abort message sending by pressing the abort switch.

It will consist of two parts:
• Module on helmet and
• Module on the bike.

Data from the helmet will be transmitted wirelessly to the bike. According to the various sensor input the micro-controller will decide the actions of other blocks.

4 SYSTEM DESIGN

The system consists of two parts: Helmet part and Bike Part

4.1 HELMET PART

It basically consists of an IR Sensor, Alcohol Sensor, Accelerometer, Microcontroller and Transmitter.

IR Sensor: An IR sensor consists of an emitter, detector and associated circuitry. The emitter is simply an

IR LED (Light Emitting Diode) and the detector is simply an IR photodiode which is sensitive to IR light of the same wavelength as that emitted by the IR LED. The LOW or HIGH output of the IR sensor determines if the helmet is worn or not worn.

Alcohol Sensor: Used for detecting alcohol concentration in breath. It provides an analog output based on alcohol concentration. If the amount of alcohol exceeds the threshold value it will not allow the bike to start [5].

Accelerometer: An accelerometer can be used to measure the tilting of the bike as well as the helmet. The tilt of the helmet is measured and sent to the microcontroller. If the angle of the bike is zero (0) with respect to ground, it will detect that accident has occurred [6].

Microcontroller: All the analog outputs from all the sensors on the helmet are sent to this microcontroller as input. According to the threshold set for alcohol sensor, accelerometer and the low or high output of the IR sensor, a decision is made and sent to the module on bike wirelessly [7].

Transmitter: A RF transmitter operating at 434 MHz Radio Frequency is used to transmit the serial data to the receiver over wireless media.
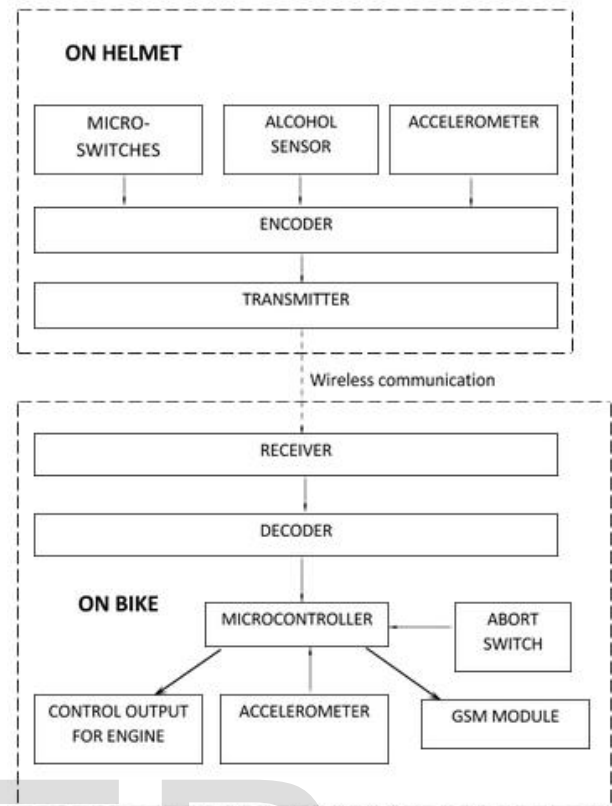

Fig.1 Block Diagram of Intelligent Helmet

4.2 BIKE PART

It basically consists of a Receiver, Microcontroller, GSM Module and Abort switch. Receiver: A RF receiver operating at 434 MHz Radio Frequency is used to receive the data over wireless medium.

Microcontroller: This is the actual decision making unit of the entire circuit and the programs will be fed into it. According to the data it will receive from the module on bike it will control the output of remaining components. Based on the output of both the accelerometers on bike and helmet, it will send message to nearest police station in case of an accident using GSM module [8], [9]. And based on the outputs of alcohol sensor and IR sensor, it will send a relay output to the engine.

GSM Module: This GSM Modem can accept any GSM network operator SIM card and act just like a mobile phone with its own unique phone number. Applications like SMS Control, data transfer, remote control and logging can be developed easily. The modem can be connected directly to any microcontroller. It can be used to send and receive SMS or make/receive voice calls. We will be using SMS application of it to send an SMS to the police station in case of accident [8].

Abort Switch: Abort switch is used to abort the operation in case of a minor accident occurred.

5. IMPLEMENTATION

The hardware and software requirements and the work flow of the Intelligent Helmet are described here.

5.1 SYSTEM WORK FLOW

The flowchart shown in Fig. 2 explains the workflow of the system.

The rider wears the helmet. When the helmet is worn, the IR sensor detects an obstacle and gives LOW output. The alcohol sensor calculates the alcohol content in the rider's breath, and Tilt of the helmet is measured by the accelerometer.

All these sensor outputs are sent as input to the microcontroller. The microcontroller processes the data and sends it to the module on the bike via RF module consisting of RF transmitter and RF receiver.

The receiver sends the data to the microcontroller on the bike module. If the IR sensor is LOW, it implies that the helmet is worn and hence the bike will run smoothly else it will not allow the bike to start.

If alcohol concentration is more than the threshold, it will not allow the bike to start else the bike will run smoothly.

If the tilt of the bike and the helmet is zero with respect to ground then it will send an SMS to the Police station.
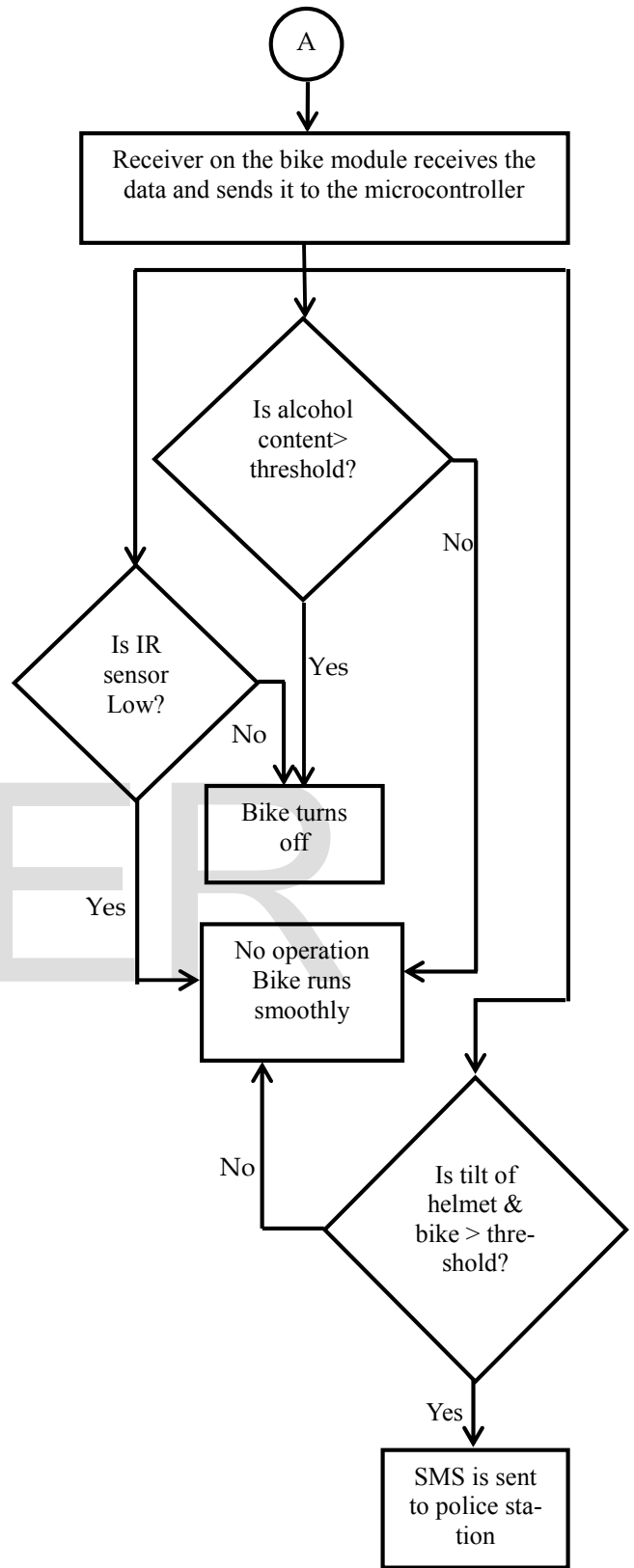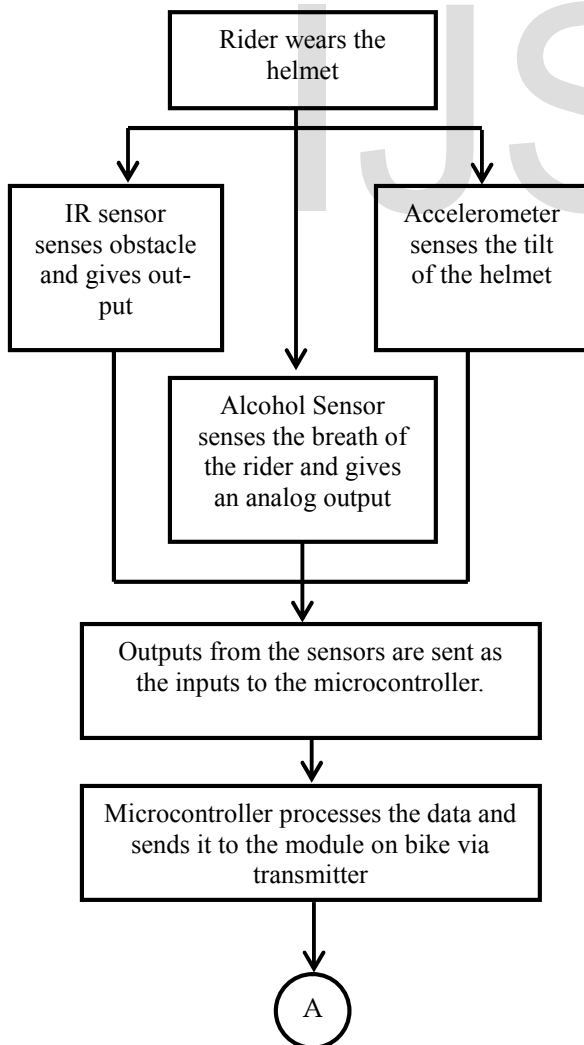
Fig. 2 Flowchart of the System

5.2 SYSTEM REQUIREMENTS

Arduino Software is used to hardcode the program into Arduino board. Other hardware system requirements are listed in Table 1 below

TABLE 1
COMPONENTS USED IN INTELLIGENT HELMET

Sr No	Components	Component Name
1	Micro switch	MSW-Push_TS4
2	IR sensor	IR Obstacle Avoidance Sensor
3	Alcohol Sensor	MQ-3
4	Accelerometer (Tilt Sensor)	Triple Axis Accelerometer ADXL335
5	Transceiver	ASK 434MHz RF Transmitter and Receiver
6	Arduino	Arduino UNO
7	GSM Module	SIM 900A

6. CONCLUSION

Intelligent Helmet ensures the safety of the rider, by making it necessary to wear helmet, and ensures that the rider hasn't consumed any alcohol. If any of these prime safety rules are violated, the system will prevent the biker from starting the bike. The system also helps in efficient handling of the aftermath of accidents by sending a SMS with the location of the biker to the police station. This ensures that the victims get proper and prompt medical attention, if met with an accident.

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