

DESIGN AND IMPLEMENTATION OF A SMART GADGET FOR BIKER'S SAFETY

by

MD. AKTHER-UZ-ZAMAN

KHADEMUL MOWLA

TOWASIN TOWAHA

**BACHELOR OF SCIENCE IN ELECTRICAL AND ELECTRONIC
ENGINEERING**



Department of Electrical and Electronic Engineering
INTERNATIONAL ISLAMIC UNIVERSITY CHITTAGONG

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CERTIFICATE OF APPROVAL

The project entitled as “**Design and Implementation of a Smart Gadget for Biker’s Safety**” submitted by **Md. Akther-uz-zaman**, bearing Matric ID. **ET171028** and **Khademul Mowla**, bearing Matric ID. **ET171031** and **Towasin Towaha**, bearing Matric ID. **ET171036** of session **Autumn 2020**, to the Department of Electrical and Electronic Engineering, International Islamic University Chittagong, has been accepted as satisfactory in partial fulfilment of the requirements for the degree of Bachelor of Science in Engineering and approved for the examination held on **24th December, 2021**.

Supervisor

Engr. Md. Rashidul Islam

Assistant Professor

Department of Electrical and Electronic Engineering

International Islamic University Chittagong.

DECLARATION

It is hereby declared that this work has been done by us and no portion of the work contained in this thesis/project has been submitted elsewhere for the award of any degree or diploma.

Md. Akther-uz-zaman

Khademul Mowla

Towasin Towaha

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Authors

ABSTRACT

The major reasons behind the death of two-wheeler drivers are over-speeding, drunken driving and careless driving. A significant number of lives could have been saved if emergency medical service could get accident information and reach in time to the scene. To overcome these present challenges, a gadget is developed that gives the best solution. The objective of our project is to design an intelligent helmet that is capable of detecting alcohol consumption as the part of safety precautions, providing post accidental aid and to ensure safety guard against any sort of bike theft. In this gadget we have provided safety precautions with the help of MQ-3, Tilt and Limit Sensor. By tracking biker's location with the help of GPS-GSM module we have ensured fast post accidental aid if an accident occurs. The main purpose of this smart gadget is to provide safety for the rider. In addition with that our gadget offers features like alcohol detection, accident identification, location tracking, an automated notification and fall detection sensor. Its compulsory to wear helmet, without helmet ignition switch cannot be ON. If the rider is drunk or does not wear helmet, then automatically ignition switch will be locked. While in riding mode, if rider faces any accident, then a message will be sent automatically to nearest selected contacts or emergency services with current live location. It also provides a feature to continuously monitor the vehicle at any situation while in idle position.

TABLE OF CONTENTS

CERTIFICATE OF APPROVAL	ii
DECLARATION	iii
ACKNOWLEDGEMENT	iv
ABSTRACT	v
TABLE OF CONTENTS	vi
LIST OF FIGURES	ix
LIST OF TABLES	x
LIST OF ABBREVIATION	x
CHAPTER 1 INTRODUCTION	1
1.1 Introduction	1
1.2 Background	1
1.3 Problem Statement	3
1.4 Motivation	4
1.5 Objectives	5
1.6 Report Outline	5
1.7 Summary	6
CHAPTER 2 LITERATURE REVIEW	7
2.1 Introduction	7
2.2 Related Works and Gaps	7
2.3 Limitations and Challenges of Past Works	15
2.4 Summary	16
CHAPTER 3 METHODOLOGY	17
3.1 Introduction	17
3.2 Hardware Description	17
3.3 Principal Components	18
3.3.1 GPS Module	18
3.3.2 Microcontroller PIC16F876A	19
3.3.3 Microcontroller PIC16F73	19
3.3.4 Liquid Crystal Display	20
3.3.5 Crystal Oscillator	21

3.3.6	Tilt Sensor	21
3.3.7	Zener Diode	22
3.3.8	Diode	23
3.3.9	Relay	23
3.3.10	Buzzer	23
3.3.11	NPN Transistor ULN2003A	24
3.3.12	Limit Switch	24
3.3.13	Alcohol Sensor	25
3.3.14	Decoder HT12D	26
3.3.15	Encoder HT12E	26
3.3.16	FM Transmitter	27
3.3.17	FM Receiver	27
3.4	Block Diagram	28
3.5	Circuit Diagram	29
3.6	Summary	31
CHAPTER 4	EXPERIMENTAL IMPLEMENTATION	32
4.1	Introduction	32
4.2	Procedure	32
4.2.1	Security Mode	33
4.2.2	Accident Detection Mode	34
4.3	Summary	36
CHAPTER 5	RESULTS AND DISCUSSION	37
5.1	Introduction	37
5.2	Description	37
5.3	Test Results	38
5.3.1	Alcohol Sensor	38
5.3.2	Tilt Sensor	38
5.3.3	Limit Switch	39
5.3.4	SIM808 GPS Demonstration	39
5.4	Cost Analysis	40
5.5	Comparative Study	40
5.6	Summary	41
CHAPTER 6	CONCLUSION	42
6.1	Introduction	42
6.2	Conclusion	42
6.3	Advantages	42
6.4	Limitations	42

6.5	Future work	42
	REFERENCES	44
	APPENDIX	47

LIST OF FIGURES

Fig. 2.1	WreckWatch Architecture Diagram	7
Fig. 2.2	Structure of a GSM network	9
Fig. 2.3	Automatic Accident Detection: assistance through communication technologies and vehicles	10
Fig. 2.4	Automatic Accident Detection: assistance through communication technologies and vehicles	11
Fig. 2.5	The protocol stack for wireless access in vehicular environments	12
Fig. 2.6	A Highly sensitive driver condition monitoring system using nonintrusive active electrodes	13
Fig. 2.7	Helmet using GSM and GPS technology for accident detection and the reporting system.	14
Fig. 3.1	GPS Module	18
Fig. 3.2	Microcontroller PIC16F876A	19
Fig. 3.3	Microcontroller PIC16F873	20
Fig. 3.4	Liquid Crystal Display	21
Fig. 3.5	Crystal Oscillator	21
Fig. 3.6	Tilt Sensor	22
Fig. 3.7	Zener Diode	22
Fig. 3.8	Diode	23
Fig. 3.9	Relay	23
Fig. 3.10	Buzzer	24
Fig. 3.11	NPN Transistor ULN2003A	24
Fig. 3.12	Limit Switch	25
Fig. 3.13	Alcohol Sensor	25
Fig. 3.14	Decoder HT12D	26
Fig. 3.15	Encoder HT12E	26
Fig. 3.16	FM Transmitter	27
Fig. 3.17	FM Receiver	27
Fig. 3.18	Block Diagram of Transmitting System	28
Fig. 3.19	Block Diagram of Receiving System	29
Fig. 3.20	Circuit Diagram of Transmitting System	30
Fig. 3.21	Circuit Diagram of Receiving System	31
Fig. 4.1	Smart Gadget for Biker's Safety	32
Fig. 4.2	The GPS system on mobile maps	33
Fig. 4.3	Helmet Circuit.	34
Fig. 4.4	Accident message and location via google maps.	35

LIST OF TABLES

Table 5.1	Alcohol Testing	38
Table 5.2	Tilt Sensor Testing	38
Table 5.3	Limit Switch Testing	39
Table 5.4	SIM808 GPS Demonstration	39
Table 5.5	Cost Analysis	40
Table 5.6	Comparative Study	40

LIST OF ABBREVIATIONS

AAS	Atomic Absorption Spectrophotometer
CNT	Carbon Nanotube
NP	Nanoparticle

CHAPTER 1

INTRODUCTION

1.1 Introduction

The improvement in technology and a steep increase in population from the past few decades had led a rapid pace of motorization. Between the years 2010 and 2013, a 16% increase in registered vehicles on street is observed. However, this motorization has occurred without regard for the safety of all pedestrians, drivers, and other road users. An increase in the number of vehicles will result in an increase in the number of road accidents. The primary concern is to find ways to avoid crash, but there might still be chances of occurrence of crash. A system is required to assist the injured people post-crash, provide information about the crash into emergency services and reduce the time lag taken for treating the injured.

In this paper, a system called “ Design and Implementation of a Smart Gadget for Bikers Safety” is proposed, a great method created to develop the survival scope for riders involved in vehicular accidents. This uplifted system offers automated crash detection, and assistance to riders involved in road accidents by efficiently sending the message including the location of the crash to the hospital server and to the ambulance and to the nearest individuals. On the other hand, this system aids rider by continuously monitoring the motorbike’s position via GPS which results the prevention of any sort of theft. This system does not focus on reducing the number of accidents, but on improving post collision assistance with fast and efficient time management, thereby increasing the chances of recovery and survival of people suffering from road accident injuries.

1.2 Background

According to global reports on safety of roads, surveyed on about 180 countries, nearly 1.25 million people die every year as a result of road accidents [1]. Principally, most ratios indicate accidents related to motorcycle rides. This is because of over-speeding and careless driving of two-wheelers that drives the driver into sudden death. Many lives could have been saved at first priority and in non-delayed manner if proper support or fast-aid would reach at the right destination in time [2]. At the time of the

first phase which could be minimum of one hour all deaths do happen. Thus, if sufficient support or aid reaches to the victims during these critical stages, death rates can be decreased. This project intends to create a communication based safety gadget that enhances the portability of connectivity, the sensing functionalities and data transformations that are the based-on GPS/GSM System. In general, the GPS system focuses on machine interactions and communication with other modules or devices, as well as objects, surroundings, and infrastructures. The vast amount of data created is then processed into appropriate actions that can also direct or control the functionality, making our lives simpler and secure [3].

In recent years, there has been legislation requiring the use of helmets. Every year, the number of traffic accidents rises. Every person riding a two-wheeler is required by law in many nations to wear a helmet. On the other hand, drunken driving is considered as a criminal offence according to the motor vehicle law. Now, as opposed to that, bike riders can easily escape from that law [17].

The primary step has to be in detection of whether the helmet is worn or not. If a helmet is worn, then ignition will start otherwise it remains turned off. In this case, Limit Sensor was used. The secondary step was alcohol detection [18]. Alcohol sensor was used as analyzing of breath which detects the presence of alcohol in the rider's breath and if it exceeds required limits, ignition cannot be started. It will send a message to the certain number saying that "Rider is drunk". MQ-3 sensor was used for this detection. When these two conditions are satisfied then ignition will start. The third main issue was accident or collisions and delayed medical support to reach into the destination. If the rider faces any collisions or accident, he will not receive any kinds of emergency help immediately that will cause the instant death. Death generally occurs due to delayed medical or emergency help, or even unknown matters about miscommunications. For gravity-fall detection, tilt sensor is attached in the bike. By this sensor, accidents also can be detected much faster. The goal of this project is to develop a helmet that acts as a shield for two-wheeler drivers. The smart gadget introduces different sensors with different functionalities as per requirement of road conditions [14].

1.3 Problem Statement

In current days when any accident happens it is difficult to locate the exact position in order to provide appropriate support or aid to the victim. As a result, we have to depend on the calling system to get the location which is a delayed process and significant negative effect already comes to the victim between this period. As GPS methodology is already a running scenario for locating desired vehicles or persons, it also can be used to detect the post accidental spot with accuracy. The GPS system is a fast and a reliable process to get quick aid to the exact location and this project relies on it. On the other hand, driving with the consummation of alcohol is banned in law as driver in such case remains unconscious to operate any vehicle perfectly. In such case, in this country, the pre-checking system of alcohol consummation before starting of a ride is unavailable. For this reason, this project provides the proper solution to detect or check alcohol quickly before starting of a ride. If any detection occurs, the vehicle through the module will not automatically let the driver start the engine. There are many cases while riding of a vehicle, specifically the bike's accidents occur very quickly that normal realization or response system of human does not work. That results, sometimes lack of acknowledgement of the accident is actually happened except outsiders witnessing it. This project covers that scenario through the usage of different sensors. Different sensors detect and acknowledge the accidents in different angles and ways which is fast, accurate and non-delayed. Post-accidental aid or help is much needed when a driver or rider faces any sort of accident in order to save lives. It has to be smooth and fast as opposed to delayed responses from emergency services. In our country, delayed responses from emergency services are common during the accident. This project removes this drawback and trying to capture fast responses from emergency services with the help of GSM messaging system. After facing any accident, the automatic message contained of GPS real time location of the accident will be sent to emergency services and the nearest selected contacts for the purpose of getting faster responses and proper aid. The message can be opened and checked via any smart phone device or browser of any sort. This methodology of GPS is also used for preventing any types of vehicular theft. It is accomplished by continuously monitoring the real-time position of a certain vehicle, and if the position continues to change for any reason, the theft of the bike will be acknowledged. Please be notified that, if module is tried to be

taken out, the bike engine will be shut down permanently until the owner re-connects the module.

1.4 Motivation

As bike registrations are increasing day by day because of enhancements of ride sharing services in order to earn goods, it is important to achieve proper safety precautions before starting the bike. On the other hand, if any accident happens, it is important to take necessary steps immediately right-after in order to save lives in first priority. For this purpose, this project is playing as a vital role to aid the upper described circumstances to meet the core goal which is to save lives. But, in order to save lives, it's also necessary to handle pre-adjustments before riding and to keep track of one's health and mental state, as these are two of the most vital assets for conducting something, So this project covers not only post-accidental preparations but also pre-safety practices before placing the steps towards driving as well as low cost proposed a module so that every stage of persons or drivers can practice the safety functionalities. As GPS technology is much known to all around the country, it is principally used for detecting the exact location and use of the location to identify or spot the accident immediately. This GPS technology is also used for monitoring the bike parked in the garage or other places for avoiding the theft. In this case if theft occurred, a movement of the bike can easily be monitored and can be taken proper actions based on the location. GSM usage is also encouraged because it is highly calibrated in a metro area and most people use SIM for communication. In this case, after spotting the accident, message services are utilized to communicate with nearby or emergency contacts in order to receive prompt assistance, which is accomplished through GSM technology. Microcontroller PIC16F876A is used in here so that comparatively easy assembly language can be utilized and written for commanding various sensors and functionalities. Tilt sensor is proposed because of easy detection of the accident through tilting or angle method which is much flexible than other sensors.

1.5 Objectives

Our goals include the following:

- a) To take precautions and safety exercises before starting of riding.
- b) To detect and identify of accident place via GPS technology and provide emergency aid.
- c) To create a safety guard against any sort of bike theft.

1.6 Report Outline

Six chapters are arranged and introduced for the purpose of presenting separated outlines and the expression of different functionalities in the project paper. The contents are as follows:

- **Chapter 1** provides background information related to the project as well as the introduction. Objective of this project is defined separately with respect to the drawbacks of previous works.
- **Chapter 2** provides literature review. Most previous works related to this project have been presented and utilized.
- **Chapter 3**, provides the methodology with block diagram and circuit diagram where every step is discussed in brief.
- In **Chapter 4**, various detection modes are elaborated along with working procedures.
- In **Chapter 5**, system is testing along with results are focused on functional tables where predictions are displayed.
- Finally, in **Chapter 6**, the project's overview is reviewed in depth. On this topic, the project's limitations, advantages, and future development are discussed.

1.7 Summary

The first chapter is all about the introduction of the proposed system that includes a problem statement, research background, motivations, project objectives and a project outline. The use of references is important in this case since it shows how previous similar activities were completed and what the shortcomings of certain projects were. In this chapter, the main and likely issues of the current project are briefly reviewed. Desired goals have been addressed as well and chapter wise outlines also have been addressed.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

The smart motorcycle safety device provides a fast and reliable service for spotting and reporting crashes. The system is built using a variety of sensors, a GSM module, and a GPS system. The detecting system notifies with a GSM system that monitors longitude and latitude differences incessantly. When an accident happens, information about it is transmitted to chosen contacts using the GSM messaging system. The GPS identifies the location of the bike, and a pin is dropped depending on the longitudes and latitudes. As a result, non-delayed aid can be provided to that point of areas and provide proper supports. Many related works have been done previously based on this system and there are a lot of gaps do exist as well. This chapter will cover these related topics with brief.

2.2 Related Works and Gaps

Security mode and accident detection mode are two areas in which for both purpose smart phone and notification is mandatory for proper directions and indications.

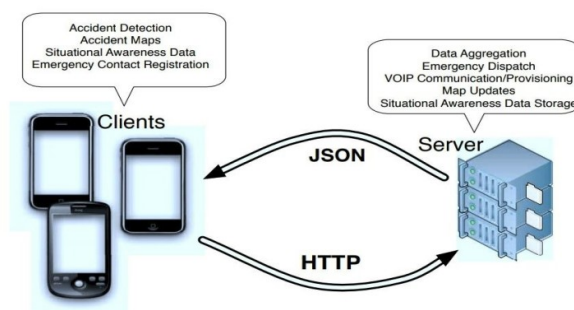


Fig. 2.1 WreckWatch Architecture Diagram [5]

In **Fig. 2.1** the diagram shows WreckWatch is separated into two main components—the WreckWatch server and the WreckWatch client. The WreckWatch client was developed using Google Android. It acts as a mobile sensor, relays accident information to the server via standard HTTP post operations, and provides an interface that allows third-party observers to contribute accident report data.

In [23], this shows a genuine scenario for detecting the accident that re-arrange the sensors and related data. In [24], This shows how cellular sensors, a network and web-based services can be utilized to provide environmental awareness to primary responders, and In [19], significant results analysing the effect of various approaches generated by cellular accident detection systems to prevent false positives.

White et al. focused on using a cell phone to detect accidents and notifications [5].

[13] C. J. Behr et al had developed a smart helmet for use in the mining industry to detect dangerous events and monitor air quality. Using an electrochemical sensor, this system can detect the presence of hazardous gases like CO, SO₂, NO₂, and particulate matter, as well as the removal of the helmet. Using the Head Injury Criteria, it also identifies an incidence in which miners are struck by an object in opposition to their head with a high force above a value of 1000. The HIC was calculated in software using an accelerometer to calculate the head's acceleration after being hit.

[14] Mohd Khairul Afiq Mohd Rasli mentioned that everyone should wear the helmet and Seat belt so, it decreases the death rate. If the Person crosses the speed limit, then the alert will be given to the rider. This project is specially developed as to improve the safety of the motorcycle's rider. Motorcyclist will be alarmed when the speed limit is exceeded. A Force Sensing Resistor (FSR) and BLDC Fan are used for detection of the rider's head and detection of motorcycle's speed respectively.

[15] Edna Elizabeth et al had designed a smart helmet that could detect and report collisions. This system makes use of a sensor network, a Wi-Fi enabled processor, and cloud computing or server-based infrastructure, all of which are linked via the IoT. IoT applications have various advantages, including the capacity to remotely monitor, manage, and control embedded devices or objects, as well as the potential to derive new insights and crucial information from a vast set of real-time data. An IoT application-specific framework can read data streams directly from sensors or sensor networks. It also performs transparent and scalable data processing, and when events of interest are detected, the predefined set of actions will be executed through the use of various cloud computing apps. The accelerometer in this smart helmet system is connected to a Wi-Fi enabled CPU, which continuously monitors for uneven or anomalous data fluctuations. When an accident happens, the necessary information is communicated to the individuals involved via a cloud-based service. The vehicle's location is determined

through GPS. Through the IoT, the proposed smart helmet system enables quick and accurate distribution of accident information in real time.

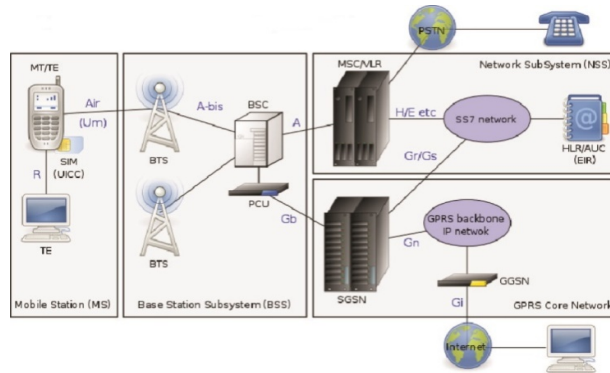


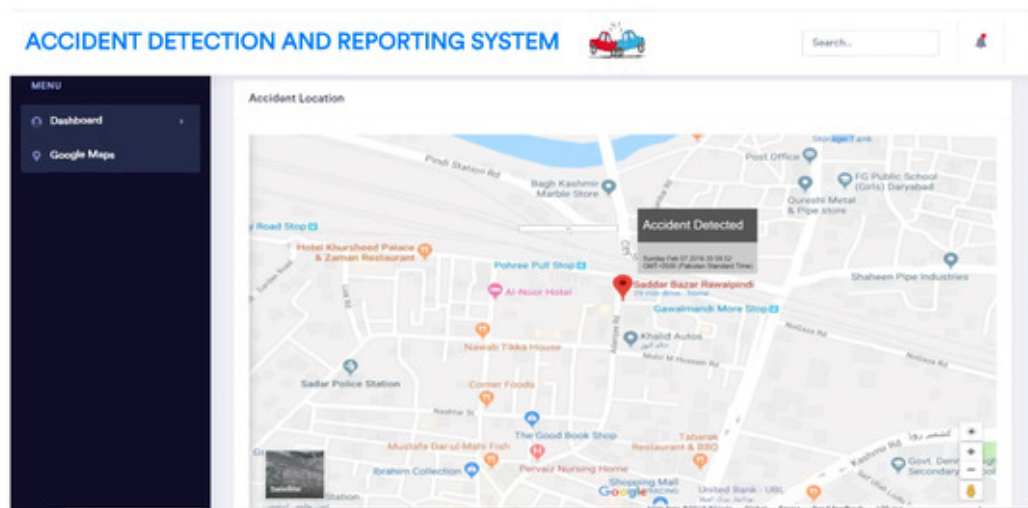
Fig. 2.2 Structure of a GSM network [6].

Fig. 2.2 shows that the BTS and the BSC communicate across the specified Abis interface, enabling operations between components that are made by different suppliers. The radio components of a BSS may consist of four to seven or nine cells. A BSS may have one or more base stations. The BSS uses the Abis interface between the BTS and the BSC. A separate high-speed line (T1 or E1) is then connected from the BSS to the Mobile MSC.

Zhao [6] expresses the insinuation of location awareness on cell-devices, and used this for smart accident monitor systems in cars. In general, cars are designed to lower the force on the driver. Thus, the force experienced by a smart cellular phone is not equivalent to the force experienced by internal vehicle sensors that are attached inside the car. As a result, faulty readings may be occurred. On the other hand, power consumption by the GPS module in any cellular device is higher that causes the battery life to be reduced in significant rates. So many papers have analysed with the communication of accident information [7], [8]. M. Fogueet al. [7] published a work on Automated Accident Detection. Communicational technologies as well as various vehicles have been tested during the periods. The significant phrase was the identification of accident via cloud determination.



(a)



(b)

Fig. 2.3 Automatic Accident Detection: assistance through communication technologies and vehicles [7]

After an accident is detected and pointed out, the cloud checks and acknowledges the nearest emergency services and informs the emergency services about the accident. This function is generated using a web-based application. This is developed using ASP.NET MVC 4. This program is coded to the hospital to estimate if there is any emergency or not. When an accident does occur, a fixed site or web platform receives the information about the accident. The web platform or site expresses the details of the accident containing the location, driver situation and vehicle live information. The Microsoft SQL database is utilized to save all the information regarding the accident. The web-based site uses HTML, CSS and bootstrap for developing the interfaces. Google maps is used to point out the live position of the accident on a map. **Fig. 2.3** shows the working of web-based application.

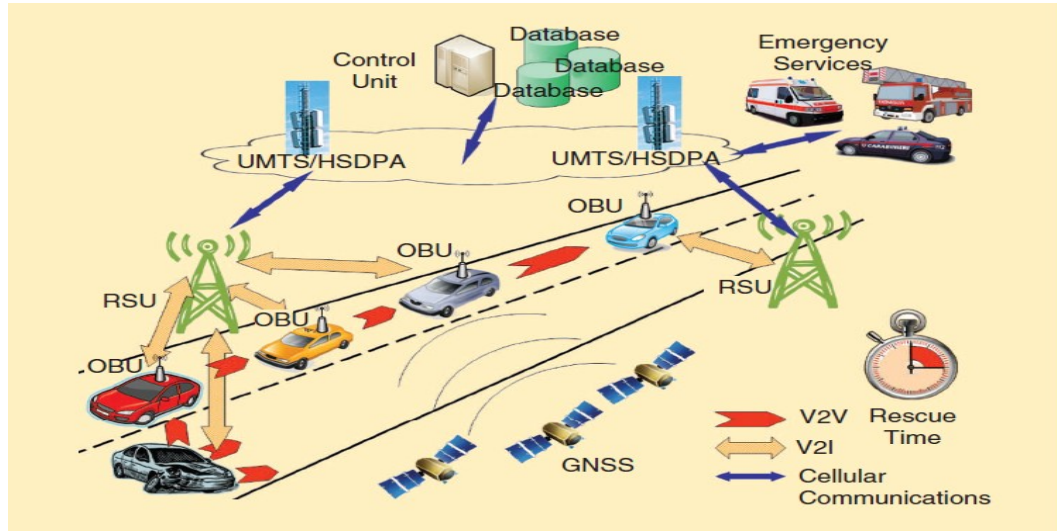


Fig. 2.4 Automatic Accident Detection: assistance through communication technologies and vehicles [7]

Fig. 2.4 presents the basic structure of an e-NOTIFY system. The proposed system contained of a lot of components with various functionalities. Primarily, vehicles should include an OBU for detecting accidents as well as communicating information about dangerous situations.

Then, detected accident notification is acquired by the combination of both V2V and V2I communications. After that, CU is the destination information that will control the warning notification, estimating the cruelty of the accident and contacting to the nearest emergency services. The OBU definition is most important for the proposed system. The module must be technically and economically appropriate as its applicability in wide range of vehicles could be increased in the future. Although the hardware design is included in vehicles primarily consist of greater purposed systems, this system is leading towards common purposed system because of the static inclusion of new services. An efficient warning message dissemination protocol should be utilized the street and buildings layouts at surrounding areas to select the most appropriate forwarding node for the message [15]. On the other hand, considerable advancements have been made in V2V technology, which is the development of vehicle-to-vehicle communication, also known as vehicular ad hoc networks (VANETs) [9].

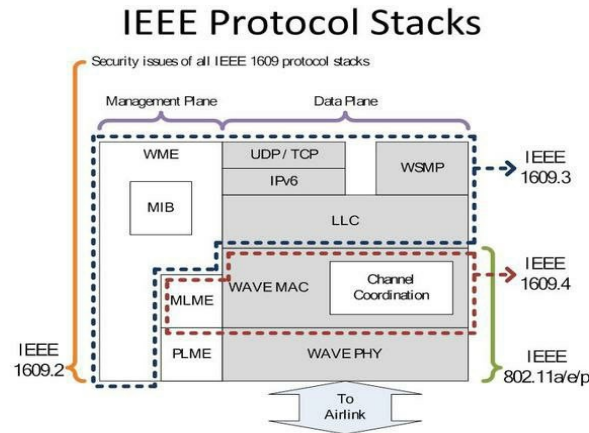


Fig. 2.5 The protocol stack for wireless access in vehicular environments. [9]

Fig. 2.5 the vehicular network could simply be an extension of the Internet, leveraging the same User Datagram Protocol/Internet Protocol (UDP/IP)-based methods. On the other hand, there is a strong need for supporting VANET-centric applications, for example, traffic safety and efficiency. As argued above, such vehicle-centric applications ideally control and access PHY and MAC parameters. Therefore, a dual stack architecture was proposed in the IEEE 1609 WAVE trial-use standard. The IEEE 1609 framework builds on IEEE 802.11p as PHY/MAC and provides two parallel stacks on top of it, one for UDP/Transmission Control Protocol (TCP) over IPv6 and one called Wave Short Message Protocol (WSMP). With WSMP, various low level parameters can be specified like data rate and transmit power level.

The Department of Transportation (DOT) created an initiative in 2012 to improve traffic safety through the use of vehicular communication. It is based on real-time, multimodal driving situations assessing the effectiveness and safety benefits of wireless linked car technologies [11].

Only V2V communications were attached in these works. Jung et al. [12] submitted a monitoring system that includes non-intrusive active electrodes implanted on the vehicle's seats.

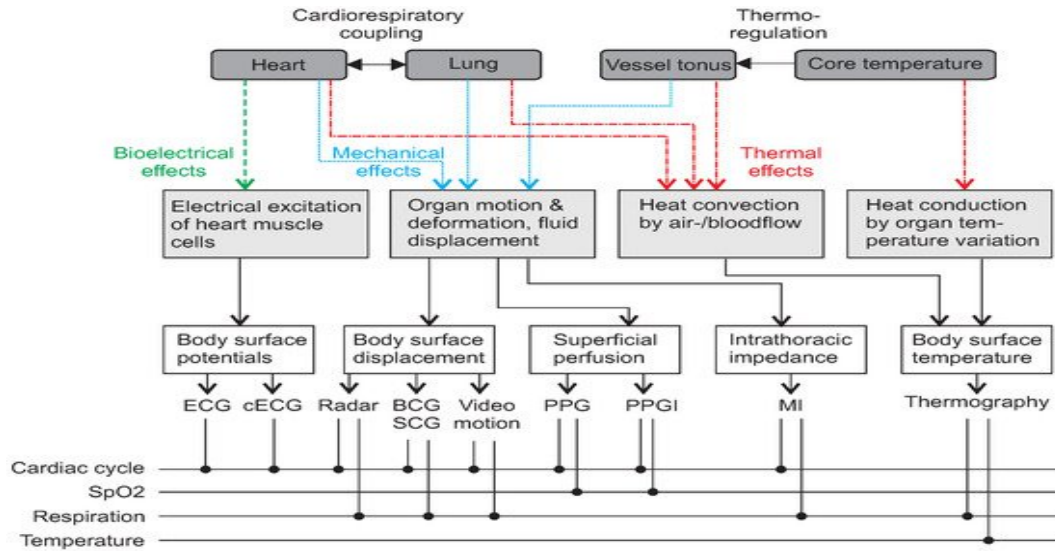


Fig. 2.6 A Highly sensitive driver condition monitoring system using noninvasive active electrodes. [12]

Fig. 2.6 shows that an overview of physiological sources, effects, unobtrusive sensors, and obtainable vital signals. Bioelectrical effects measured by ECG, a beating heart produces thermal effects that can be captured by thermography, and mechanical effects, reflected in the displacement of body surface due to organ motion that can be nicely seen by a mm-wave radar, and changes in superficial blood flow which is the basis for photoplethysmographic imaging (PPGi). Just like different sensing modalities are used in conjunction to equip a vehicle with the understanding of its surroundings, it is possible sensor fusion is also the way to go inside the cabin for increased robustness and precision of health monitoring.

The data was obtained and transmitted via a wireless PAN, where it was analysed to determine whether or not the driver was anxious. Due to the very small communication range, it is clear that these methods are too limiting. The majority of existing technologies, on the other hand, have been modified for 4-wheeled vehicles and are limited in terms of reach and cost. Maintenance becomes more expensive as the network of such systems evolves [5]. As a result, an intelligent vehicular safety system that assures economical safety and is accessible to all is required. As a result, we present a straight model and implementation of an Internet-based Smart Safety Gadget that is both low cost and secure.

According to a 2016 research paper titled ‘21 Helmet Using GSM and GPS Technology for Accident, Detection, and Reporting System,’ the author created this initiative with

the goal of increasing rider safety. The goal of this project is to analyze and comprehend the concept of an RF transmitter and receiver circuit. The project makes use of an ARM7 processor, a GSM module, and a GPS module. A buzzer is also used as an indicator in the project. Whenever an accident occurs, the location of the accident will be documented, and information will be sent to the registered cell phone number. [21]. 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.

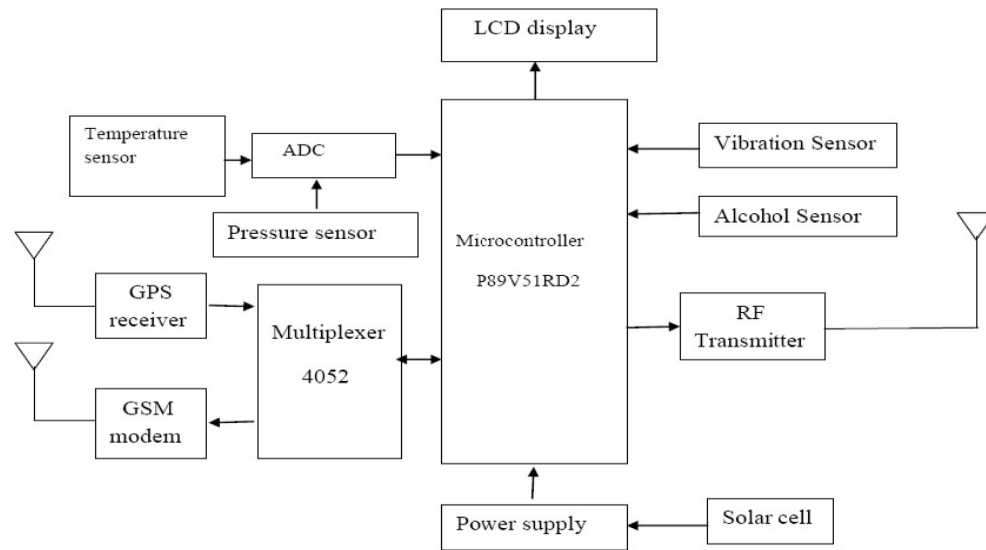


Fig. 2.7 Helmet using GSM and GPS technology for accident detection and the reporting system. [22]

In the **Fig. 2.7** P89V51RD2 microcontroller is used. The LED will turn on when the system is turned on, indicating that power is being delivered to the circuit. The RF is used to start two-wheelers. First, it checks whether the driver is drunk or not. If the driver is inebriated, the two-wheeler will not start. The small voltage of the ignition of the two-wheeler is grounded. When the helmet is worn under normal conditions, the pressure sensor detects pressure and the RF transmitter transmits an FM modulated signal. The RF receiver is connected with the two-wheeler which receives the radiated signal and activates the relay. The relay is removing the ignition wire from the ground and connected with the starter switch now the two-wheeler will start. When the driver meets with an accident, the vibration sensor sends a message to the microcontroller. The GPS

receives the location of the vehicle that met with an accident and gives the information back. This information will be sent to a mobile number through a message. This message will be received using GSM modem present in the circuit. The message will give the information of longitude and latitude values. Using these values, the position of the vehicle can be estimated.

The vibration sensor is placed in the helmet such that it detects vibrations of the helmet. When the rider crashes, the helmet hits the ground and the vibration sensor detects the vibrations that are created when the helmet hits the ground and then the microcontroller detect the accident occurrence and it will send a SMS containing information about the accident and location of accident using GSM and GPS modules. Alcohol sensor senses the alcoholic content whether the rider drunken or not. If drunk, bike will not start showing as alcohol detected on LCD display.

2.3 Limitations and Challenges of Past Works

1. Vibration sensors or shock sensors are used in past projects which results sometimes detection of illogical and erroneous output as many roads are not smooth in most of the countries of Asia. As a result, natural vibration does occur. In this case, tilt sensor is much simple and gives accurate reading with the help of gravitational forces.
2. The motorist has a tendency to wear a helmet only where they expect to be checked; they do not wear a helmet when no checking is envisaged. In this case, previous cases did not give importance on the obligatory environment of wearing of helmet. This project allows a compulsion for wearing the helmet. Otherwise, bike engine remains the shutdown.
3. By passing the ignition switch, the vehicle might be started or stolen. On the other hand, a vehicle may be carried away with support of another vehicle. Anti-theft functionalities were absent previously or separated along with other singular projects. Which would be a challenge for the portability of any safety modules. Current work gives a solution for this type of drawback and includes simple procedure.
4. Raspberry Pi, Arduino UNO or ARM7 was used in previous projects, which is too costly and programming language is difficult to handle. MCU PIC16F876A and PIC16F73 is much easy solution for smooth programming and handling/responding the sensor databases.

5. Previous projects expressed significant values on the cloud system for detections and communications. In this case, it has to be notified that cloud system has limitations outside the metro area and sometimes latency does fall that results delayed response from the server. For this purpose, global GSM/GPS technology has been utilized for the detection of real time locations and data transfer.
6. Most reports highlighted the report based on 4 wheelers scenarios, where the nature of the bike is much different as it includes helmet and outer layer free ridings. As a result, the two-wheeler solution is being prioritized in the current project.
7. Some projects advised modem system for receiving the GSM/GPS signal which is a drawback in current scenario as it requires more electricity supply and separated connections are needed. There exists latency problem while in riding conditions that causes delayed responses. Current work supports any sort of smart devices for transferring the data without any extra medium or layer.

2.4 Summary

Past researches are being carried out in this chapter. In the context of Bangladesh, this technology is quite beneficial in terms of user safety. To ride a bike, the user must wear a helmet, and as a result, the rider will adhere to traffic rules. This system is under financial control, i.e., riding a two-wheeler with safety in mind and a budget in mind. This system has simple functions. It offers the biker with more security.

CHAPTER 3

METHODOLOGY

3.1 Introduction

In this project, the GSM module is a vital part that detects precise locations and alerts the driver via a smart phone. Aside from that, the main description of the diagram has been provided in a concise manner. The explanation of how the MCU works and contributes to the circuit that results in the GSM module receiving a controlled power supply and acquiring the precise position of latitude and longitude, as well as the time interval is being managed for resetting purposes. In this chapter, with the help of tilt sensor and GSM module, the working procedure of MCU has been covered. Various components are listed here and a flowchart of full procedure is expressed. For the purpose of portability, Vero board as circuit, battery for power supply, fan as the starter of engine and buzzer for notification are used. There are many small portable versions of the MCU and GSM module which can make the total project smaller. However, standard size was chosen to keep the project's total costs low.

3.2 Hardware Description

The components of smart gadget for biker's safety are described as follows:

- GPS/GSM Module
- GPS/GSM Antenna
- PIC16F876A microcontroller
- PIC16F73 microcontroller
- Liquid Crystal Display
- Crystal Oscillator
- Tilt Sensor
- Limit Switch
- Alcohol Sensor
- Engine Switch
- Zener Diode

- Diode
- Relay
- Buzzer
- Resistor
- Capacitor
- LM 7805 voltage controller
- Battery holder
- Push button
- NPN transistor ULN2003A
- FM Transmitter/Receiver
- Encoder HT12E
- Decoder HT12D

3.3 Principal Components

3.3.1 GPS Module

The Global Positioning System (GPS) is a space-based satellite signal that GPS receivers use to deliver precise time and three-dimensional location (latitude, longitude, and altitude). GPS receivers provide worldwide users with accurate location, navigation, and timing services on a continuous basis in all weather conditions, day and night, wherever on or near the Earth. SIM808 is a GSM, GPRS, GPS, and Bluetooth all-in-one module. SIM808 is a sophisticated device. SIM808 features a GNSS receiver, allowing for simple GPS FIX. There are two antenna sockets on the SIM 808: one for GSM and the other for GPS. For GSM, a stub antenna is utilized, and for GPS, a magnetic external patch antenna is employed.



Fig. 3.1 GPS Module [25]

3.3.2 Microcontroller PIC16F876A

This CMOS FLASH-based 8-bit microcontroller, which packs Microchip's powerful PIC architecture into a 28-pin package and is upwards compatible with PIC16C5X, PIC12CXXX, and PIC16C7X devices, is both powerful (200 nanosecond instruction execution) and easy to program (only 35 single word instructions). The PIC16F876A has 256 bytes of EEPROM data memory, self-programming, an ICD, two comparators, five channels of 10-bit A/D converter, two capture/compare/PWM functions, a synchronous serial port that can be configured as either 3-wire Serial Peripheral Interface (SPITM) or 2-wire Inter-Integrated Circuit (I²CTM), and a Universal Asynchronous Receiver Transmitter (USART). All of these characteristics make it appropriate for higher-level A/D applications in the automotive, industrial, appliances, and consumer applications.



Fig. 3.2 Microcontroller PIC16F876A [26]

Additional Features

1. 2 PWM 10-bit.
2. 256 Bytes EEPROM data memory.
3. ICD.
4. 25mA sink/source per I/O.
5. Self-Programming.

3.3.3 Microcontroller PIC16F73

This CMOS FLASH-based 8-bit microcontroller, which packs Microchip's powerful PIC[®] architecture into a 28-pin package and is upwards compatible with the

PIC16C5X, PIC12CXXX, and PIC16C7X devices, is powerful (200 nanosecond instruction execution) yet easy-to-program (only 35 single word instructions). The PIC16F73 has five 8-bit A/D converter channels, two additional timers, two capture/compare/PWM functions, and a synchronous serial port that can be configured as either a 3-wire Serial Peripheral Interface (SPITM) or a 2-wire Inter-Integrated Circuit (I²CTM) bus, as well as a Universal Asynchronous Receiver Transmitter (USART). All of these characteristics make it appropriate for higher-level A/D applications in the automotive, industrial, appliance, and consumer applications.

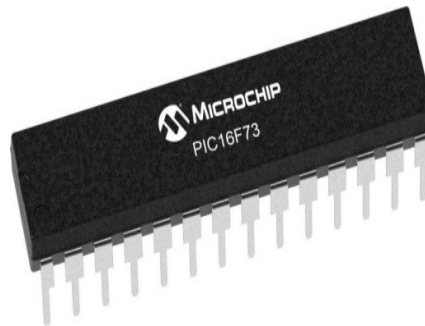


Fig. 3.3 Microcontroller PIC16F873 [27]

3.3.4 Liquid Crystal Display

LCD (Liquid Crystal Display) screens are electrical display modules that can be used in a variety of ways. 16x2 refers to the number of characters that can be displayed in each of the 16x2 LCD's two rows, for a total of 32 characters at any given moment. It has a single LED backlight with a resistor and can be powered directly from 5V. It has white lettering on a blue background. It can be adjusted easily with a resistor or PWM if it's too bright, and it uses far less power than LCD's with EL (electroluminescent) backlights. Only six digital lines are required to manage it completely. English is supported by the built-in character set.



Fig. 3.4 16x2 LCD

3.3.5 Crystal Oscillator

A crystal oscillator is an electronic oscillator circuit in which the frequency is controlled by a piezoelectric resonator, or by a crystal. It generates an electrical signal with a precise frequency by using the mechanical resonance of a vibrating crystal of piezoelectric material. This frequency is frequently used in quartz wristwatches to keep track of time, to provide a reliable clock signal for digital integrated circuits, and to stabilize frequencies for radio transmitters and receivers. Because the quartz crystal is the most prevalent type of piezoelectric resonator, oscillator circuits that utilise it are known as crystal oscillators.



Fig. 3.5 Crystal Oscillator [28]

3.3.6 Tilt Sensor

A tilt sensor is a device that monitors the tilt of a reference surface along different axes. Tilt sensors are used in a variety of applications to measure the tilting position in

relation to gravity. They make it simple to identify angle or orientation. They're also known as tilt switches or rolling ball sensors, which are similar to mercury switches.

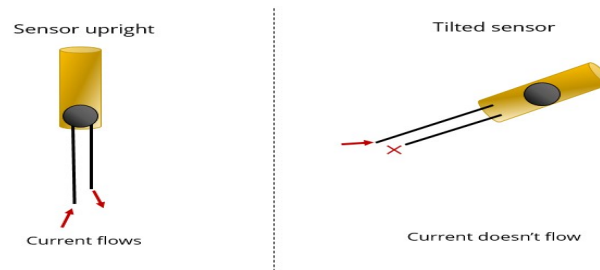


Fig. 3.6 Tilt Sensor [29]

Benefits

- Compact and easy to use
- Better resolution and clarity
- Minimal cost
- Low power dissipation
- It may be read by industry standard data recorders

3.3.7 Zener Diode

When the Zener voltage is attained, a Zener diode permits current to flow not only from its anode to its cathode, but also in the opposite way. The p-n junction of zener diodes is heavily doped. Reverse voltage causes normal diodes to fail, but the voltage and sharpness of the knee are not as precisely defined as in a Zener diode. Normal diodes are not meant to work in the breakdown area, whereas Zener diodes do.

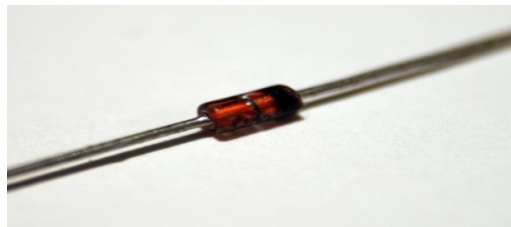


Fig. 3.7 Zener Diode [30]

3.3.8 Diode

A diode is a two-terminal electrical component with low (preferably zero) resistance in one direction and high (ideally infinite) resistance in the other. It conducts current mainly in one way (asymmetric conductance).



Fig. 3.8 Diode [31]

3.3.9 Relay

A relay is a switch that is controlled by electricity. When a separate low-power signal is necessary to operate a circuit or when numerous circuits must be controlled by a single signal, relays are used. Electromagnets that operate as switches make up a conventional and widely used relay.

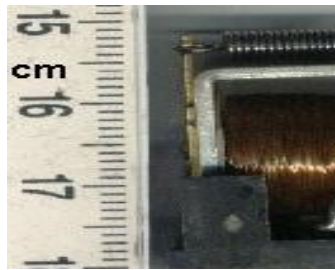


Fig. 3.9 Relay [32]

3.3.10 Buzzer

A buzzer or beeper is a mechanical, electromechanical, or piezoelectric audio signaling device (piezo for short). Alarm clocks, timers, and confirmation of human interference such as a mouse click or keyboard are all common uses for buzzers and beepers.



Fig. 3.10 Buzzer [33]

3.3.11 NPN Transistor ULN2003A

The ULN2003A is a seven-node array of NPN Darlington transistors with a 500-mA, 50-volt output. For switching inductive loads, it has common-cathode flyback diodes. It can be packaged in PDIP, SOIC, SOP, or TSSOP. ULN2002A, ULN2004A, ULQ2003A, and ULQ2004A are all part of the same family and are designed for different logic input levels.



Fig. 3.11 NPN Transistor [34]

3.3.12 Limit Switch

A limit switch is an electromechanical device with an actuator mechanically connected to a set of contacts. The gadget works the contacts to form or break an electrical connection when an object comes into contact with the actuator. Because of their durability, easy visible operations, ease of installation, and operational reliability, limit switches are employed in a wide range of applications and conditions. Because of their robustness, ease of installation, and dependability of operation, limit switches are

utilized in a wide range of applications and settings. Limit switches come in a wide range of body, rotary arm, and operating requirements, as well as environmental concerns such as moisture, pollution, temperature, shock, and vibration.



Fig. 3.12 Limit Switch placed on the helmet

3.3.13 Alcohol Sensor

The MQ3 sensor is one of the most widely utilized in the MQ sensor series. It is a MOS (Metal Oxide Semiconductor) sensor. Because sensing is based on the change in resistance of the sensing material when exposed to alcohol, metal oxide sensors are also known as chemiresistors. Alcohol concentrations can be measured by using it in a simple voltage divider network. The MQ3 alcohol sensor operates at 5V DC and consumes about 800mW. It can detect alcohol concentrations ranging from 25 to 500 parts per million (ppm).

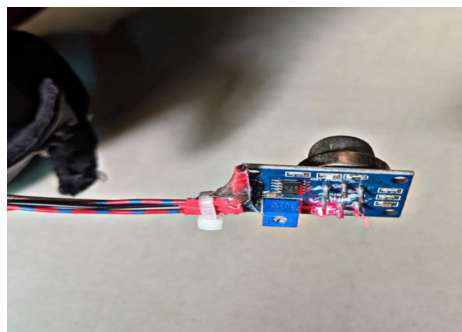


Fig. 3.13 Alcohol Sensor

3.3.14 Decoder HT12D

The HT12D decoder integrated circuit is part of the 212 series of decoders. This family of decoders is mostly utilized in remote control systems, such as burglar alarms, automobile door controllers, and security systems. It's mostly used to connect RF and infrared circuits. They're paired with encoders from the 212 series. The encoder/decoder pair selected should have the same number of addresses and data format.



Fig. 3.14 Decoder HT12D [35]

3.3.15 Encoder HT12E

The HT12E encoder integrated circuit is part of the 212 encoder series. They're used in remote control system applications with the 212 series of decoders. It's mostly used to connect RF and infrared circuits.



Fig. 3.15 Encoder HT12E [36]

3.3.16 FM Transmitter

A low-power FM radio transmitter that broadcasts a signal from a portable audio device (such as an MP3 player) to a regular FM radio is known as an FM transmitter.

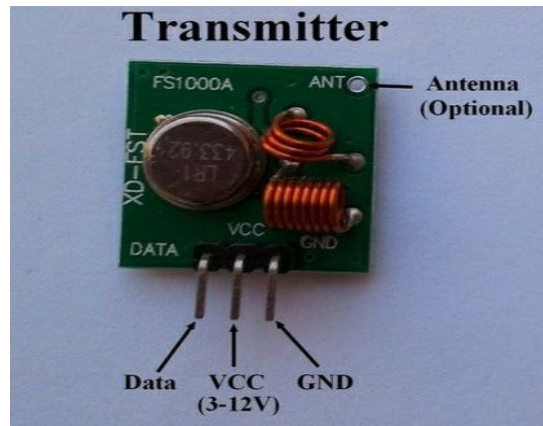


Fig. 3.16 FM Transmitter [37]

3.3.17 FM Receiver

A radio receiver, also known as an FM receiver, is an electronic system that accepts radio waves and changes the data carried by them into usable form. To catch the desired frequency waves, an antenna is used.

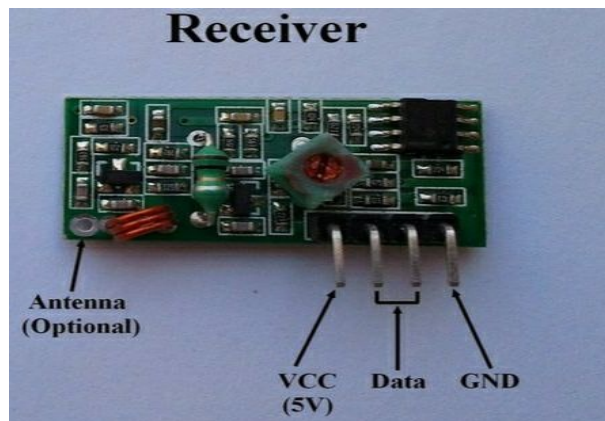


Fig. 3.17 FM Receiver [37]

3.4 Block Diagram

In **Fig. 3.18**, and **Fig. 3.19**, the transmitting and the receiving block diagram are in between bike and helmet have been categorically expressed. Two separated circuits contained of different MCU for different functionalities are utilized in this project in order to get proper wireless support.

In **Fig. 3.18**, MCU PIC16F73 has been used for functional and programming flexibility. The signals from the helmet sensor and the tilt sensor are processed by the MCU, and then sent to the decoder through a transistor. Encoder encodes the signal as per requirement for FM transmitter.

In **Fig. 3.19**, MCU PIC16F876A has been used in the circuit specifically for GSM transmitting and receiving technology as well as Universal Synchronous Asynchronous Receiver Transmitter (USART). Here, the FM receiver receives the transmitted signal from the transmitting circuit. Then decoder decodes the signal and give functional acknowledgement to MCU to act accordingly. A display shows the progress report from time to time. If any error occurs or faulty detection occurs, reset switch resets the overall procedure. There is an alarm for the notifications. GSM 808 is being utilized for transmitting GSM messages containing the results from MCU and combining with the GPS technology via GPS mapping system.

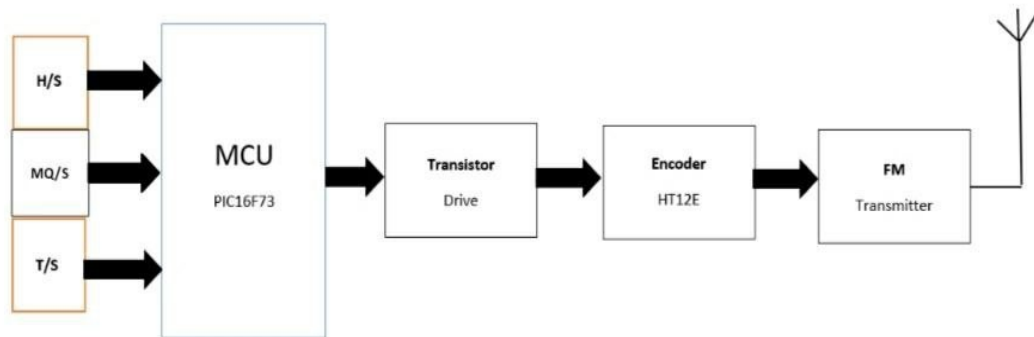


Fig. 3.18 Block Diagram of Transmitting System

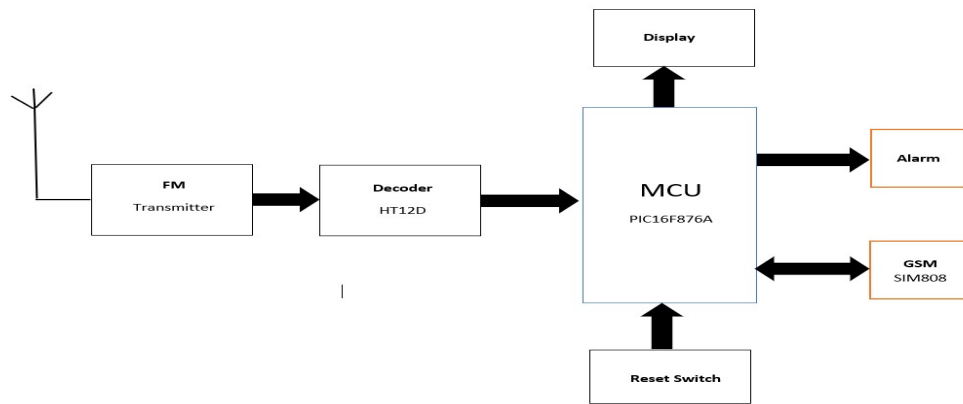


Fig. 3.19 Block Diagram of Receiving System

3.5 Circuit Diagram

In **Fig. 3.20**, when limit switch sensor is pressed through wearing of helmet, a detection for acknowledgement of helmet placement is sent to MCU PIC16F73. After that NPN Transistor drives the acknowledgement to the encoder. Encoder encodes the acknowledgement and transmits to the receiver circuit via FM transmitter. For the tilt sensing acknowledgement, the same procedure is being continued along with limit sensor. After that, FM receiver located in receiving circuit receives the signal and transmit it to the decoder to decode for acknowledgement results. In **Fig. 3.21**, if accident is detected in the result, MCU PIC16F876A acts according to the program and sends a message to selected contacts via SIM808 module with tracking the GPS current location. On the other hand, if decoding the result becomes negative according to the program or alcohol sensor provides negative output, MCU PIC16F876A denies the fact and bike engine will not be started. The sensor MQ-3 for detecting alcohol when it is in high state, there will be no alcohol detected, but when it is in low state then alcohol will be detected. The mercury switch, also known as a tilt switch, is turned off while in the low position and on when in the high position. A reset button is available. The module may be in the hang position if the power connection fails or the GPS signal drops. When this happens, the reset switch clears all states first. Resistors are used in this circuit for biasing purpose. SIM808 module is running with 4V supply. As a result, output will be 4V which runs the whole circuit that causes no need for any regulators.

[illegible]

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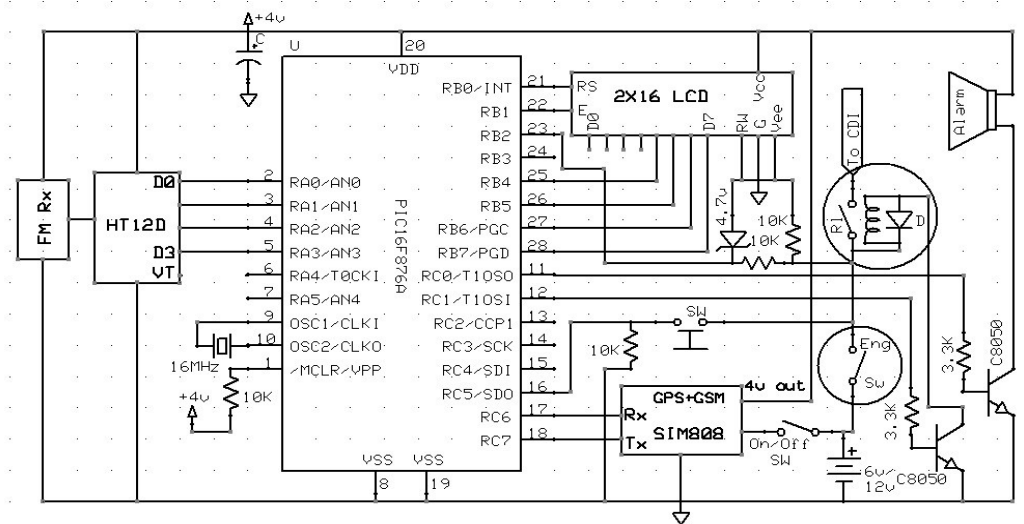


Fig. 3.21 Circuit Diagram of Receiving System

3.6 Summary

This chapter figured the entire circuit diagram of the proposed system, including all of the components. Components are principally various sensors and each has different functionalities on demand of the diagram. The circuit diagram elaborates the procedure of how the system works for the MCU and GPS module in connection with sensors. A flowchart is also given for the purpose of addressing the overall procedure in short. This device has 20 components and is relatively flexible and less expensive. Alternatively, micro and more portable components can be used to turn the gadget into much smaller version if the budget is relaxed and the amount is enhanced.

CHAPTER 4

EXPERIMENTAL IMPLEMENTATION

4.1 Introduction

Implementation of overall gadget is discussed in this chapter which describes executions and procedures of the circuit in two different modes. One is Security mode and another is Accident Detection mode. Diagram has been given in this chapter shows that how implementation in circuit is done with brief.

4.2 Procedure

Here is the experimental implementation of smart gadget for biker's safety:

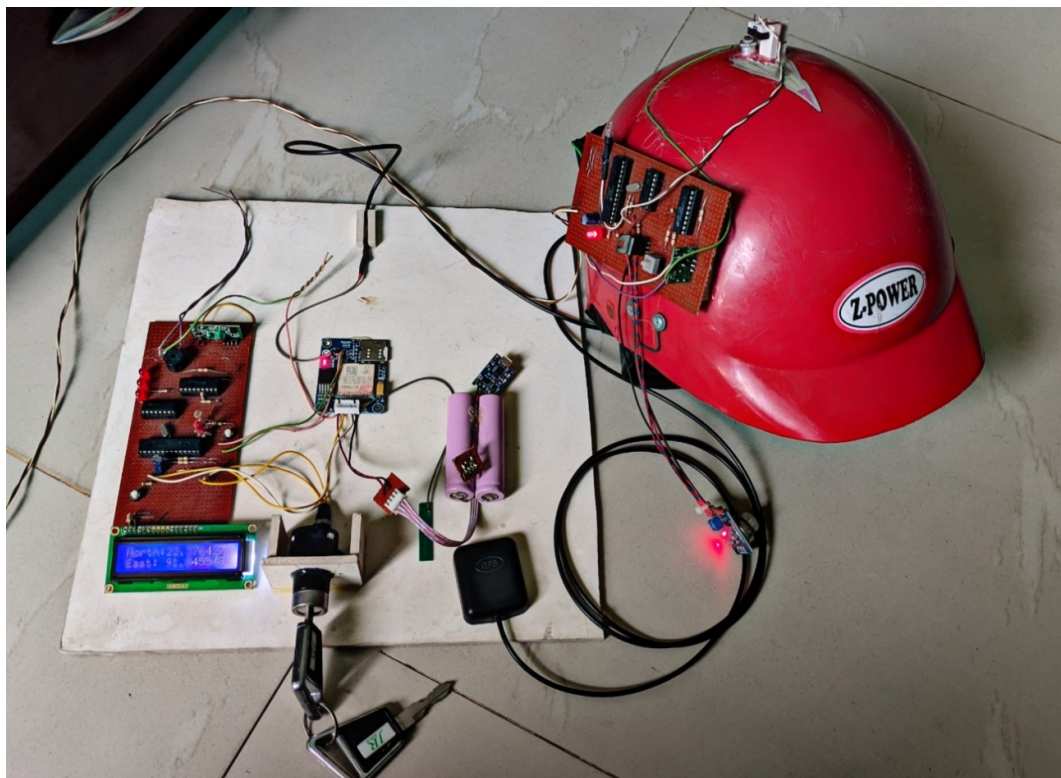


Fig. 4.1 Smart Gadget for Biker's Safety Module

There are two modes in Circuit.

- a) Security Mode
- b) Accident Detection Mode

4.2.1 Security Mode

Fig. 4.2 shows when the vehicle is parked to a certain location, the system will store the current location in memory. GPS will continue to track and send that location contained of longitude and latitude to biker's mobile phone in a second. In general, tracking and sending of location is done both in riding and standby mode. The position tracker via microcontroller continues to send location during the seconds break. When bike is in standby mode and engine is shut down and biker goes to another location on foot, the position tracker will continue the duty. If a thief tries to take away the bike and for somehow do succeed, start of engine notification will be sent to the bikers mobile and position tracking will be continued. In this way, a live scenario of the stolen bike will always be in the biker's mobile device and the biker can take any action based on location. Of course, there might be some location error, but after a few distance, the position will automatically be captured because of calibrated service of authority.

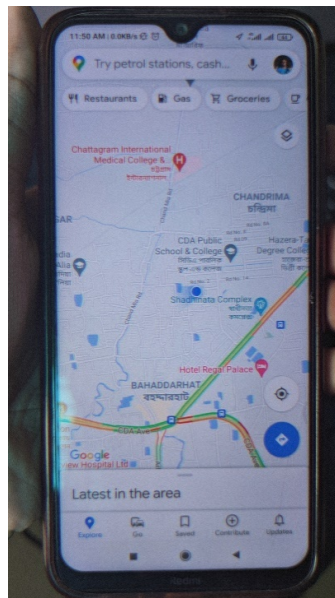


Fig. 4.2 The GPS system on mobile maps.

4.2.2 Accident Detection Mode

The receiving circuit in the smart safety gadget is limited to GSM module and Microcontroller. For detecting the accident, MCU PIC16F876A is used and it is main responsible for the processes done at the receiving circuit. Firstly, while the starting of the engine, MCU will check whether the bike key at the initial position twisted or not. If the engine is successfully started MCU will also check the connection of the helmet as well as biker wears the helmet or not through the limit switch sensor. There are two conditions of letting the MCU approve off whether turn the module on or off. One is the connection of the helmet with the main receiving circuit and another is the placement of the helmet after the connections. FM Transmitting and receiving technology have been used in order to get proper wireless support. Encoder encodes the functional signals of helmet sensor and tilt sensor and sends to the main circuit via FM transmitter. After that, the FM receiver receives that signal and sends to decoder. Decoder decodes the desired signals containing the results from MCU PIC16F73 and sends it to current MCU PIC16F876A. Alcohol sensor attached with receiving circuit checks for any alcohol consumes or not. Any detection of alcohol will also result to not start of bike engine.

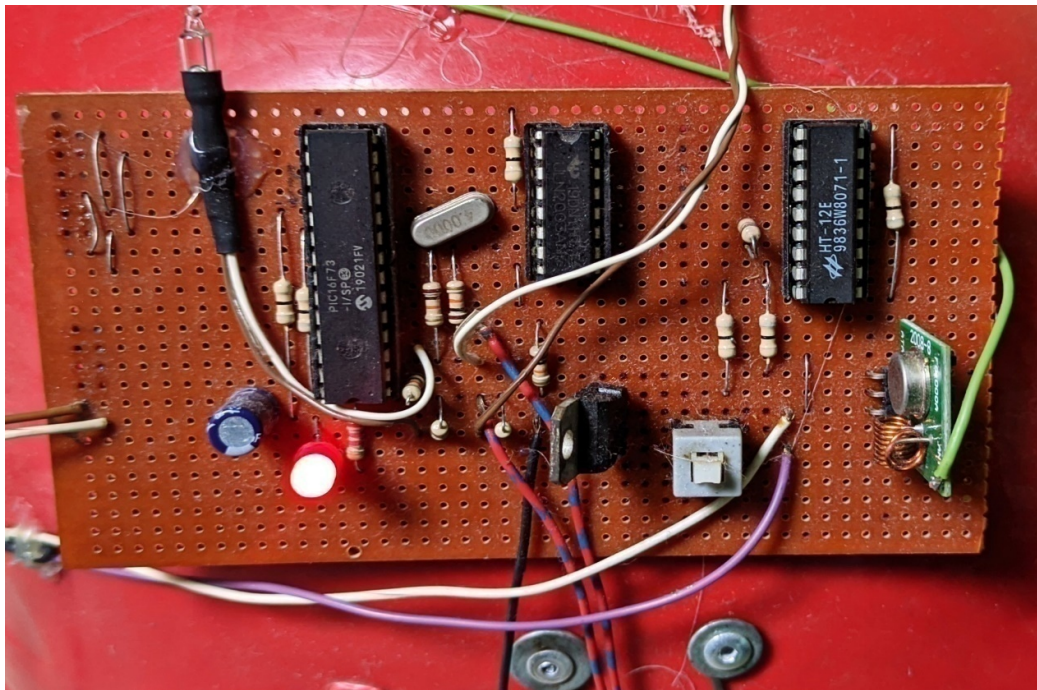


Fig. 4.3 Helmet Circuit.

During the running moment, tilt sensor will continuously be checked by MCU PIC16F73. That is whether tilt sensor is in tilting position or not, which means two points are connected or not in the tilt sensor module with the help of gravity. In this case, if the helmet is totally separated from the head by accident or other reason, the same acknowledgement will still be executed. If for somehow or some reason accident is detected which is not serious or helmet falls apart from the head, there is an option for resetting or cancelling the overall progress which is done by a reset switch additionally attached to the main module. The time period of reset switch is 15sec and after that help message will be sent automatically to emergency contacts including the location address of accident place. The message is contained with a link addressing the longitude and latitude of certain location of the accident happened, which will be displayed via google maps or any browser in any smart phone device.

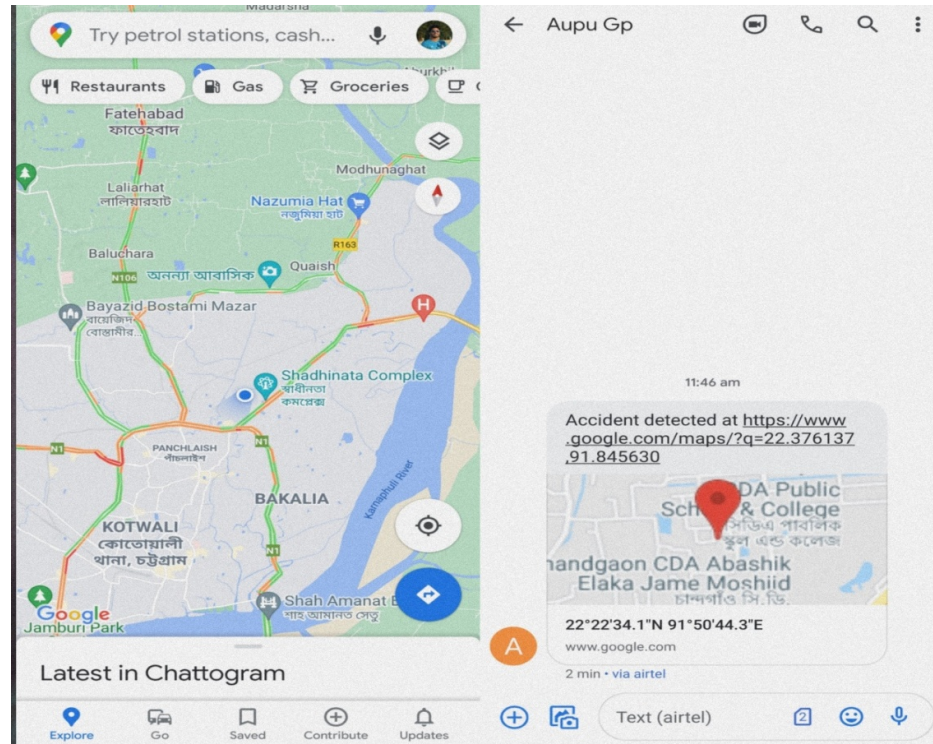


Fig. 4.4 Accident message and location via google maps.

For detecting alcohol, if the driver wears a helmet, a sensor attached along with receiving circuit will sense the measurement of alcohol. If the sensor is in high mode, no alcohol will be detected. If the sensor is in low mode, then alcohol will be detected

and MCU will not let the engine start. The whole module is combined with GSM and GPS technology. MCU processes most of the areas and controls many sensors including the power supply. The Crystal oscillator gives the clock pulses and resistors are placed for biasing the circuit. Two transistors are used for driving fan and buzzer.

4.3 Summary

In this chapter, overall procedure has been discussed with brief. In the principle, connectivity has to be ensured between the main circuit and the helmet circuit so that MCU can read proper data and take steps based on it. Layout design is necessary in order to adjust the helmet circuit in aligned position and also the connections between the helmet circuit and the main circuit. Fan is used to represent the engine start condition and display is used to read and study the output data.

CHAPTER 5

RESULTS AND DISCUSSION

5.1 Introduction

This chapter discusses the overall comparison of this project with previously invented similar modules. Some advantages and disadvantages have been pointed out for the purpose of experiencing real life drawbacks that causes significant limitations that can be covered in future. In this case, future plans have been addressed and executions have to be in line with the current theory.

5.2 Description

Via the GPS technology, identification of accident place has been possible as well as accuracy is well maintained. For identification, GPS antenna has been used and module has to be well calibrated. GSM module is used with a SIM card placed into that and the amount has to be recharged for messaging services. Precaution is taken by forcing of wearing the helmet via limit switch which sends a positive signal to microcontroller that helmet is in the place and bike engine can be started. On the other hand, if sensing of alcohol is done then bike engine will not be started. In this way safety exercises are being done before starting of ride. The tilt sensor, which works by monitoring the tilt at various axes of a reference surface, detects accidents. Tilt sensors are used in a variety of applications to measure the tilting position in relation to gravity. They make it simple to identify angle or orientation. While accident happens, the same scenario is occurred that causes the appropriate detection from tilt sensor. It is placed in the helmet besides the head. Detection is acknowledged by the MCU and then sends a emergency help message via GSM module to the nearest emergency services or specific contacts including GPS position with longitude and latitude for the purpose of fast aid. This requested position can be opened by any smart cell phone through google maps or any browser. There is also an anti-theft feature included with this whole module. It is also done by GPS technology to detect the position of bike via any smart cell phone. If bike got stolen, then GPS will continue to give present live locations with longitude and latitude, at which it will become easier to detect the live location of stolen bike and take necessary steps to prevent the theft.

5.3 Test Results

5.3.1 Alcohol Sensor

Here we have tested our alcohol sensor five times. In test T01, T03, T04, T05 alcohol is successfully detected and it prevents engine from starting. In case of T02 the sensor didn't find any alcohol so the bike's engine started. The test results are given below:

Table 5.1 Alcohol Testing

Test Number	Detection	Engine Lock
T01	YES	YES
T02	NO	NO
T03	YES	YES
T04	YES	YES
T05	YES	YES

5.3.2 Tilt Sensor

Here we have tested tilt sensor for three conditions, while bike is running, in idle position and the helmet is in the hand. The results of the tests are given below:

Table 5.2 Tilt Sensor Testing

Test Points	Number of successful attempts of tilt sensor								
	Bike			Hand			Idle		
	By Faulty Road	By Accident	By looking down	Ideal Position	Tilting Position	Side Arm Position	On Table	On Bike	On Flat Surface
Test Point 01	Detected	Detected	Detected	N	Detected	Detected	N	N	N
Test Point 02	N	Detected	Detected	N	Detected	N	N	Detected	N
Test Point 03	N	Detected	Detected	N	Detected	Detected	N	Detected	N
Test Point 04	N	Detected	N	N	Detected	Detected	N	N	N

5.3.3 Limit Switch

We have tested limit switch/helmet sensor. We can see in T01, T02,T05 for successful helmet detection the engine started. The test results are shown below:

Table 5.3 Limit Switch Testing

Test Number	Helmet Detection	Engine Lock
T01	YES	NO
T02	YES	NO
T03	NO	YES
T04	YES	NO

5.3.4 SIM808 GPS Demonstration

Here we have tested GPS-GSM module and its response time. The results are shown in **Table 5.4**

Table 5.4 SIM808 GPS Demonstration

Demonstration	Syntax	Expected Result	GPS-Detection Duration
Turn on GNSS Power	At+CGNSPWR=1	OK	22 Sec
Turn off GNSS Power	At+CGNSPWR=0	OK	N
Read GNSS navigation	At+CGNSINF	OK	02 Sec
Successfully Sent Messages	At+CGNSURC=0	OK	02 Sec

5.4 Cost Analysis

Here is the cost analysis of the project in **Table 5.5**

Table 5.5 Cost Analysis

No.	Name of Components	Price (BDT)	No.	Name of Components	Price (BDT)
1	GPS/GSM Module	1500	8	Alcohol Sensor	200
2	Antenna	200	9	Limit Switch, Engine Switch	70
3	PIC16F876A	320	10	Zener Diode, Relay	40
4	PIC16F73	120	11	Buzzer, Push Button	25
5	LCD	180	12	PN Transistor	35
6	Crystal Oscillaor	10	13	FM TX, FM RX	200
7	Tilt Sensor	20	14	Encoder, Decoder	200
Total Cost = 3120 BDT					

5.5 Comparative Study

Here we have compared our Smart Helmet with Vehicular Monitoring and Tracking using Raspberry Pi in **Table 5.6**

Table 5.6 Comparative Study

Point of View	Vehicular Monitoring and Tracking using Raspberry Pi	Smart Gadget for Bikers Safety
Wireless Monitoring	YES	YES
Autonomous Detection	YES	YES
Precaution	NO	YES
Accident Detection	YES	YES
Safety Guard	NO	YES
Cost	12500 (BDT)	3120 (BDT)

5.6 Summary

This chapter discussed the principal comparisons of “Smart Gadget for Motorbike Safety” project with the previous projects which in scenarios of current environment had some drawbacks and limitations. As technologies improved, the effectiveness of cost is enhanced. Regarding this situation, minimizing of cost is important in every section of the project so that general individual rating can be minimal and usage can be reached at maximum level. Future works will be covered based on the drawbacks and limitations so that perfection and portability of the project can be reached in industrial level.

CHAPTER 6

CONCLUSION

6.1 Introduction

The Smart Gadget for Motorbike Safety system, which was built with multiple sensors and a GPS/GSM system, is dependable and intends to assist in the prevention, detection, and reporting of accidents, as well as lowering the likelihood of drunk driving instances.

6.2 Conclusion

This smart gadget introduces different sensors with wide range at a very low cost. The primary importance of this system is to prevent the accidents and also wearing helmet is compulsory in this system. So it ensures the safety of the bikers. The most vital point is that if any of the primary safety criteria are broken, the system will prevent the bike from starting. So we are pretty optimistic that this smart helmet will reduce the number of accidents as well as deaths by a large margin.

6.3 Advantages

1. As helmet plays significant role to avoid any collision or damage, compulsion plays vital role to wear helmet at any circumstances.
2. Comparatively cheap sensors are used.
3. GPS technology is much improved now and provides accurate data instantly.
4. Constant monitoring of vehicle through GPS.
5. Wireless connectivity between helmet and bike.

6.4 Limitations

1. Starting of bike would be much more difficult in the helmet gets lost
2. Possibility of not finding GPS network all the time.
3. SIM slot doesn't support nano sim or e-sim.

6.5 Future Work

1. Wireless connectivity could be improved.

2. Additional master key could be included.
3. A small solar panel can be attached.

REFERENCES

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APPENDIX

Rx code

```
'PIC16F876A
Define CLOCK_FREQUENCY = 16
TRISA = 255
TRISB = 4
TRISC = %10100000
RC = 0
Define LCD_BITS = 4
Define LCD_DREG = RB
Define LCD_DBIT = 4
Define LCD_RSREG = RB
Define LCD_RSBIT = 0
Define LCD_EREGL = RB
Define LCD_EBIT = 1
Lcdinit 0
    Lcdcmdout LcdClear
    Lcdout " Welcome to IIUC"
    Lcdcmdout LcdLine2Home
    Lcdout" Dept. of EEE"
    WaitMs8000
    Lcdcmdout LcdClear
    Lcdout "Advd. Gadget for"
    Lcdcmdout LcdLine2Home
    Lcdout "Motorbike Safety"
    WaitMs8000
```

```
Dim ty As Byte
Dim t As Byte
Dim tg As Word
Dim tp As Word
Dim x As Word
Dim y As Word
Dim lit As Byte
Dim tmp As Byte
Dim a As Byte
Dim b As Byte
Dim tm As Word
Dim mt As Byte
Dim wt As Byte
Dim nt(9) As Byte
Dim sth(9) As Byte
Dim nv As Word
Dim sv As Word
Dim nvm As Word
Dim svm As Word
Dim gp As Bit
gp = 0
```

```

Dim mq As Bit
Dim hm As Bit
Dim e1 As Byte
Dim e2 As Byte
Dim e3 As Byte
Dim e4 As Byte
    Lcdcmdout LcdClear
    Lcdout" Please wait"
    WaitMs500
    Hseropen 9600
    WaitMs 20

    Hserout "AT", 13
    Hserinwt
    If a < 2 Then Gotoatd
    Gosub bp

    Lcdcmdout LcdClear
    Lcdout" Module Check"
    Lcdcmdout LcdLine2Home
    Lcdout " Successfull"
    WaitMs 1000

powd:
    Hserout "AT+CGNSPWR=1", 13
    Hserinwt
    Gosub bp
    Lcdcmdout LcdClear
    Lcdout " GPS powerup"
    Lcdcmdout LcdLine2Home
    Lcdout " Successfull"
    WaitMs 1000
    ty = 1

con:
    Gosubgps
    If nt(0) = 50 Then
        If nt(1) = 50 Then
            Lcdcmdout LcdClear
            Lcdout" connected to  "
            Lcdcmdout LcdLine2Home
            Lcdout" Satellite OK "
            Gosub bp
            WaitMs 1000
            ty = 1
            Goto set
        Endif
    Endif
    Lcdcmdout LcdClear
    Lcdout "Waiting for GPS"
    Lcdcmdout LcdLine2Home

```

```

    Lcdout " Satellite,@ ", #ty
    ty = ty + 1
    WaitMs 3000
    If ty > 30 Then Gotolll
Goto con

```

```

set:
    Lcdcmdout LcdClear
    Lcdout" Pls set GPS"
    Lcdcmdout LcdLine2Home
    Lcdout " location =>", #ty
    WaitMs 1000

```

```

    Gosubgps
    Gosubvw
    For n1 = 0 To 500
        WaitMs 40
        If RC5 Then Gotost
    Next n1
    If ty > 5 Then Gotost
    ty = ty + 1
Goto set

```

```

st:
    Gosub get
    nvm = nv
    svm = sv
    Gosub bp
    Lcdcmdout LcdClear
    Lcdout" GPS location"
    Lcdcmdout LcdLine2Home
    Lcdout" set success"
    WaitMs 3000

```

```

lll:
    Dim vb As Bit
    Dim ah As Bit
    Dim ll As Bit
    Dim eh As Bit
    ah = 0
    ll = 0
    eh = 0
    Gosub bp

```

```

main:
    RC0 = 0
    Gosub ds
    vb = 0
    a = 0
    While RB2 = 0
        If a = 0 Then Gosub ds
        If a = 35 Then

```

```

        Gosubgps
        Gosubvw
    Endif
    a = a + 1
    If a > 80 Then a = 0
    WaitMs 100
    If RC5 Then
        vb = 1
        Gosubgps
        Goto msg
    Endif
    Gosubadc
    If ll = 0 Then Gosubchk
Wend

```

nohm:

```

    If RB2 = 0 Then Goto main
    Gosub in
    If tp = 0 Then '-----Helmet of
        Lcdcmdout LcdClear
        Lcdout " No helmet"
        Lcdcmdout LcdLine2Home
        Lcdout " detected "
    Endif

```

```

    While tp = 0
        Gosub in
        If RB2 = 0 Then Goto main
        WaitMs 100
    Wend

```

```

    While tp = 9
        WaitMs 50
        If RB2 = 0 Then Goto main
        Gosub in
    Wend
    If RB2 = 0 Then Goto main
    If tp = 0 Then Goto nohm

```

gf:

```

    WaitMs 200
    Gosub in
    If tp = 5 Then '-----Helmet not on head
        Lcdcmdout LcdClear
        Lcdout " Pls wear your"
        Lcdcmdout LcdLine2Home
        Lcdout " helmet "
    Endif
    While tp = 5
        Gosub in
        If RB2 = 0 Then Goto main
        WaitMs 100
    Wend

```

```

Wend
While tp = 9
    WaitMs 50
    If RB2 = 0 Then Goto main
    Gosub in
Wend
If tp = 0 Then Gotonohm
If RB2 = 0 Then Goto main
If tp = 5 Then Gotogf '+++++++++++++++++++++++
alc:
If tp = 3 Then '-----Alcohol
    Lcdcmdout LcdClear
    Lcdout "Biker is drunken "
    Lcdcmdout LcdLine2Home
    Lcdout" Pls wait !!"
Endif
While tp = 3
    Gosub in
    If RB2 = 0 Then Goto main
    WaitMs 1000
    Gosub bp
Wend
While tp = 9
    WaitMs 50
    If RB2 = 0 Then Goto main
    Gosub in
Wend
If RB2 = 0 Then Goto main
If tp = 0 Then Gotonohm
If tp = 3 Then Gotoalc
If tp = 4 Then Goto run
Goto main
End

run:
e1 = 0
e2 = 0
e3 = 0
e4 = 0
RC1 = 1
Lcdcmdout LcdClear
Lcdout" Smart Gadget"
Lcdcmdout LcdLine2Home
Lcdout "Bike is running"
While RB2
    WaitMs 100
    Gosub in

    If tp = 9 Then
        e1 = 0
        e4 = e4 + 1
    Else

```

```

        e4 = 0
    Endif

    If tp = 0 Then
        e2 = e2 + 1
        If e2 > 7 Then Goto acc
    Else
        e2 = 0
    Endif

    If tp = 5 Then
        e3 = e3 + 1
        If e3 > 7 Then Goto acc
    Endif
    If tp = 7 Then Goto acc
    If tp = 4 Then
        e2 = 0
        e3 = 0
    Endif
Wend
RC1 = 0
Goto main

```

```

acc:
    RC1 = 0
    Lcdcmdout LcdClear
    Lcdout "Accident alert !"
    Lcdcmdout LcdLine2Home
    Lcdout " Need help ? ", #tp

```

```

    For a = 0 To 14
        If RC5 Then Gotos
        WaitMs 1000
    Next a
    RC0 = 1
    For a = 0 To 8
        nt(a) = 48
    Next a
    For a = 0 To 8
        sth(a) = 48
    Next a
    nt(2) = 46
    sth(2) = 46

```

```

    Gosubgps
    Gosub msg
    Gosubvw
    WaitMs 2000
    Lcdcmdout LcdClear
    Lcdout "Accident detectd"
    Lcdcmdout LcdLine2Home
    Lcdout " pls help"

```

```

While RC5 = 0
Wend
rs:
RC0 = 0
Lcdcmdout LcdClear
Lcdout" System reset"
Lcdcmdout LcdLine2Home
WaitMs 3000
While RC5 = 1
Wend
WaitMs 100
Goto main

```

```

chk:
Gosub get
If nv>nvm Then
    x = nv - nvm
Else
    x = nvm - nv
Endif
If x > 1000 Then
    ll = 1
    vb = 1
    Goto msg
Endif

If sv>svm Then
    x = sv - svm
Else
    x = svm - sv
Endif
If x > 1000 Then
    ll = 1
    vb = 1
    Goto msg
Endif

```

Return

```

get:
a = nt(5) - 48
nv = a
nv = nv * 10
a = nt(6) - 48
nv = nv + a
nv = nv * 10
a = nt(7) - 48
nv = nv + a
a = nt(8) - 48
nv = nv * 10
nv = nv + a

```

```

a = sth(5) - 48
sv = a
sv = sv * 10
a = sth(6) - 48
sv = sv + a
sv = sv * 10
a = sth(7) - 48
sv = sv + a
a = sth(8) - 48
sv = sv * 10
sv = sv + a

```

Return

in:

```

WaitMs 100
tp = RA
If tp = 15 Then tp = 0

```

Return

bp:

```

RC0 = 1
WaitMs 70
RC0 = 0

```

Return

ds:

```

Lcdcmdout LcdClear
Lcdout "Advd. Gadget for"
Lcdcmdout LcdLine2Home
Lcdout "Motorbike Safety"

```

Return

gps:

```

Hserout "AT+CGNSINF", 13

```

Return

vw:

```

Lcdcmdout LcdClear
Lcdout "North:"
For a = 0 To 8
    b = nt(a)
    Lcdoutnt(a)
Next a

Lcdcmdout LcdLine2Home
Lcdout "East: "
For a = 0 To 8
    b = sth(a)
    Lcdoutsth(a)
Next a

```

Return

msg:

```
Lcdcmdout LcdClear  
Lcdout " Sending message"  
Lcdcmdout LcdLine2Home  
WaitMs 300
```

```
Hserout "AT+CMGF=1", 13
```

```
Hserout "AT+CMGS=", 34, "01660108411", 34, 13
```

```
If eh Then Hserout "I am in danger, please send help. It is at https://www.google.com/maps/?q=",  
#nt(0), #nt(1), nt(2), #nt(3), #nt(4), #nt(5), #nt(6), #nt(7), #nt(8), ",", #sth(0), #sth(1), sth(2), #sth(3),  
#sth(4), #sth(5), #sth(6), #sth(7), #sth(8), 26
```

```
If ah Then Hserout "Accident detected at https://www.google.com/maps/?q=", #nt(0), #nt(1), nt(2),  
#nt(3), #nt(4), #nt(5), #nt(6), #nt(7), #nt(8), ",", #sth(0), #sth(1), sth(2), #sth(3), #sth(4), #sth(5), #sth(6),  
#sth(7), #sth(8), 26
```

```
If vb Then Hserout "Bike may be stolen. location - https://www.google.com/maps/?q=", #nt(0),  
#nt(1), nt(2), #nt(3), #nt(4), #nt(5), #nt(6), #nt(7), #nt(8), ",", #sth(0), #sth(1), sth(2), #sth(3), #sth(4),  
#sth(5), #sth(6), #sth(7), #sth(8), 26
```

```
Lcdout " Message sent"  
WaitMs 3000
```

```
RC0 = 1  
Lcdcmdout LcdClear  
Lcdout " Plz reset the"  
Lcdcmdout LcdLine2Home  
Lcdout" the system"  
While RC5 = 0  
Wend  
RC0 = 0
```

```
LcdcmdoutLcdClear  
Lcdout " Plz switch off"  
Lcdcmdout LcdLine2Home  
Lcdout" the engine"
```

```
While RB2  
Wend
```

```
WaitMs 100  
Gosub bp
```

Goto main

Return

Tx code

```
'PIC16F73
Define CLOCK_FREQUENCY = 4
TRISA = 255
TRISB = 0
TRISC = %01000000
RC = 0

Dim mq As Bit
Dim hm As Bit
Dim tl As Bit
Dim a As Byte
Dim b As Byte
Dim x As Byte
x = 0

main:
    If RA0 Then
        hm = 1
    Else
        hm = 0
    Endif

    If RA2 = 0 Then
        mq = 1
    Else
        mq = 0
    Endif

    If RA1 = 0 Then
        tl = 0
    Else
        tl = 1
    Endif
    If hm Then
        If tl = 0 Then
            If mq Then
                a = 6
            Else
                a = 8
            Endif
        Else
            If mq Then
                a = 12
            Else
                a = 11
            Endif
        Endif
    Else
        a = 10
    Endif
```

```
RC = a
WaitMs 300
Goto main
```