

# NEXT-GEN HELMET

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**Abstract:** In the last few decades, there have been numerous road accidents due to two-wheelers. The main cause of such accidents are over-speeding, drunken driving and reckless driving. The objective of this project is to design a low-cost intelligent helmet capable of identifying alcohol consumption and preventing road accidents. Considering the increasing number of motor cycle riders in the country and with the number of accidents higher still, the importance of wearing helmet and that of immediate aid is evident. In this paper, we propose building a system that can be implemented on a bike which works with the helmet for the safety of the rider. It incorporates motion sensors, alcohol sensors, GSM, GPS, LEDs and Bluetooth to provide safety, comfort and assistance. When the helmet is worn, the alcohol sensor checks the threshold alcohol level and ensures that the rider is capable of riding the vehicle. Otherwise, it doesn't start the system at all. In case of accidents, a message will be sent automatically to emergency contacts with their current location. It thus reduces the fatality of accidents as numerous lives can be saved if emergency medical services reach accident scenes in time.

**Keywords:** Smart Helmet, Road safety, Prevention of Drunk Driving, Accident Prevention, Sensors, Accident Location, GSM, GPS

## INTRODUCTION

Riding a vehicle in a busy road comes with its risk. In fact, one can never predict when and where an accident might occur and when it does, immediate aid to the rider and pillion involved can make the difference between life and death.

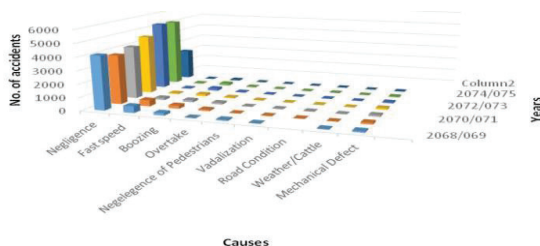


Fig. 1. Causes of road traffic accidents(RTA)

Source: Police Headquarters, Operation Department, Traffic Directorate ,Naxal, Kathmandu

There are many reasons of RTA in Nepal. Negligence of the driver, fast pace, consumption of alcohol during driving and before driving[1],no helmet riding,etc.To reduce the risk and impact of such accidents, the Next-Gen Helmet has been proposed and invented.While helmets are in themselves a protective casing, the smart helmet fulfills two more objectives in favor of the rider. Before starting the vehicle, it checks whether the helmet has been worn and secured in place by wearing the belt. In case of an accident, an auto-generated message containing the exact location of the accident is sent to emergency contacts using GPS and GSM modules. The interfacing of the components is done in Arduino Uno. While some people may shudder at the advance of technology, others see it as a convenience and advance in rider safety that will give them more freedom and a sense of responsibility.

## LITERATURE REVIEW

Road accidents make the news on a regular basis. A total of 105 people lost their lives to road accidents in Kathmandu Valley in the first six months of the current fiscal year 2017/18. According to RSS, National News Agency, of them, 59 deaths were related to two-wheeler accidents, and 35 accidents included pedestrians. The Division's statistics of the past three consecutive years showed that deaths from traffic accidents have been on an increasing trend.[2] Along with the easy financing facilities for two-wheelers in the country and ease of traffic and parking, the demand for two-wheelers has increased manifolds in the Nepali market. As per records with Metropolitan Traffic Police Division, a total of 46,349 road accidents were recorded in the last five years inside the valley. Of the total road accidents, two-wheelers were involved in 26,184 accidents, approximately 56.49 per cent. As of May 14 of the current fiscal year, 211 people have died in road accidents in the Valley; 95 people were either two-wheeler riders or pillions. The division says many pillion riders would not have

died if only they were wearing helmets at the time of the accident. [3]

The NEXT-GEN Helmet is a smart helmet that works in two phases: before starting of the vehicle and immediately after an accident occurs. Some of its features are an LED light on the back of the helmet which can flash presumably to make the rider more visible at night; a sensor that detects a crash and alerts friends with GPS co-ordinates of the incident using GSM; an adjustable speed alert; and when the helmet is taken off, it records where the bike is parked on a GPS map. An accident is detected by the vibration sensor and the gyro sensor. These sensors check the axis change of the helmet and use this information to flag the nearest emergency center. It has the looks of any normal helmet but has various functionalities. Every component used is relatively small in size and can thus fit easily inside the helmet.

Two systems are incorporated in the making of this smart helmet. The first system is fitted into the helmet itself, while the second will be attached to the bike. HC05 Bluetooth Module is used to communicate between the two systems. Bluetooth protocol is an affordable communication method in PAN network, with a maximum data rate of 1Mb/S, working in a nominal range of 100 meters using 2.4 G frequency. HC05 Bluetooth module has a working voltage of 3.6V – 5V; internal antenna and automatic connection to the last device. [4]

The components used in the systems are interfaced in Arduino. Arduino is an open-source platform used for building electronics projects. Arduino consists of both a physical programmable circuit board (often referred to as a microcontroller) and a piece of software, or IDE (Integrated Development Environment) that runs on the computer, used to write and upload computer code to the physical board. It uses a simplified version of C++, making it easier to learn to program. Arduino can interact with buttons, LEDs, motors, speakers, GPS units, cameras, the internet, etc. [5] Many accidents have occurred and still continue to occur because of rash and drunken driving. The alcohol sensor checks the alcohol limit in the breath of the rider and even restricts the start of the bike in case of a drunken rider. Likewise, the GPS system installed within not only helps to navigate directions of the vehicle to the rider, but also forwards the rider's exact location in case of accidents. To do this, GSM module sends the data via message to police stations, hospitals and emergency contacts. Thus, the rider can get the required aid as soon as possible.

#### METHODOLOGY

An alcohol sensor inside the helmet checks the threshold alcohol level and ensures that the rider is capable of riding the vehicle. The alcohol sensor

estimates the blood alcohol content (BAC) from a breath sample. To encourage wearing a helmet and securing it in place, switches are placed inside (detecting presence of rider) and on the belt of the helmet. For the vehicle to run, the alcohol range, belt and switch has to be in place. This involves passing of information as binary codes from one Bluetooth in the helmet to another in the two-wheeler. The switches send either 0 or 1, while alcohol sensor sends a higher value according to the range set in its module. Based on these values, the system detects whether all three conditions are fulfilled or not.

Other features include GSM, GPS, and Bluetooth. During the ride, in case of an accident, sensors like vibration sensor and gyroscope sensor detect it and using GPS and GSM, send the exact location of the accident to emergency contacts via text. The GPS system installed within thus not only helps to navigate directions of the vehicle to the rider, but also forwards the rider's exact location in case of accidents.

Li-ion battery is kept in the helmet part within the component box. That battery is chargeable and can be charged by regular mobile charger. Two 3.7 li-ion battery in series = 7.4 volt is passed through 7805 voltage regulator when converts into 5 volt suitable for the Arduino chip. Capacitors are kept to store the extra flowout charges.

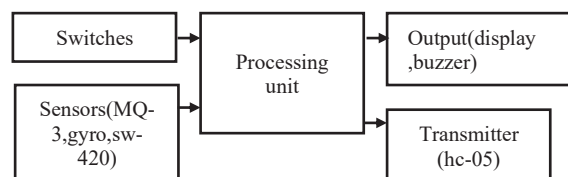


Fig.2. Block diagram of helmet part

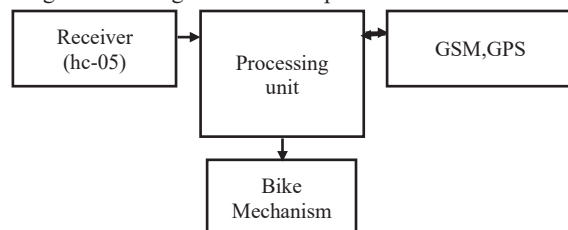


Fig.3. Block diagram of Bike part

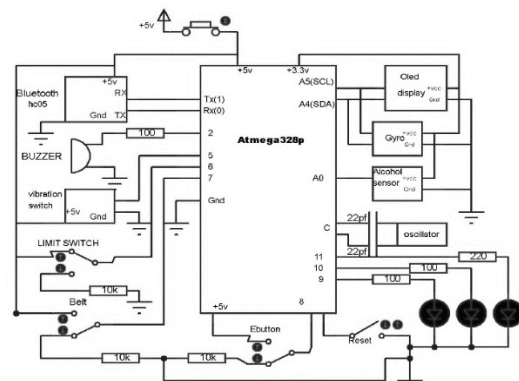


Fig.4. Circuit diagram of helmet part

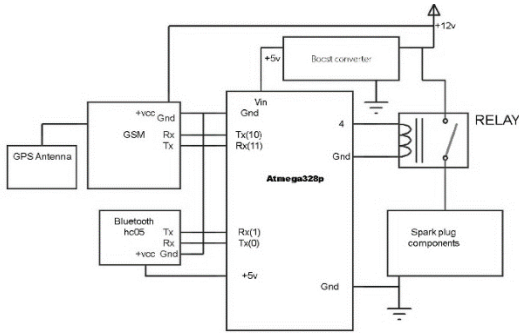


Fig.5.Circuit diagram of bike part

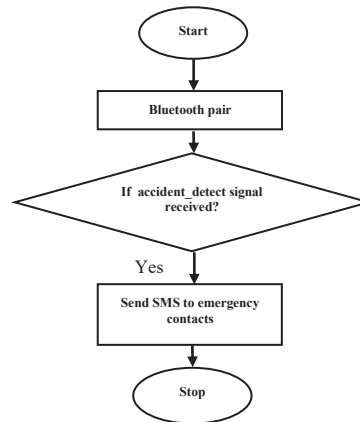


Fig.8.Flowchart of app part

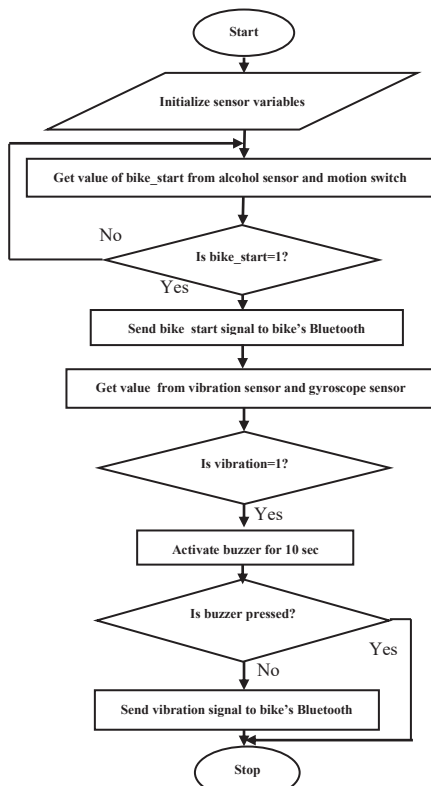


Fig.6.flowchart of helmet part

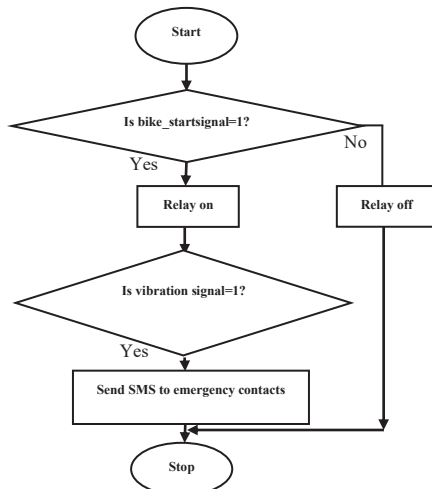


Fig.7.flowchart of bike part

### COMPONENTS

This paper on “Next Gen Helmet” basically stands upon the following main components:

#### 1.Arduino:

The Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller[14].ATmega328P consists of 28 pins can be separately operated providing an oscillator.

#### 2.MPU6050 Sensor Module:

MPU6050 sensor is 6-axis Motion Tracking Device.It combines 3-axis Gyroscope, 3-axis Accelerometer and temperature sensor and uses I2C protocol.

#### 3.MQ3 Alcohol Sensor:

Alcohol sensor is used for detecting sensitive analog output of alcohol concentration on our breath, just like common breathalyzer.

#### 4.SIM 808 GSM/GPRS Module:

It supports GSM/GPRS Quad-Band network and combines GPS technology for satellite navigation. It has high GPS receive sensitivity with 22 tracking and 66 acquisition receiver channels[13]. Used for emergency sms during accident.

#### 5.HC-05 Bluetooth Module:

HC-05 Bluetooth Module is an easy to use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup.It provides switching mode between master and slave mode [4]which means it is able to transfer data between helmet and bike. It uses the 2.45GHz frequency band and maximum range is 10 meters.

**RESULT AND DISCUSSION**

All the circuits were designed and fabricated in lab using PCB wizard and proteus. After the circuits were completed, all the components were assembled and then the testing of each components and of the whole system was carried out thoroughly & successfully.

The serial data from all the sensor was successfully recorded and analyzed. These analyzed data were transmitted wirelessly between bike and helmet module through HC-05 Bluetooth module in master slave configuration.

Thus, the testing phase was completed successfully. The test was carried out for each component separately and for whole bike and helmet system. The helmet module sensed the presence of rider using limit switch, amount of alcohol consumed using MQ3 alcohol sensor and if the helmet strap is locked or not before starting the bike. It also detected the accidents of the riders using vibration and gyro sensor and through GSM and GPRS module it sends an emergency message to the registered number along with the location of accident in form of google map.

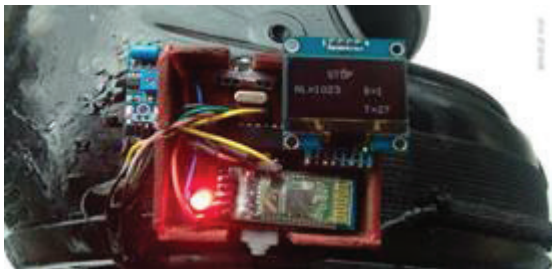


Fig.9.Helmet part circuit

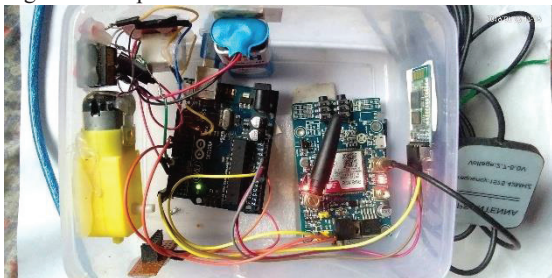


Fig.10.Components of bike part

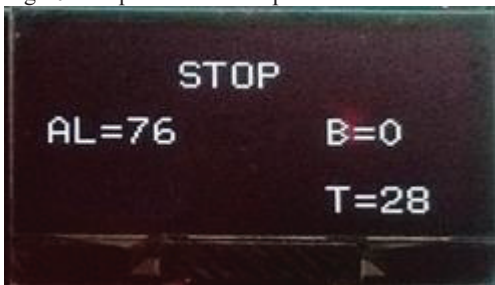


Fig.11.Shows condition when helmet is not worn and bike is in stop state,

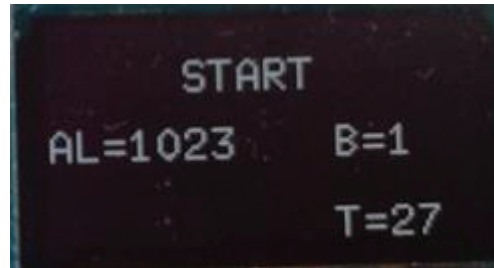


Fig.12.Shows condition when human presence is detected with wearing of belt.

In Fig 10 and 11,the words represents:

AL=Alcohol level

B=Belt state

T=Temperature of surrounding

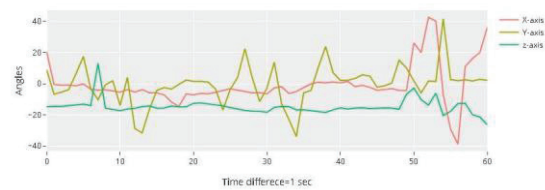


Fig.13.Graph of data of gyroscope sensor during normal condition of bike.

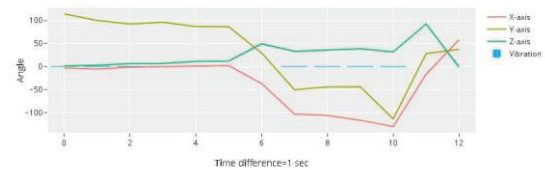


Fig.14.Graph of data of gyroscope and vibration sensor during normal condition of bike

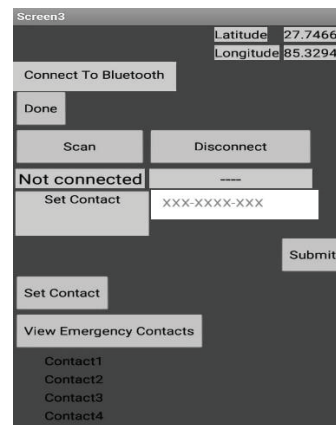


Fig.15.screen of android app.

In app, emergency contacts were saved ,mobile gps showed location at top, so when Bluetooth was paired with helmet and received emergency signal,message was sent.

TABLE 1. Comparison table between this paper and other similar papers.

S\ N.	Fields	Other papers	This paper
1.	Communication type	-RF[7][8] [9][12] -nRF24L01 [10]	Bluetooth (hc-05)
2.	Processor type used	Arduino Uno[12]	Atmega328 (chip only)
3.	App used	No	Yes
4.	Size of helmet part	Bulky with large modules [8][11][12]	Compact in single circuit(5.5*5*2 cm)

### CONCLUSION

Nowadays the number of road accidents is increasing day by day. Many motorcycle accidents lead to fatalities. The severities of these accidents are increased because of not wearing a helmet; the consumption of alcohol while riding; lack of immediate aid. In this project we pursue to prevent, if not minimize the severities of these accidents. This project also emphasizes on making the riders self-aware and promote safe driving habits. From checking whether the rider is wearing a helmet and its strap to ensuring the system doesn't start for a drunken rider, a sense of responsibility and awareness is retained before the ride. The system also sends an emergency SOS message of whereabouts of the injured person to their relative or nearest hospital and police station. By implementing this system, a safer and much more secure two-wheeler journey is possible.

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