

# Smart Interactive Headgear

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**ABSTRACT:** In India the usage of two wheelers is more when compared to four wheelers, it requires more attention as far as safety is concerned and a important problem is bikers suffer from inadequate roads and bad driving conditions. Other important problem is that most of the time they don't wear helmet which could be fatal when accidents happen. If rider runs into a blind spot at an intersection or path hole in the road, he can activate the microphone by pressing a button and then record bad road condition or big dangerous hole. With GPS technology installed in helmet, it will then detect when the rider is travelling near those spots another day and turns on the recorded audio when he is at distance of 10 meters from the hazard to alert him and other rider passing in the same road wearing smart headgear. The rider could also record anything that he is interested like favourite malls, food joints etc... for remembrance. The recorded audio files will be available in the dashboard graphical display and the rider has the option to delete it any time and he can also transfer those locations to his smartphones and use his favourite maps for reaching the previously recorded destination, and the main feature is, bike engine starts only when helmet is brought near to bike which gives additional protection from theft.

## I. INTRODUCTION

People prefer motorcycles over car as it is much cheaper to run, easier to repair, easier to park and flexible in traffic. One third of all those who died in road accidents could have survived if they had worn a helmet. Studies shows that usage of helmet can save accident death by 30 to 40 percent. The rate at which number of two wheelers in India is rising is 20 times the rate at which human population is growing. According to statistics serious head injuries can happen even in low speeds. Ninety percent of head injury cases are due to road traffic accidents, about 72 percent are youngsters in the age group of 18 to 40. At least three young men using two wheelers die every ten minutes in India due to head injury. For a young Indian chance of being killed or

disabled by road traffic injury is higher than HIV, heart attack or cancer.

## II. OVERVIEW OF SYSTEM

Helmet unit is capable of recording human speech using the built-in microphones and saves it as audio files. The recording process is started and stopped with a simple push button fitted on the helmet that runs on a microphone. For instance, if rider runs into a blind spot at an intersection path hole in the road, he can activate the microphone by pressing this button and then record slippery surface, dangerous hole etc... With GPS technology installed helmet will then detect when the rider is travelling near those spots another day and turns on the recorded audio. Of course the rider could also record anything that he is interested like favourite shops, food malls to remind him again. The recorded audio files will be available in the dashboard graphical display and the rider has the option to delete it at any time. The helmet unit has wireless communication capability so that biker would be warned when the bike is started without wearing helmet. The rider should bring the helmet within 100cm of dash board for helmet presence authentication. Although this is simple authentication it could act like an object password and gives additional protection from theft.

## III. TROUBLES

One important problem is that bike riders suffer from inadequate roads and bad driving conditions. Other important problem with bikers is that most of the time they don't like to wear helmet which could be fatal when accidents happen. If rider runs into a blind spot at an intersection or path hole in the road, it would be a problem.

## IV. SMART HEAD GEAR

To overcome this flaw, we have designed a SMART HEAD GEAR. Which helps the rider to know, the problems through the course of his drive. If rider travels

across a bad road or finds a pot hole, he can activate the microphone by pressing a button and then record his comment. With GPS technology installed in helmet, it will then detect when the rider is travelling near those spots another day and turns on the recorded audio when he is at distance of 10 meters from the hazard to alert him. The rider can send the location to the cloud so that other smart head gear users can make use of it and know the faulty road conditions.

The rider could also record anything that he is interested like favourite shops, food joints, and shopping malls to remind him again. The recorded audio files will be available in the dashboard graphical display and the rider has the option to delete it any time and he can also transfer those locations to his smartphones and use his favourite maps for reaching the previously recorded destination, and also bike engine starts only when helmet is brought near to bike.

Similarly if the rider meets with an accident, the helmet will find the location of the rider and send it to the SOS number that the rider has stored in his mobile phone along with the video which has been recorded while riding before the accident took place so that the reason for accident can be figured or the vehicle which caused the accident can be easily found out and head gear uses this camera which takes snaps of required places and favourite spots on single click, and stores them in micro-sd card attached along with the head gear.

## V. CONSTRUCTION

### PARTS LIST

- 1) ARM Cortex- M3 ,
- 2) Graphics LCD,
- 3) Audio decoder,
- 4) ADC
- 5) Bluetooth module(hc-05),
- 6) microphone,
- 7) micro SD
- 8) IEEE 802.15.4/transceiver,
- 9) GPS module.
- 10) Vibration sensor

### PARTS DESCRIPTION:

#### 1) THE ARM® CORTEX®-M3 PROCESSOR

It's the industry-leading 32-bit processor for highly deterministic real-time applications, specifically developed to enable partners to develop high-performance low-cost platforms for a broad range of devices including microcontrollers, automotive body systems, industrial control systems and wireless networking and sensors.

#### Why we choose The ARM® Cortex®-M3 processor:

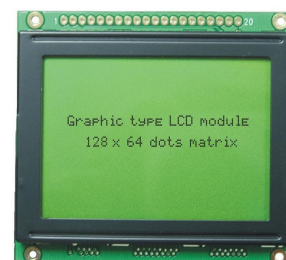
- The processor delivers outstanding computational performance
- The processor is highly configurable enabling a wide range of implementations Designed for efficient embedded system.
- Very easy to use, most applications can be programmed completely in C or any high level language.
- Scalable architecture supporting ultra-low power sensors to high performance controllers.

#### 2) AUDIO DECODER

It is device or program capable of coding or decoding digital data stream. It can decode multiple formats such as MP3, AAC, WMA, FLAC, WAV, and MIDI. It uses SPI protocol to interface with LPC1300. It is used to control volume, bass and treble. Its features includes low power operation, high quality on-chip stereo DAC,

#### 3) GRAPHICS LCD DISPLAY

Graphics LCD used in this project is PCD8544. It is a low power CMOS LCD controller/driver which is designed to drive a graphic display of 48 rows and 84 columns. All necessary functions for display are available in single chip generation of LCD supply and bias voltage that results in a minimum of external components and low power consumption. PCD8544 is manufactured in n-well CMOSCAN controller MCP2515. Logic supply voltage range VDD to VSS is 2.7 to 3.3V. Display supply voltage range VLCD to VSS is 6.0 to 8.5V with LCD voltage internally generated and 6.0 to 9.0V with LCD voltage externally supplied.



#### 4) IEEE 802.15.4

Network IEEE standard 802.15.4 intends to offer the fundamental lower network layers of a type of wireless personal area network which focuses on low cost, low speed ubiquitous communication between devices. The basic framework conceives a 10 meter communication range with transfer rate of 250 kb/s. Trade-offs are possible to favour more requirements through the definition of not one, but several physical layers. Lower transfer rates of 20 and 40 kb/s were initially defined with 100kb/s rate being added in the current revision. Even lower rates can be considered with the resulting effect on power consumption. The main identifying feature of IEEE 802.15.4 among WPANs is the importance of achieving extremely low manufacturing and operation costs and technological simplicity without sacrificing flexibility or generality

#### 5) VIBRATION\_SENSOR

A piezoelectric sensor is a device that uses the piezoelectric effect, to measure changes in pressure, acceleration, temperature, strain, or force by converting them to an electrical charge. The Minisense 100 is a low-cost cantilever-type vibration sensor loaded by a mass to offer high Sensitivity at low frequencies. The pins are designed for easy installation and are Solderable. Horizontal and vertical mounting options are offered as well as a reduced Height version. The active sensor area is shielded for improved RFI/EMI rejection. Rugged, flexible PVDF sensing element withstands high shock overload. Sensor has excellent Linearity and dynamic range, and may be used for detecting either continuous vibration or impacts.

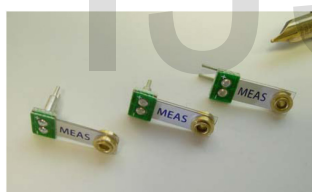


Fig.3. Vibration Sensors

#### 6) GPS MODULE

The FGPMOPA6B is an ultra-compact POT (Patch on Top) GPS Module. This POT GPS Receiver provides a solution that is high in position and speed accuracy performances, with high Sensitivity and tracking capabilities in urban conditions. The GPS chipset inside the module is powered by Mediate Inc., the world's leading digital media solution provider and the largest Fab-less IC Company in Taiwan. The module can support up to 66 channels, and is designed for Small-form factor device.

It is suitable for every GPS-related application, such as:

- \_ Fleet Management/Asset Tracking
- \_ LBS (location base service) and AVL system
- \_ Security system
- \_ Hand-held device for personal positioning and travel navigation

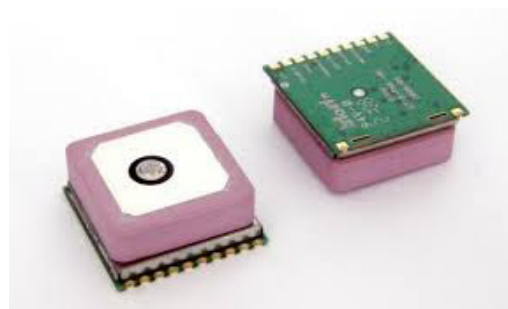


Fig.4.GPS-Module

#### 7) HC-05

It is a class-2 Bluetooth module with Serial Port Profile, which can configure as either Master or slave. a Drop-in replacement for wired serial connections, transparent usage. You can use it simply for a serial port replacement to establish connection between MCU and other devices

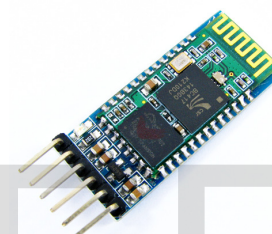


Fig.5. Bluetooth-Module

#### 8) ADC

An ADC is defined by the range of frequencies it can measure and how accurately it can measure a signal relative to the noise it introduces. The actual bandwidth of an ADC is characterized primarily by its sampling rate and to a lesser extent by how it handles errors such as aliasing. The dynamic range of an ADC is influenced by many factors including the resolution, linearity, accuracy and jitter. The dynamic range of an ADC is often summarized in terms of its effective number of bits. An ideal ADC has an effective number of bits equal to its resolution. In this project it is used to detect the important traffic sounds like traffic horn, fire siren Through External Microphone And Mute The Volume of mp3 so that rider can hear those important traffic sounds and can be cautious.

#### 9) MICRO SD CARD

Micro SD is a type of removable flash memory card used for storing information. SD is an abbreviation of Secure Digital. The cards are used in mobile phones. They are also used in newer types of handheld GPS devices, portable media players, digital audio players, expandable USB flash drives It is the smallest memory card that can be bought; at 15 mm ×

11 mm × 1 mm (about the size of a fingernail), it is about a quarter of the size of a normal-sized SD card. There are adapters that make the small micro SD able to fit in devices that have slots for standard SD, mini SD.

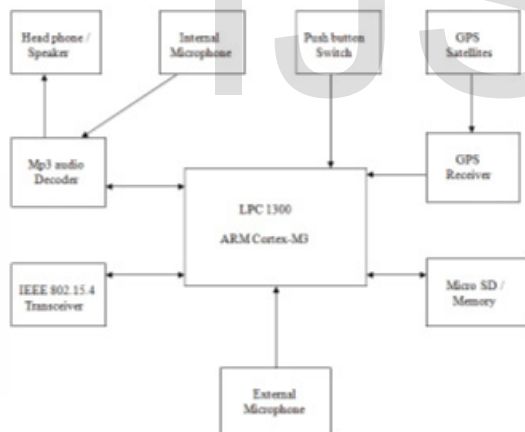


Fig.6.micro SD card

## VI. WORKING

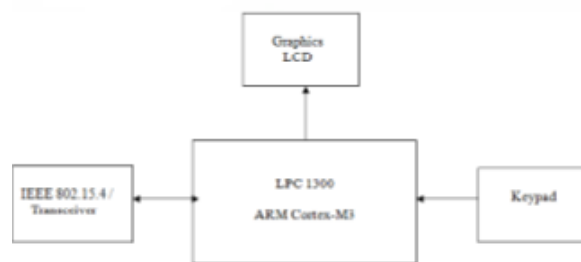
### 1) BLOCK DIAGRAM OF HELMET UNIT

Helmet unit includes head phone/speaker, internal microphone, push button switch, GPS satellites, MP3 audio decoder, LPC 1300, ARM Cortex-M3, GPS receiver, IEEE 802.15.4/transceiver, micro SD/memory and external microphone. Head phone acts as a speaker to hear recorded voice and mp3 songs. Microphone is used to record voice or commands given by rider with the help of push button switch provided in the helmet. GPS receiver is used to receive the location of the rider through GPS satellites. IEEE 802.15.4 helps in communicating with bike dashboard unit. ARM cortex-M3 controls everything.



### 2) BLOCK DIAGRAM OF DASHBOARD UNIT

Bike Dashboard unit includes Graphics LCD, IEEE 802.15.4/transceiver, LPC1300, ARM Cortex-M3 and keypad. Graphics LCD is used for display purpose. It displays menu. ARM Cortex controls every function. Transceiver is used for communicating with robotic helmet unit. Keypad is used for providing input.



## VII. SUMMARY

- When rider comes across bad road conditions he can activate the microphone by pressing a button and then record his comment. With GPS installed in helmet, it will then detect when the rider is travelling near those spots another day and turns on the recorded audio when he is at distance of 10 meters from the hazard to alert him. Moreover he can send these information to the cloud so that this can remain as an alert to other Smart Head Gear users. Similarly in case of traffic, he can send his location as an alert.
- Of course the rider could also record anything that he is interested like favourite shops, food malls to remind him again. The recorded audio files will be available in the dashboard graphical display and the rider has the option to delete it any time and he can also transfer those locations to his smartphones and use his favourite maps for reaching the previously recorded destination. The graphic display displays the store GPS locations. These data's are stored in micro SD card and this can be deleted when needed
- In case if the rider meets with an accident, When he falls, the vibration sensors will sense the vibrations, and automatically the location and the video taken will be sent to the SOS number saved
- Moreover this head gear is programmed in such a way that only if he wears the helmet, he can drive his bike.

## VIII. CONCLUSION

The helmet is intended to be user friendly, with the help of GSM and GPS, in case of accident it locates the place of accident and intimates it to emergency service. This aims to bridge the gap between the user and traditional physical hardware devices. Given the high learning curve in understanding how to use advance technologies, we hope to break away from conventional control mechanisms and explore an intuitive way. our goal is to make Smart Head Gear to feel more like an extension of the body as opposed to an external machine and encourage the motorcycle riders to wear such user friendly and useful gears.

## IX. RESULT

Bike engine starts only when helmet is brought near to bike dashboard unit. The condition is – helmet: present = engine on and helmet: absent = engine: off. Hazard warning information is passed to riders wearing headgear when they are at distance of 10 meters from the hazard to alert them

## X. FUTURE SCOPE

In future if there is a large demand for these type of helmets we can print the whole circuit in a multi-layered pcb, so that circuit becomes smaller and can be easily fitted into helmet. The circuit can also be powered by solar energy so that it uses green energy and does no harm to environment .The flexible solar panels can fixed all along surface of helmet. This type of helmet technology can also be implemented for the combat helmets used by the soldiers working under extreme temperatures.

## XI. REFERENCES

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