IJMRT: Volume (1), Issue 5, 2019

ISSN (Print) : 2663-2381
ISSN(Online) : 2663-4007

International Journal of Multidisciplinary Research Transactions

(A Peer Reviewed Journal)

www.ijmrt.in

Smart Helmet - SHAKO

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Abstract

In this paper a smart working helmet known as shako has been designed and tested. This has been developed with an idea of using some of the comfortableness to the customer in lieu with instrumentation technologies. In this model, there are three major parameters are included which will be an imperative ideas need to be installed. Helmet which is accompanied with technologies on fuel, speed, temperature indicating systems, in which every customer need to be aware of his/her own vehicle. On future based vehicles, these implementation plays a vital role for the next generation society knowing that these technologies will help them to look after their own safety to both the vehicle and to them.

Keywords: Microcontroller, Amplifier with Buffer, Voice Bank Circuit, RF Transmitter & Receiver and Encoder & Decoder..

1. Introduction

Usage of helmet is a very good habit for those who are known about its characteristics. These are given only physically to it till date. Further the main model of this design gives the characteristics of the helmet not physically but also technically. Now a days accidents are held frequently, in order to reduce the problem usage of a smart helmet which will be of user friendly and security purpose will also be high. This idea can be added in military uniforms and Defence Research and Development Organization (DRDO) for our national security. Previously used helmets possess protection just for the Cranium. Previous invention includes an ordinary glass which gets easily broken for miniature shocks. To overcome this Kevlon or Carbon fibre glass material has to be introduced with full faced anti glaring material

2. Literature Review

Marcus Weller[1] et al. has Invented for Skully helmets Inc. in various instrumentation technologies and aspects for the motorcycle rider to be fully aware of the environmental conditions. These technologies includes heads up display , Blind spot camera , smart voice commands , turn by turn navigations and output audio connection. They discover look head mirror proportion with Heads up Display, without even refocusing our visual. The also enhance an overall safety by providing an ultra-wide glanceable view of the road behind. The output indication provided by Skully is done with the help of smart voice commands by attaining a features of Fenix Ar smart. The audio & visual navigation is been constantly reported when and wherever needed, weather monitoring is also determined. The Audio quality for the output matches with thumping speakers with crystal clear call quality.

Parul Nagarkar[2] et al. Proposed in the paper Intelligent Helmet Band, the idea of driving the motor cycles has been made safer and they have implemented GSM and GPS technology with limit switches. The purpose of the limit switches is placed here is to detect whether the rider has worn the helmet or not, if not the bike will not start. They also determined that when a rider meets an accident, the Accelerometer acquires the signal and delivers a short message with a perfect location to the predefined registered number using GSM modem.

Albert Daimary[3] et al. Proposed in A Low Power Intelligent Helmet System, the concept behind their working system consists of two things. First one is related to Alcohol detection and second is wearing of the helmet for ignition of the engine. They have installed an alcohol sensor and sensitive switches inside the helmet which is connected wirelessly. The power sent to the helmet is by lithium ion battery charged by manually or by a solar panel, embedded outside the helmet. The model is designed in such a way that the alcohol detection circuit is automatically shut "OFF" after a predefined time.

Jennifer William[4] et al. proposed system in which the Intelligent Helmet ensures the safety of the rider by making it necessary to wear the helmet and assure that rider hasn't consume any alcohol while driving the vehicle. The system also help in efficient handling of aftermath of accident by sending a SMS with the location of the rider to his/her well-wisher's number to get proper and prompt medical attention, after meeting with an accident.

Mukundala Sai Rohit [5] et al. proposed in the paper which explains about Alcohol detection, Ignition of the engine only after wearing the Helmet, and finally about Theft control security system. The alcohol sensor used in the experiment senses the conductivity of it and if it is denoted at a higher rate it sends a signal to the output resulting the rider has consumed alcohol. Regarding the ignition, the rider needs to wear the Helmet and it is mandatory at ever instances of starting the bike. Third parameter speaks about Anti-theft security system which is achieved with the help of face recognition technique which is previously installed in the process. It also includes 2 IR sensors for sensing the face of the original owner of the bike.

Himadri Nath Saha[6] et al. proposed in the paper Accident and alcohol Detection in Bluetooth enabled Smart Helmets for Motorbikes and explains the importance of analysing an accident well in advance by using Impact sensor, Accelerometer , Flex sensor and breathe analyser. The sensed data will be updated in API (Application Programming Interface) through online. When these data exceeds the legal limit, an alertness will be sent via smart phone to any registered number. By doing so accidents are well treated without any delay.

Amir Mukhtar[7] et al. describes Vision based Motorcycle detection base on HOG features mainly in order to reduce the accidents, the vehicles(either one or many) are detected by vision based technology. These are achieved by detecting the colours of the opposite vehicle's Tyre and Helmet based on their shape and size which is already predefined in the rider's Helmet.

This Tough task is achieved with the help of a unique technology called HOG (Histogram of Gradients) features. By analysing the parameter by the HOG these collision of vehicles and accidents can be avoided.

Prashant Ahuja [8] et al. tells about Microcontroller based Smart helmet using GSM and GPRS. He explains that these GSM and GPRS is fixed in the Helmet due to indication of the accidental situations well in advance. This was mainly done due to late knowing of the accident conditions which leads to death. To overcome this at the time of accidents a registration number which is installed previously by the owner (rider) in his/her vehicle. This number gets activated to the concern people by a CALL or a VOICE message alerting that his/her close ones have met with an accident. A sensor is fixed and the signal is sent within a minute through GSM for calling and GPRS helps in Location of the actual spot.

Sagar Patil[9] et al. has developed Smart Motorcycle Security system which explains about Ignition of the engine occurs only after the helmet is worn, and the stand support needs to be straightened. On doing attaining these two parameters the vehicle is ready to drive. Also accompanied with a GPS tracking system which finds the exact location of the bike in terms of coordinates when it(bike) is stolen. The mapping is being displayed by those coordinates and helps in finding the vehicle easily.

3. Problem Identification

Context oriented display inside your helmet (virtual display) which means only relevant data is displayed when it is needed, maintaining your focus on the road only. This project was converted from visual display to audio, because distraction, initial cost, replacement cost, special glass material is required. The sequential occurrence of the error has not been ordered yet, solution to this above needs to be determined.

4. Proposed System Design

Microcontroller Atmega16 is an 8 bit controller Advanced RISC Architecture 130 powerful instructions. It is mostly a single clock cycle Execution 32 x 8 general purpose working registers and 8k byte of IM-system self-programmable and a and a flash program memory type. The Microcontroller we have used here consists of 40 pins and 4 ports namely PORT-A, PORT-B, PORT-C & PORT-D. Out of which PORT-A is been allocated for A/D Conversion purpose and remaining PORTS acts as a Bidirectional Input/output PORT.

RF Transmitter:-In our experimental work transmitter circuit place a vital role. The transmitter circuit is made up of IC HT12E and TX 433.92MHz Frequency. Its Working range of voltage varies from 2.4v to 12v. The Encoder part consists of 8 address and 4 data lines. On successive 4 times, the data will be transmitted. The positive pulses are of 0's & 1's (Binary) in different lengths. The frequencies of these pulses of 0's & 1's are in the range between 1.5 to 7KHz depends upon resistor value of OSC 1 and OSC 2 pins. On viewing above the encoder & decoder ratio aspect, the internal frequency oscillator is 50 times more than that of decoder oscillator. Encoder frequency is of the range approximately of 3 KHz. Buffer with Amplifier: Buffer with Amplifier it helps to transfer all the combined signals periodically by succeeding stages, without any collapse of signal.

Voice Bank Setup :- It consists of 28 pin IC configuration. Out of which, 8 pins are allocated only for voice recording. Each pin has the capacity for storing 90 seconds of voice, but here we used only 3 pins each consisting of only 5 to 10 seconds voice recorded in it. Initially the saved 3 pin voice will be triggered only when the pins status changes from low to high. As

soon as this condition occurs the voice or the output signal is triggered out to the output port or Speaker.

RF Receiver: The Receiver Decoder circuit is built with the help of IC HT12D and RX 433.92MHz frequency range. It is a Holtek Processor, Consists of 8 address line and 4 data line. The VT pin allocates for one positive pulse when the valuable data is received. When the Condition satisfied it gives an acknowledge signal. At a frequency of up to 150 KHz, there is an external resistor is connected across an oscillator pin, so that the above frequency generation occurs. By doing so the power consumption is very low and it's been operated that +5v DC Supply. For receiving the data ISM module band RX 433.92MHz frequency is used.

The output is taken as digital output with an 8-pin module configuration. It operates at +5v DC supply. It has very low power drain and the module handling is very easy. On every "1" state (o/p) we come to know that valuable transmission is been detected. By sensing the data pin, we can gather perfect information from far end.

5. System Architecture

In fig (1) it has been divided into two conceptual descriptions. The vehicle part and helmet part. The vehicle part consists of sensing circuits such as fuel level, speed & Temperature respectively. All these three signals are send to the microcontroller which allocates for each process to be programmed and those programmed command signals are send to the amplifier circuit for amplification .The buffer is also preferred to avoid collision and overloading of signals. The process output is being transmitted to the receiver part (Helmet). The corresponding power supply for the process is maintained at 5v, the set point indications and digital values are displayed on LCD screen. Switching to the helmet part, the decoder receives the RF code signals from the code generator and sends it to the microcontroller. The program command is been given at each instances of time, accompanied by a voice bank alongside with an amplifier circuit. The voice bank receives the amplified signals, stores the voice command (smart) and the output is fed outside through an audio port via the speaker.

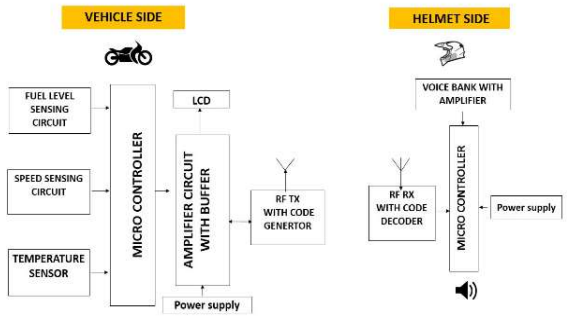

Fig.1. System Architecture of Smart Helmet

6. Process Flow

In fig (2) the process flow states that the input signal is sensed by the microcontroller. Those input signal is converted into binary codes as 0's and 1's.These binary signals have been sent to the controller for computational purpose. The microcontroller command signals and it is stimulated to the output device such as audio port via the speaker.

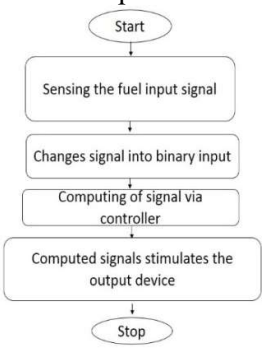

Fig.2. Process Flow

7. Results and Observation

Speed Control Circuit Design has been tested with MOC7811 with an IR sensor, which converts Mechanical rotation into Logical status. Initially with the help of an LED the rotation of motor has been determined with a help of blinking. The speed sensing parameter is achieved with the predefined set point value (750 rpm).Once the Set point is achieved the output is generated by a voice alerting mechanism.The Power supply for the sensor, the range between 3.3 to 5v and for the motor (1000rpm-Gear motor) is up to 12v. The corresponding output generated is based upon our set point (RPM) has been tested and result is verified.

The Fuel level sensing circuit has been tested with IC 4093 consists of the two electrode denoting low level and high level signal. These two signal connected to a NAND gate logic. These logical output has been analysed corresponding to the detection of two electrodes. If the condition satisfied for any one electrode, the indication of fuel level is attained if not the electrode doesn't sense the fuel level (no voice indication). This condition has been tested and verified.

Temperature sensor used here is LM 35 and operating range is 4V-20V with respect to amount of heat observed by the above sensor. The Expected output is compared with the help of Set point say up to 50^{o}C. The out coming results are in the range from -55^{o} C to 150^{o}C. In the case of exceeding the set point level an indication of voice alerting mechanism occurs.The performance of the given sensor has been tested and verified.

The prototype was tested and found to deliver satisfactory reports, in helping the rider to know the statistical conditions of their vehicle.

8. Conclusion

The proto type has been designed, processed, and perfectly executed for the comfortableness of his/her safety precautions. Until then it's Shako saving you not just from one step, but three steps from danger.

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