International Journal of Advances in Engineering and Management (IJAEM)
Volume 2, Issue 1, pp: 318-323 www.ijaem.net ISSN: 2395-5252

Intelligent Helmet and Motorcycle using MSP430 for identifying Accident and Outbreakoccurrence

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Date of Submission: 10-06-2020 Date of Acceptance: 27-06-2020

ABSTRACT: Themain objective of this paper is to implement Intelligent helmet for safety of two wheeler journey. The proposed idea is to make mandatory for the rider to use this helmet in order to drive a bike and to check for outbreak occurrence. Outbreak condition could be number of road accidents or road conditions in any particular geographical area. System is designed such that intelligence is integrated in helmet and bike. The module in system will store outbreak data to database. If such condition is identified then this database will be used by higher authority take preventive measures. This is definitely the first line of defense for the riders that would possibly avoid the accidents. This can be implemented using Texas Instrument launch pad with MSP430 micro controller. The force sensor checks if the person wearing the helmet or not. The bike will start only if rider wears it. When the rider crashes, helmet hits the ground, sensors detect the motion and tilts of helmet and informs the occurrence of an accident. This information of the corresponding vehicle location is updated to database and short service message is sent to family members of therider.

KEYWORDS: motorcycle rider's safety, Accident detection and Outbreak identification, Helmet sensor, RF communication, vehicle locater.

I. INTRODUCTION

The desire to develop the project is to contribute good things towards the society. Recently, in few years the two wheeler accidents are increasing and leads to loss of many lives and also it leads to loss of private property. According to survey of India there are around 750 accidents occurring due to bike crashes per year. The reasons may be many such as no proper driving knowledge, no fitness of the bike, fast riding of bike, drunk and drive, etc. Sometimes the person injured, the accident may not be directly responsible for the accident, it may be fault of rider, but end of the day it's both the drivers involved in the accidents who is going tosuffer.

If accidents are one issue, lack of treatment in proper time is another reason for death, according to the survey of India 698 accidents occur per year, nearly half the injured people die due to lack of treatment in proper time, the many reasons for this such as late arrival of ambulance, no persons at place where the accident occur to give information to the ambulance or relatives. This is a situation we observe in our daily life, a thought of finding some solution to resolve this problem come up with this idea of giving the information about accident as soon as possible and in time. Because after all it is a matter of time, if everything is done in time, at least we can save half the lives that are lost due to bikeaccidents.

Considering the major factors for avoiding the accident causes such as make wearing helmet compulsory, if person met with an accident, no one is there to help him. Simply leaving or ignoring the person can be very dangerous. In such situation, informing to ambulance or family members through mobile to rescue him/her for anextent.

II. LITERATURESURVEY

[1] The earliest published work on smart helmet was on MAY 2015 by Lakshmi Devi and her group members. This project only concentrated on only one specific purpose i.e. an accident. Whenever the accident will occur then accident spot will be noted down and information will be sent on the noted mobile number. The major disadvantage of this project was the cost of the helmet and it was implemented for a one specific task.

[3] One of the earliest report was published in MARCH 2016 by AbhinavAnand and his Team. They worked only on the phenomenon of accident which generally happens due to drink and drive. But as we know that the accident in the area not

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only happens due to consuming alcohol, other parameters are alsoresponsible.

[4] In MAY 2016 SudharsanVijayanand his team discussed about safety and security of the bikers against road accident. Smart helmet has special idea which makes motorcycle driving safe than before, they implemented it using GSM and GPS technology and also included alcohol detection in it. The disadvantage was they used microcontroller for controlling their overall operation due to that the project might fail to upgrade to newversion

III. CONCEPT MODELLING

Following are the stages of project development **A. Design& Development**

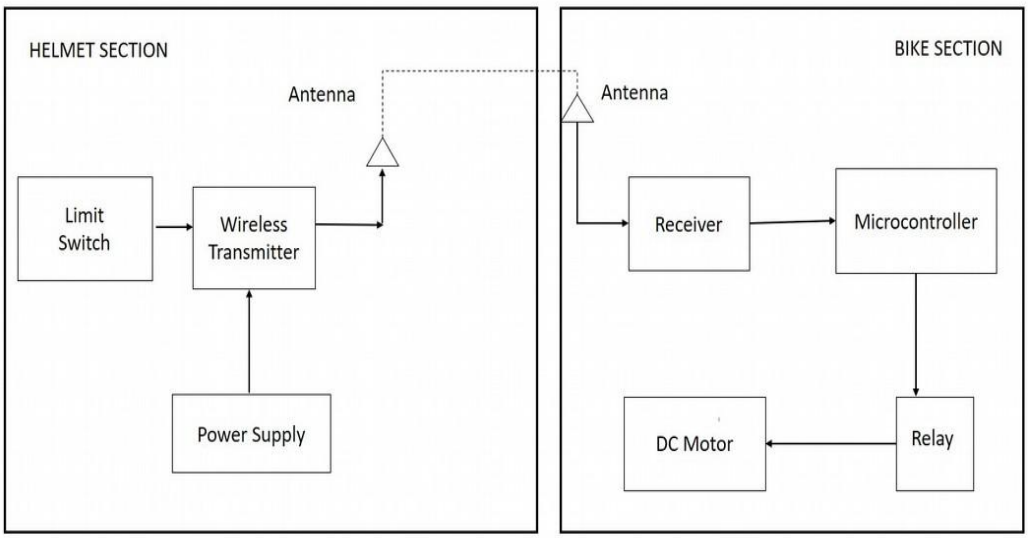

Fig. 1.1. Block diagram

B. BikeInterlock

The bike interlock will make use of wireless communication between Helmet and Bike through RF communication. The Bike will not start until and unless the rider wears helmet. So, it is necessary for the rider to wear the helmet as the bike cannot start without it. The bike interlock will be implemented by using a DC motor and a relay which acts as bike and ignition contact respectively. The touch sensor will detect the presence of human and thus the transmitter module will get activated. As soon as the transmitter gets activated, the signal is encoded and is sent to the receiver module which will decode the signal sent by the transmitter and the relay will get energized and hence the DC motor will turnON.

C. Wifi-GPS-GSM Module

to ensure RF communication the wifi module is placed in the helmet unit, GPS is a navigation technology that provides us with stable and accurate navigation data. The smallest form factor and miniature design is the best choice to be embedded in a device such as portable navigation device, personal locator, speed camera detector and vehicle locator. The GSM module is a plug and play GSM Modem with a simple to interface serial interface. It is used to send SMS, make and receive calls, and do other GSM operations by controlling it through simple commands from microcontrollers andcomputers

IV. HARDWAREDESCRIPTION

A. Embedded Microcontroller

The MSP430FR2433 is an ultra-low-power MSP430FRx FRAM-based microcontroller (MCU). MSP ultra-low-power microcontrollers from Texas Instrument offer the lowest power consumption and the perfect mix of integrated peripherals for a wide range of low-power and portable applications. 6-Bit RISC Architecture, Clock Supports Frequencies up to 16 Mhz, Wide Supply Voltage Range From 1.8 V to 3.6 V. Intelligent Digital Peripherals, Enhanced Serial Communications,High-Performance Analog devices.

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Fig 3.1 MSP430 microcontroller

B. LimitSwitch

The limit Switch 1A 125V AC contains only one group of contacts for switching. It has a lever present on theswitch. The limit switch has 3 contacts viz. NO, NC andCOMM,

Fig 3.2 limit switch

C. Sensor Boosterpack

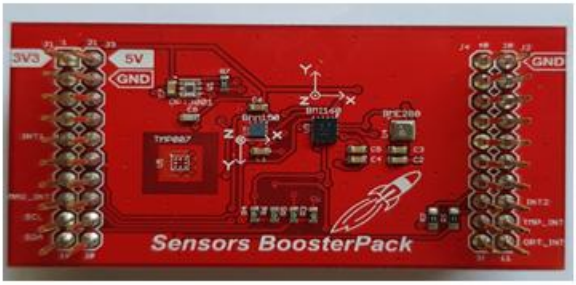

Fig. 3.3 sensor booster pack ftormtexas Instruments

The Sensors Booster Pack kit (BOOSTXL-SENSORS) is an easy-to-use plug-in module for adding digital sensors to MSP430 module to start developing sensor applications using the onboard gyroscope, accelerometer, magnetometer, pressure, ambient temperature, humidity, ambient light, and infrared temperature sensors. The Bosch BMI160 inertial measurement unit is a 6-axis digital accelerometer and gyroscope sensor that measures gravitational forces exerted on the EVM as well as speed of rotation in degrees per second. BMI160 can synchronize its own accelerometer and gyroscope data as well as with an external device such as a geomagnetic sensor. Rotating the board about its axis increases the gyroscope output of the sensor, and changing the orientation of the board with respect to the earth changes. its accelerometer output BMI160 has a secondary I2C interface for connecting additional Bosch sensors such as the BMM150 geomagnetic sensor. The BMI160 Accelerometer and Gyroscope tile responds to acceleration in g and rotation in degrees per second The BMM150 Magnetometer tile responds to magnetic field in microtesla. This sensor can be stimulated by changing the sensor orientation with respect to Earth's geomagnetic field or by passing a magnet overit.

D. WiFiModule:

ESP8266 Module is a self contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your WiFinetwork. The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor. This module has a powerful enough on-board processing and storage capability that allows it to be integrated with the sensors and other application specific devices through its GPIOs with minimal development up-front and minimal loading duringruntime.

Fig3.4 wifi module-ESP8266MOD connection

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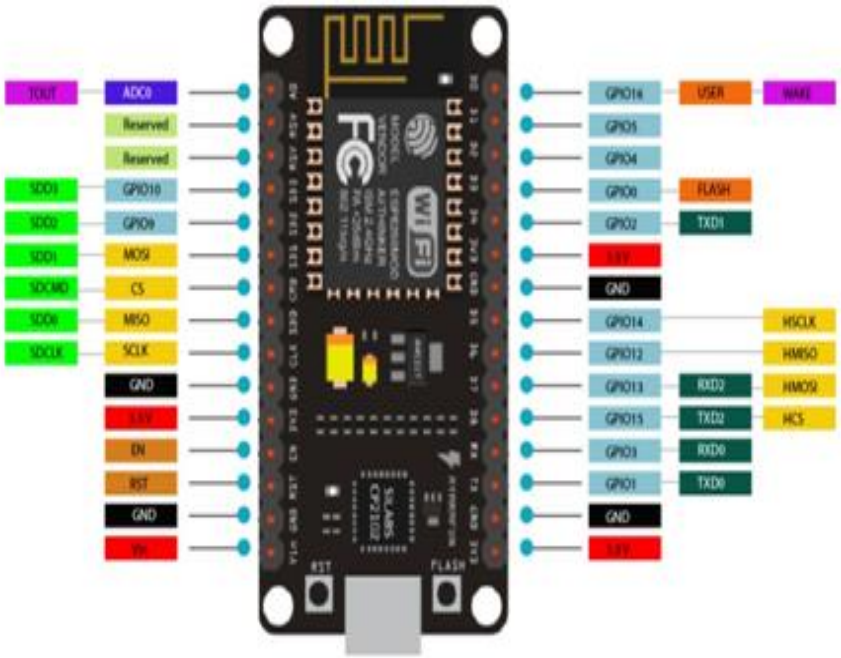

Fig 3.5 ESP8266MOD pinout

Its high degree of on-chip integration allows for minimal external circuitry, including the front-end module, is designed to occupy minimal PCB area. The ESP8266 supports APSD for VoIP applications and Bluetooth co-existance interfaces, it contains a self-calibrated RF allowing it to work under all operating conditions, and requires no external RF parts.

E. GSMModule

Fig.3.6 GSM module

The GSM SIM800C Shield with Antenna provides you with a way to use the GSM phone network to receive data from a remote location, and it is compatible with all boards having the same form factor and pinout as a standard Arduino Board. This shield can also be applied to DIY phones for calling, receiving and sending messages, making GPS tracker or other applications like in our case a Smart Helmet. The SIM 800C GSM Shield delivers GSM/GPRS850/900/1800/1900MHz signals for Audio, SMS and GPRS Service. Also, it operates at the low power consumption of about 0.6mA in sleep mode, with a two-in-one headset jack. Chip used: QUAD BAND SIM800C GSM CHIP . Antenna type is finger antenna,Output is TTL and RS232 serial output. Gives buzzer for CALL and SMS indication Indication, LEDs PWR – Power Indication, STS – Status Indication, NTW – NetworkIndication.

V. WORKING AND FLOWCHART

A. Helmet Unit: This circuit contains a Limit Switch, RF Transmitter and a power supply. All the above components run witha9Vbattery.LimitSwitchisusedhereashelmetsensor
i.e. it will detect the wearing of helmet. In normal condition it will be off and when it is contact, it will be ON. Once the limit switch gets energized, the transmitter sends the information to the receiver mounted on a vehicle.

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B. Vehicle Unit: This system includes Microcontroller, DC Motor, GPS Module, GSM Module, RF receiver and an Accelerometer RF receiver receives signals from the helmet module and is fed to microcontroller, it is continuously scanned by the microcontroller and does the required actions. A motor is used to show the status of the bike. Accelerometer is fixed on the bike unit, if accident occurs it will detect, it will send SMS to a specified number using GSM Module with accident location which is traced by GPSModule.

C. Project Flow

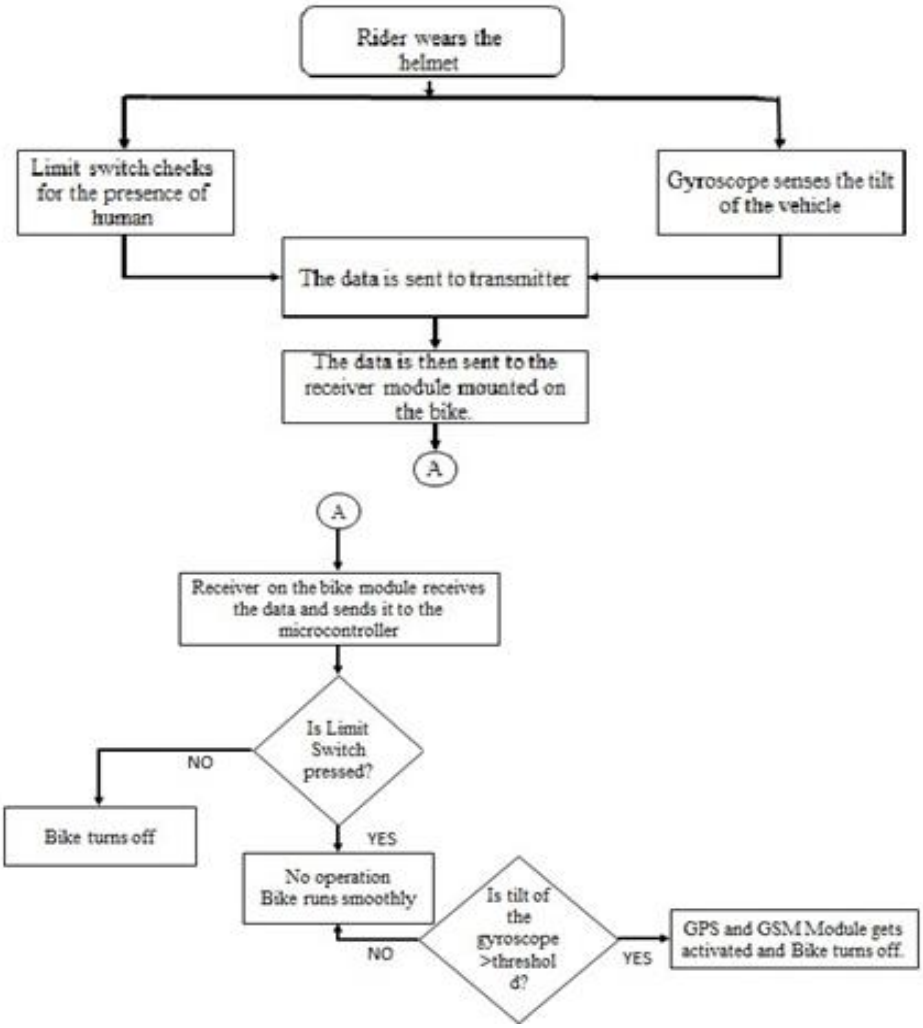

Fig 5.1 working flow of helmet and vehicle

D. Software Development

Code Composer Studio is an integrated development environment (IDE) that supports TI's Microcontroller and Embedded Processors portfolio. Code Composer Studio comprises a suite of tools used to develop and debug embedded applications. It includes an optimizing C/C++ compiler, source code editor, project build environment, debugger, profiler, and many other features.

The intuitive IDE provides a single user interface taking you through each step of the application development flow. Familiar tools and interfaces allow users to get started faster than ever before. Code Composer Studio combines the advantages of the Eclipse software framework with advanced embedded debug capabilities from TI resulting in a compelling feature-rich development environment for embedded developers.

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VI. RESULTS

Once vehicle unit detected that there was accident then GSM sends location of accident with help of GPS system. Following figure shows the SMS sent to assigned mobile number.

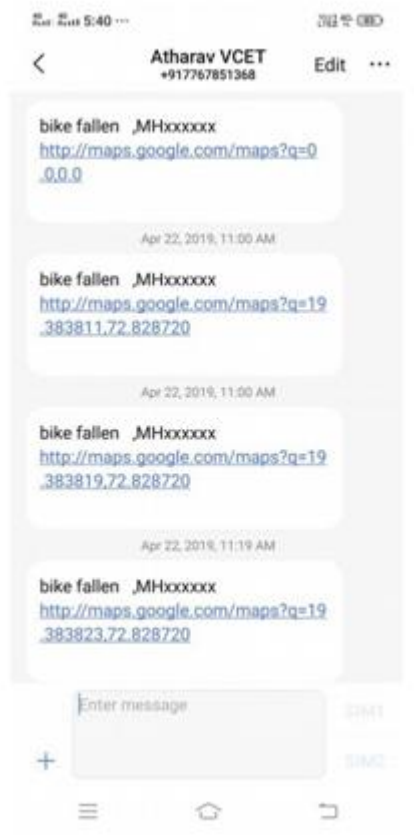

Fig. 6.1 SMS sent to mobile

VII. CONCLUSION

The developed system efficientlyensures:
Rider is wearing helmet throughout the ride. Accident detection and auto indication by sending the SMS. Thus probability that victim may get timely medical attention. Higher athourity check data from database about outbreak occurrence in any particular geographical area in which accident is happened and then take corrective decision to prevent frequent such incidents. This is definitely the first line of defense for the riders. By implementing this system, a safe two wheeler journey is possible which would decrease the head injuries and also reduce accidentrate.

VIII. FUTURESCOPE

In future we can implement small solar panels on helmet to charge the battery. This circuit can be manufactured in compact size and can be implemented into a small module later using C2000 XL 320F2002X piccolo launch pad evaluation kit by TexasInstruments

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International Journal of Advances in Engineering and Management
ISSN: 2395-5252

IJAEM

Volume: 02 Issue: 01 DOI: 10.35629/5252

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