ABSTRACT

The rapid growth of population with increased economic activities has resulted in tremendous growth of vehicles in developing countries like India, which is the primary factor, responsible for road accidents. The current work is based on a very serious issue of number of deaths of two wheeler drivers due to severe head injuries. It is observed from the previous art that the major reason for severe head injuries is not wearing the helmet while riding.

The statistical data for two wheeler accidents in India shows the total 1,44,391 accidents happened in year 2015. Out of total 36,803 deaths, 19.6% occurred due to head on collision and most of the cases happened due to not wearing of the helmet. To address this issue a novel system in the form of an Intelligent helmet has been developed in the current work. The thesis elaborates the development, analysis and testing of the system.

A system has been developed to analyze the sensory data to authenticate the ignition of two-wheeler only by authorized person, only if he/she is wearing helmet. The whole system comprises of three sections (a) helmet section, (b) two-wheeler section and (c) server. The helmet section consists of helmet interfaced with flex sensors, transmitter RF modem and microcontroller. Two wheeler section consists of RFID, receiver RF modem and microcontroller. The sensory and RFID data is transmitted for analysis of the complete system. The system has been designed in such that the engine of vehicle will ignite only if the person with authorized RFID tag is wearing the helmet. To establish wireless communication between helmet and two wheeler section, 2.4 GHz RF modem is used.

An experimental research is carried out with the samples collected from the flex sensors interfaced with the helmet and analyzed with the help of LabVIEW and "Internet of Things".

The threshold value of flex senor level for igniting the engine of vehicle is calculated by applying hypothesis on the samples collected from the age group of 18-25 years for a temperature range of 21^0C to 41 ^{0}C in Dehradun during the year

2016. The threshold value to ignite the vehicle is observed as level '212' or 1.03V.

An optimized solution has been suggested for implementing the hardware system on FPGA for both Helmet and two-wheeler sections. The high speed controller with frequency 781.250 MHz is designed with the help of VHDL using Xilinx 14.2 and synthesized on Virtex-5 FPGA.

The novelty of the current work is a new approach towards safety of two-wheeler drivers in form of an 'Intelligent Helmet'. The sensory data is analyzed with the help of LabVIEW and IoT server in order to determine the threshold value for individuals. A hardware has been developed for realizing the entire system which operates on 16 MHz. To optimize the developed system in term of size and speed, the system has synthesized in high speed Xilinx Vertex5 FPGA with the frequency 781.250 MHz.

Keywords- ESP8266, Helmet, Safety, Two- wheeler, FPGA, Flex sensor, Internet of Things, RFID, Zigbee, VHDL