

Intelligent System For Helmet Detection Using Raspberry Pi

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Abstract- *Intelligent System for Helmet Detection using Raspberry Pi ensures helmet possession by a motorcyclist at all times by capturing a snapshot of the rider's helmet using Pi Camera and confirming object detection by Haar cascading technique. The main idea behind the project is to reduce road fatalities among motorcyclists. Due to ignorance of riders for the Helmet compulsion law, every motorcyclist's safety has been compromised. Intelligent System for Helmet Detection solves this problem by leaving the rider no choice as the engine of the vehicle is operated through a single channel relay which is only closed after detection of the rider's helmet. An interactive LED display will alert the rider if the helmet is not detected after which the rider needs to ensure the possession of a helmet or else the System will display a warning message which will earn the rider a strike if it is ignored. Three such strikes will lead to the RTO server penalizing the rider for breaking the law.*

Keywords- Helmet Detection, Raspberry Pi, OpenCv, RTO server, Python.

I. INTRODUCTION

Each year there are 1.4 million traumatic brain injuries (TBI's) in the INDIA. About 300,000 of these individuals suffer sports related brain injuries annually. Up to 90,000 of the people having experienced a traumatic brain injury have long-term or lifelong disabilities. About \$76.5 billion dollars is spent in treatment related to these injuries. More than 50,000 individuals die from TBI.

This proposal aims at the security and safety of motorcyclist against road accident while also providing them with a luxurious comfortable two wheeler experience. Each smart vehicle has built in a circuit and various functions. The circuit of each vehicle is designed in such a manner that the bike won't start unless the rider wears the helmet .The camera installed on the bike will capture the rider wearing the helmet or not. In the case of failure, it transmits strike to the server. such three strikes will indeed disengage The motor service for the motorcyclist.

II. RELATED WORK

Generally, the population in India is using a helmet while driving their motorcycle. But as due to lack of laws and justice department in India has not made the helmet compulsion in India Riding a motorcycle in India is way too risky. Accident cases are also increasing due to it.

The Smart Helmet having built-in Bluetooth capabilities and controls, enabling users to use all features of organization communication devices without any pre-requirement of installing a headset. Chat with your buddies over the intercom system or take calls directly through your helmet with the built-in microphone, and hear your music louder and clearer built-in speakers boost the audio level while you're out on the open road[7].

A passive/active infrared imaging system apparatus for mounting on a head/helmet includes a passive infrared camera Head Pack having a removable narrow band filter cover, an objective lens, an interface board, and a display unit such as LCD or LED, with tilt adjustment functions fitting any mask, mounted in the front of said head/helmet for converting infrared light images into electronic signals. An electronic unit coupled between the UFPA of the infrared camera and the display unit includes a controller for processing video signals from the infrared camera and supplying them to the display unit. The electronic circuit includes a wireless video & audio transceiver, a piezoelectric microphone, a voice controller, and a neural network pattern recognition chip[6].

The Helmet features head up display which is transparent in nature giving us the display of rear mirror on gear shield screen. They do have taken care of situational awareness with help technology of GPS navigation and Bluetooth connectivity with mobile for communication the below could give you an idea about market creativity.

III. SYSTEM DESIGN

3.1. System Requirements

3.1.1. Software Requirements :

- Operating System - Raspbian
- Front End - Python

3.1.2. Hardware Requirements :

- Raspberry Pi 3
- Raspberry Pi NOIR Camera
- Relay
- DC Motor
- 12V DC Power Supply

3.2. Proposed System

The proposed approach of a Smart Helmet for motorcyclists using Raspberry Pi and its modules which will ensure compulsory possession of a helmet with every motorcyclist. Scanning the object (helmet) using the Pi Camera module and verify if the helmet is present using image processing in Python. The model will also help R.T.O. by providing the information of rider who had challenged the system to trick by removing the helmet during its ride as system ensures a periodic check on the rider.

3.3. Flow Chart

Flowchart is a pictorial representation of a dataflow throughout the project. This is drawn based upon the algorithm of the system. The flowchart itself is called as a data flow diagram. The various notations used for drawing a flowchart is as shown below in Figure 3.1

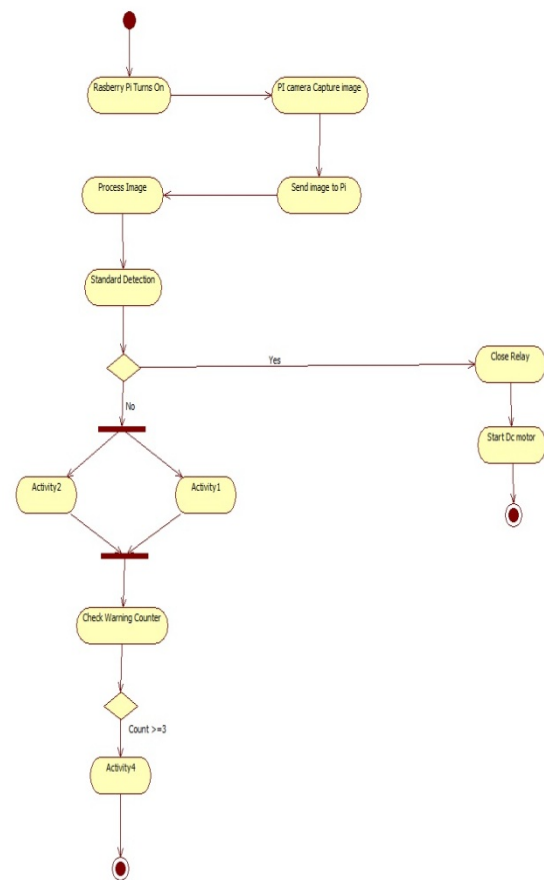


Figure 3.1 Flowchart of proposed system

3.4. Module Design

3.4.1. Raspberry Pi 3: The Raspberry Pi 3 Model B features a quad-core 64-bit ARM Cortex A53 clocked at 1.2 GHz. This puts the Pi 3 roughly 50% faster than the Pi 2. Compared to the previous model Raspberry Pi 2, the RAM remains the same – 1GB of LPDDR2-900 SDRAM, and VideoCore IV GPU. As the leaked FCC docs will tell you, the Pi 3 now includes onboard 802.11n WiFi and Bluetooth 4.0. WiFi, wireless keyboards.

3.4.2. Raspberry Pi NOIR Camera Module: The camera module includes the dedicated CSI interface, which is available behind the Ethernet port on the Raspberry Pi3. The NOIR Pi Camera Module has an 8MP CMOS camera with a fixed focus lens that is capable of capturing still images as well as high definition video. Stills are captured at a full HD resolution while the video is supported at 1080p at 30 FPS, 720p at 60 FPS and 640x480 at 60 or 90 FPS. This makes it ideal for projects such as hidden security cameras, high altitude balloon experiments. The camera is supported in the latest version of Raspbian, Raspberry Pi's preferred operating system.

3.4.3. Relay: Relays are switches used to open and close circuits electronically. When a relay contact is normally open, there is an open contact where a relay is not charged. While in case relay contact is Normally Closed, there is a closed contact where the relay is not charged. In both cases, an electrical current applied at the contacts will change their states. Relays are generally used to switch smaller currents in a control circuit like small motors and Solenoids that draw low amps.

3.4.4. DC Motor: A DC motor is an electronic device that is used to convert direct current into mechanical energy. It basically, works on the mechanism of a magnetic field to periodically change the direction of current flow in part of the motor. They are available in a various model to carry load ranging from low-powered device to highly powered equipment.

3.4.5. Open CV: It is a library of programming functions mainly aimed at real-time computer vision. Originally developed by Intel, it was later supported by Willow Garage and is now maintained by Itseez. The library is cross-platform and free for use under the open-source BSD license. OpenCV is written in C++ and its primary interface is in C++, but it still retains a less comprehensive though extensive older C interface. Wrappers in other languages such as C#, Perl, Haskell and Ruby have been developed to encourage adoption by a wider audience.

IV. IMPLEMENTATION

Architectural Diagram is a graphical representation of the concepts, their principles, elements and components that are part of architecture.

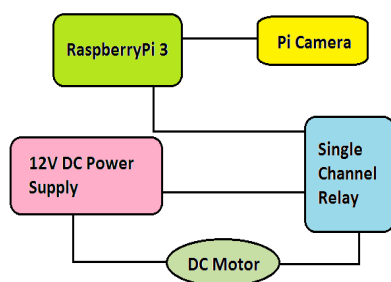


Fig. 4.3 System Architecture

The fig. 4.3 depicts the working of proposed methodology in brief. Raspberry Pi captures a image with the help of pi camera then process it to generate the result for detection of helmet .Resulting in giving access to rider to ride a motorcycle.

V. EXPERIMENTAL RESULTS AND FUTURE WORK

In our system we are developing a haar cascade for a helmet for helmet detection using Viola Jones algorithm[8].then our system will capture the stream of image in continuous buffer stream format and en-rectangle the helmet found in particular image .one may have to change scale factor for proper detection of helmet. Here below is an example on identification of helmet.

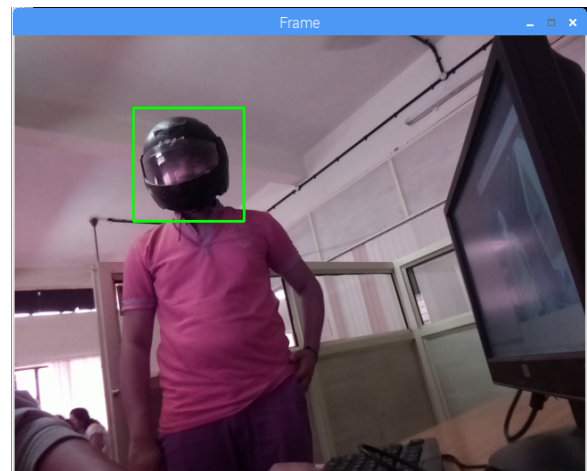


Fig. 4.3 Identification of Helmet

In future work the system will be enable feature like key elimination as the helmet itself would become a key when it comes in contact with vehicle. Also with use of pneumatic sensors we would make pressure on visor (chin strap).

VI. APPLICATIONS

- Smart Vehicle Detection Systems.
- Helmet Detection at Traffic Signals.
- Smart RTO Server Systems.
- Helmet Detection at Ore Mines.

VII. CONCLUSION

The scope of this project is a motorcycle rider that they care about their safety while riding. As we know, the motorcycle riders are now less concerned about their safety while riding, then the creation of this helmet safety rates can be increased and rate of road accidents can be reduced. The accident rates for motorcyclists are increasing, a Smart System on vehicle using Raspberry Pi which in future will inspire safety features for motorcyclists.

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