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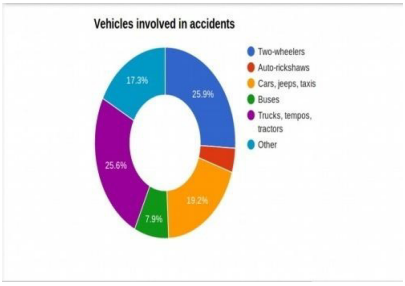
HELMET MOUNTED HEADS-UP DISPLAY A RIDER ASSISTANCE SMART HELMET FOR EVERYONE

[1]R.Kavitha, [2]G.Kavitha,[3]Kevin Arnold Thakur
[1,2,3,]Department of Computer Science and Engineering,
BIST, BIHER, Bharath University, Chennai-73, Tamil Nadu, India
[1]rkavithacse@bharathunive.ac.in, [2]gkavitha.cse@bharathunive.ac.in

Abstract: This paper is about the implementation of a helmet mounted heads up display that communicates with the motorcycle and displays information to the rider with a device similar to the Google Glasses, integrating the motorbikes' vital information into the riders field of view without obstructing and hindering his/her view. This is aimed at reducing accident fatalities in India where a majority of young riders don't wear helmets.



1. Introduction

In a survey taken by 'The Hindu' Newspaper towards the end of 2015 found that 173,000 people died in road related accidents in the year 2014-15.No other country has this high a toll to human lives on road than in India. Despite all of the governments' effort to reduce this, it was found that the pace of vehicles purchased has increased by 300% in 40 years from 1970[1-3] .In the chart below, out of the 173,000 fatalities, a majority25.9% of these involved two-wheelers. It was subsequently found that only roughly 25% of the victims actually wore a helmet during these accidents.
chart showing the casualties of every mode of transport in percentage.

This caused the government to enforce stricter penalties for motorists not wearing helmets. The initiative was given praise and media attention back in 2015 and as a result many people wore helmets, only for a few days during which the law was heavily enforced by the police, but the enforcement went lax[4-6].

This prompted us to engage in a discussion with some of my friends about this issue. Their solutions were to enforce the rider in several ways such as not allowing them to move the bike if the rider wasn't wearing a helmet.This picture shows how its possible to access the ECUA DIY HUD made by Alain Mauer based off of the Google Glasses It was proposed to install pressure sensors inside the helmet that could tell if it was being worn or not. The immobilizing technique would be achieved through a kill switch installed in the bike[7].

Although this seemed good, practically people would definitely find means and ways to go around this. More over, enforcing helmet designers and motorcycle manufacturers to implement this seemed pointless. The problem with these ideas were that we were finding means of doing the same thing again, enforcing people with restrictions. This also didn't appeal to me being a rider myself[8].I realized after many attempts to get a solution, was not to enforce it on others, rather we should encourage people to wear helmets. I realized that many of the 25.9% two wheeler fatalities were young adults, teens and millennials. And this demographic was especially difficult to convince. The solution came to me after reading about motorcycle ECUs[9-11].

2. Proposed work

An ECU is like a brain of a motorcycle. It stands for Engine Control Unit, its main task is to monitor vital engine performance parameters. Accessing it is very easy.The blue device is what we use to communicate between ECU and external software and is called the "ELM 327" [12] Following are the images of Mr.Mauer's experiment to obtain the optimum distance for the heads-up display. His project is to display a multimeter reading to the glasses[13].

The basic layout of the setup

Note: for the helmet, the device can be placed anywhere near the front. The required distance can be calculated as above[14].

Required formula for finding object distance and the resulting setup based on the calculations

Operation:

Basic Schematics of the system

Formula:

Engine RPM

$$\frac{256A + B}{4}$$

Here 'A' and 'B' are two fields passed by two sensors in the engine.

Vehicle speed and gear position do not require to be run through any formula but it needs to cleaned in the sense that the returned data is a hexadecimal code that needs to be converted to decimal code[15].

The display in the view finder will look like this:

The rider gets to see the Speed, RPM and Gear position through his or her view finder.

2.1 Limitations

There are a few problems that may arise due to implementation with various vehicles and other situations;Incompatible PID code[16-17]:

- ➔This was observed when testing two different vehicles. The KTM motorcycles used a proprietary code for their RPM while a local Indian manufacturer, Bajaj, utilized standard OBD2 PID for their RPM

  Refresh rate:

- ➔ Insufficient refresh rate of the OLED display caused by 'large' graphics library. Causes synchronization issues as indicated RPM may be different than actual RPM.

3. Conclusion

Encouraging young people and others alike to wear helmets by appealing to their sense of technology, this product wont' take long to complete and it is being designed to fit on most full faced helmets and compatible with most modern motorbikes. A list of compatible bikes will none the less be made available. Current tests are being done on the KTM Duke and a Bajaj Dominar. It will move to other bikes once their OBD adapters are available. A helmets primary role is to save a persons' life, this does not compromise the safety or the integrity of the helmet or the rider. The device is only to be attached to the helmet and does not require any modification to the structure of the helmet, hence complying with national and international regulations on helmet adjustments. It is similar to a Go Pro action camera being mounted to the helmet.

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