HELMET DIGITAL SPEED MEASUREMENT

DISPLAY WITH ALARM

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To my beloved mother and father

" I hereby declared that this PSM report is a result of my own work and no portion of the work contained in this report has been submitted in support of any application for any degree or qualification of this or any university or institute of learning except as cited in the reference. "

Signature   :..

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" I hereby declared that I have read through this report entitle "Helmet Digital Speed Measurement Display With Alarm" and found that it has comply the partial fulfillment for awarding the degree of Bachelor Of Mechatronic Engineering . "

Signature   : ....

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Date   : .....11 | 05 | 2010.................

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ABSTRACT

The accident and summon for the road user increasing from days to days. There are many technology implement to the vehicle to reduce the damage if an accident occur. However, it still cannot reduce number of accident because of the careless and fast driving is the will leads for an accident to happen. The purpose of this project is to develop a product that can measure the motorcycle's speed and displays the speed value on the helmet's visor. Basically, infra-red sensor is use as a sensor for speed measurement device. This sensor will be attach near to the wheel and as sensor detects object will send the pulse to process device. The process device is the Programmable Integrated Circuit 16F877A act like Central Processing Unit (CPU) that controls the system for the product. The data from infra-red sensor will be process by the C programming and produce the speed reading. LCD were used to displays the speed reading on the helmet's visor. The alarm trigger once the speed calculated is exceeding at certain limit.

ABSTRAK

Kemalangan dan saman untuk kesalahan jalan raya meningkat dari hari ke hari. Terdapat banyak teknologi yang telah diguna pakai di dalam kenderaan untuk mengurangkan kesan akibat kemalangan. Walaubagaimanapun, ianya tidak dapat mengurangkan bilangan kemalangan disebabkan kecuaian dan pemanduan kenderaan yang laju pasti membawa kearah kemalangan jalan raya. Tujuan kajian ini, adalah untuk menghasilkan sebuah produk yang boleh membuat bacaan halaju motosikal dan juga memapar nilai halaju pada cermin hadapan helmet. Secara ringkanya, pengesan cahya infra merah digunakan sebagai alat membaca halaju. Alat pengesan ini, akan diletakkan berdekatan dengan roda dan akan mengesan objek yang melintasinya. Alat untuk memproses adalah litar kawalan pengatucaraan 16F877A bertindak sebagai sistem pemprosesan pusat yang mengawal sistem produk. Maklumat yang diperolehi dari alat pengesan cahaya infra merah akan diproses oleh litar integrasi pengatucaraan C dan akan mengeluarkan nilai bacaan halaju. LCD digunakan untuk memaparkan baacan halaju dalam pada cermin helmet. Penggera akan dihidupkan apabila halaju yang dikira melebihi had laju tertentu.

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LIST OF ABBREVIATIONS

v — Velocity

km/h — kilometer per hour

V — Volt

DC — Direct Current

ns — nano second

T,t — time

CLK — clock

LCD — Liquid Crystal Display

4WD — Four Wheel Drive

FYP — Final Year Project

LED — Light Emitting Diode

PIC — Programmable Integrated Circuit

GPS — Global Positioning System

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CHAPTER 1

INTRODUCTION

1.1 Project Background

Helmet digital measurement display with alarm is a product which affords to measure and display the motorcycle speed. Generally, the speed values displayed using LCD on the helmet's visor. The input of speed taken by sensor (infrared sensor) which attached near the wheel and processed by the PIC located in the motorcycle body.

The infrared sensor use to detect the object which passes between the transmitter and the receiver. The pulse will be high (1) if the object detected by the sensor and low (0) if there no object detect through the sensor. The time different between two high pulse is the time travel between two objects. The distances of the objects are fixed. The speed value determined by using speed equation which is the distance (km) divide by time (hour) travel is equal to speed (v). Further discussion on the sensor will be explained in the literature review chapter.

The programmable integrated circuit (PIC) is the process unit used microchip from Motorola 16F877A. This is the 40 pin, 5 DC volts, with 20MHz operating frequency. The C programming will be use to program the chip according to software designs. The program can be erasing as it is programmable integrated circuit. The program will calculate, convert unit, and display the values of speed using LCD. Once, the speed is exceed the speed limit set in the program, the alarm will trigged and the values of speed set to be blinking.

The power supply of the circuit is from the motorcycle battery or the DC jack power. The 240 Vac will be use as supply by step down the voltage using transformer adapter, AD-UT-500. The output range the voltage transformer adapter is from 1.5-12volt. The battery of motorcycle is already in DC, it is can be use direct to the circuit board. On the PIC board, the voltage regulator can regulate voltage with range 7-18volt DC input. The motorcycle's battery is only 12volt DC. The battery will be charged by the motorcycle coil and magnet (electric generator) in the engine. As long as the motorcycle is in good condition, it can be use to supply power to the PIC board.

Generally, this project is to produce a product that can help rider's awareness. The alarm approach can help riders to be more alert as the speed is exceed the limit. Once the rider on the high speed, the risk and probability of an accident happen is high, so, this product help the rider to alert and more aware on the road. Furthermore, the riders can avoid summon from police speed trap by slowing down their motorcycle.

1.2 Project Objective

The major objective of this project is to develop a speed measurement device that displays the speed value on the helmet's visor. The product consists of 3 main parts which is input, process and output. The input part will be attached near to the wheel, process part in the motorcycle body and the output part will be attached on the helmet's visor. The combination of these three parts wills completely called helmet digital speed measurement display with alarm. More specific objectives include:

- To design the helmet that display motorcycle's speed.
- To trigger the alarm if the speed is exceed certain speed limit.

In general, this project is conducted based on motivation towards a effort to create a new product by apply the simple and basic knowledge on the project. It intends to demonstrate the abilities and advantages as the new speed reading value.

1.3 Project Scope

Generally, the project scope is to build the hardware (product), produce the programming that suitable, and construct the experimental process to ensure the product well function. The product must be reliable to implement into the motorcycle as the speed measurement display. The focus is to fulfilling the objective by integrated the input, process, and output part in one product.

The scope target of this product is only for Yamaha LC 135. The product will be implemented in this motorcycle as it will be use during the troubleshooting, experimentation and for demonstration.

1.4 Problem statement

Motorcycle mostly expose to the danger and accident. An accident could occur because of the rider itself or others riders behavior. In order to decrease the risk and probability of accident happen riders need to aware of safety on the road, follow the rule and tolerate. Sometimes, riders forget about their safety, riding too fast exceed the speed limit and careless on the road. This behavior could higher the risk and probability of accident to happen. Specific problem statement:

- Rider visions are limited and it is hard and dangerous to see the speedometer especially during the night and rainy days.

- The rider will not notice when their motorcycle speed is exceeding the limit because, there is no indication or warning device on the motorcycle.

These problems mostly contribute the idea to develop a product that could lower the risk and probability of an accident to happen. By implementing a warning device, it could help riders to be aware about the speed limit, hence reduce the risk and probability of an accident to happen.

1.5 Organization of the Report

This project report is organized in the following order. First, the literature review is presented in Chapter 2. The literature reviews includes the supporting idea and strengthen the idea for this project. Chapter 3 explained the flow of the project including the hardware work flow, and software design work flow. The following chapter, Chapter 4, presents the result, analysis and discussion. Finally, Chapter 5 presents the conclusions and the future research of this project.

CHAPTER 2

LITERATURE REVIEW

2.1 Road Accident Statistic

The total number of accident cases happen in Malaysia for year 2007 is 363,319 cases consist of 33999 cases accident with injury. The year 2006 with 341,252 accident cases, follow by year 2005 with 328,264 cases, year 2004 with 326, 815, 2003 with 298,653 and the year 2002 with 279,711 accident cases [6]. The number accident cases increase by year.

Table 2.1: Statistic accident cases with injury for every classes

	Rider	Back riders	Total
Motorcycle	18151	3124	21275
Car, bus , van, 4WD, bicycle	5626	4071	9697
Walkers	-	-	2738
Others	176	113	289
			33999

The table above shows, 21275 accident cases involves the motorcycle, followed by car, bus, van 4WD and bicycle accident cases. The walker's accident cases with injury are 2738 cases. 289 accident cases is other accident. The motorcycle is the highest accident cases with injury because, if motorcycle involve in an accident, the riders will fall and injured. The probability having injury if involve in an accident is higher compare to car, bus, van or 4WD.

The most factor of an accident occurs is driver driving fast exceeding the speed limit. The fast driving is dangerous and lead to losing car control especially during rain. No warning signboard also the causes the driver to drive faster than the road speed limit [7]. The fast driving is very dangerous because it is hard to control the car especially during the rain and also night. No speed limit sign board is the causes of accident to happen too.

The road accident that involved motorcycle are because of human factor like careless, not expert in handling the motorcycle and also fast riding the motorcycle [8]. Careless and fast riding is always being a factor that leads for an accident. Fast riding will increase the risk and probability of an accident to happen, as to prove the result of this statement, statistic from the police always show motorcycle is the highest involve in accidents.

The maximum speed on the road for vehicle on the highways is 110km/h not including heavy vehicle. However the government always implements 85% of the speed maximum speed limit (90km/h or 93.5km/h) to be the safe speed for all vehicles. In town there are many road speed limit signboard depend of the location. In the main road the speed limit could be 90km/h, in the heart of town is 60km/h, and in the village road is 40km/h for the speed limit [9][10].

In the Road Transportation Act, Act 333, driving beyond the speed limits is the again the Law of Malaysia for section 4(40) [11]. The driving beyond of the speed limit can be charge RM300 maximum by the police traffic or if detected by the speed trap.

2.2 GPS

Global Positioning System (GPS) is not only a navigation system, it is also a time-transfer system. As a time-transfer system is provide stability very close to one part in ten to fourteenth over one day (1 ns/day) [2]. The time-transfer system of GPS can apply for the speed measurement speed. The entire new GPS device display speed value and the coordinate. This the best about GPS device that could be use in the helmet digital speed measurement display with alarm.

The accuracy of GPS position is primarily dependent on the satellite position, signal delay, and various environment noises such as ionospheric delay effect, ephemeris errors, satellite clock error, multi-path distortion, tropospheric delay effect and numerical errors [3]. The usage of GPS application in measurement speed device might not accurate in the town because of noise is every way.

Figure 2.1: GPS device with speed display

2.3 Giant Magneto Resistor Sensor

Wheel speed sensor using GMR (Giant Magneto Resistor) technology for speed measurement which the sensor is place in the wheel. GMR offer the highest sensitivity compared to the other technology for speed measurement [1]. These sensors use the same method by having high pulse and low pulse clock for speed measurement with fixed distance. By using the time interval and fixed distance of magnet, the vehicle speed can be calculated.
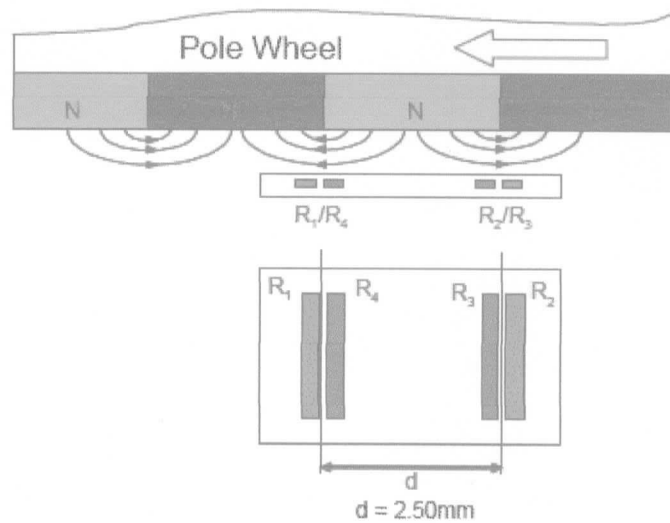

Figure 2.2: Application of magnet in the speed measurement on the wheel.

2.4 Laser Radar

The time interval measurement electronic form the hearst of a laser device placing limitation on its ultimate performance in terms of precision, linearity and stability. The time interval between two pulses, a start pulse and a stop pulse can be measure analogically, digitally or an interpolating method [4].This paper is about the time interval measurement using laser radar where, the application into speed measurement of motorcycle since the distance of two pulses is fixed.
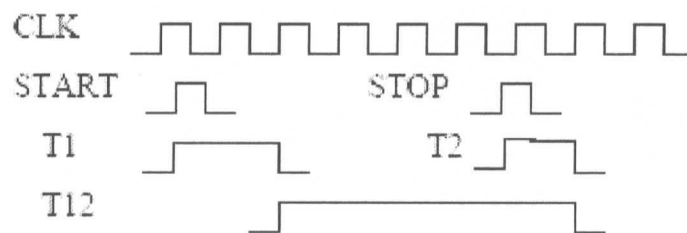

Figure 2.3: Time interval of two pulses with fixed distance.

2.5 Infrared Sensor

The infrared sensor (IR LED) is use for counting the revolution which can apply for calculation the vehicle speed. This sensor can be used to measure the speed of object moving at a very high speed, like in industry or in tachometers. The basic idea is to send infra red light through IR-LEDs, which is then reflected by any object in front of the sensor [11]. The advantages of this infrared sensor, it is cheap and can detect high speed. It is also easy to find in the market. However it only work well in short distance of transmitter and receiver.