UNIVERSITI TEKNIKAL MALAYSIA MELAKA

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MOTORCYCLE ACCIDENT ALARM SYSTEM BY IMPLEMENTATION OF ELECTRONIC CONTROL UNIT (ECU)

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Electronics Engineering Technology (Industrial Electronics) with Honours.

By

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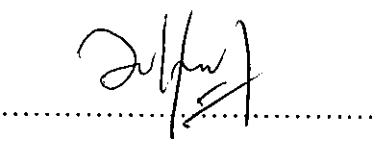
This report is submitted to the Faculty of Electrical and Electronic Engineering Technology of UTeM as a partial fulfillment of the requirements for the degree of Bachelor of Electronics Engineering Technology (Industrial Electronics) with Honours. The member of the supervisory is as follow:



(Project Supervisor)

ABSTRAK

Kajian ini bertujuan untuk mengurangkan peratusan kemalangan yang gagal dikesan dengan menambah baik sistem yang sedia ada pada Unit Kawalan Elektronik. Kaedah untuk menjalankan projek ini bermula dari pemilihan tajuk, kajian literatur, menentukan masalah, analisis hasil perbincangan dan akhirnya kesimpulan. Objektif projek ini adalah mengesan kemalangan motosikal dengan lebih cepat dan tepat dengan menghantar isyarat melalui sms beserta lokasi dimana kemalangan itu terjadi.

ABSTRACT

This study aims to reduce the percentage of failures that fail to detect by improving existing systems at the Electronic Control Unit. Methods for carrying out this project start from title selection, literature review, methodology, design the system and hardware selection. The objective of this project is to detect of motorcycle accident faster and precisely with the accurate location tracking by sending an information via SMS along with the location where the accident occurred.

DEDICATION

This study is wholeheartedly dedicated to my beloved parent, who have been our source of inspiration gave me strength when I thought of giving up, who continually provide their moral, spiritual, emotional and financial support.

To my brother, sisters, relatives, mentor, co-supervisor, friends and coursemates who shared their words of advice and encouragement to finish this Bachelor Degree Project.

And lastly, I dedicated this thesis to the Almighty God, thank you for the guidance, strength, power of mind, protection and skills and for giving me a healthy life. All of these, I offer to you.

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In the accomplishment of this project successfully, many people have best owned upon me their blessing and the heart pledged support, this time I am utilizing to thank all the people who have been concerned with this project.

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LIST OF ABBREVIATIONS, SYMBOLS AND NOMENCLATURE

ECU	-	Electronic Control Unit
VDS	-	Vehicle Down Sensor
GSM	-	Global System for Mobile communications
CPU	-	Central Processing Unit
PCB	-	Printed Circuit Board
EPROM	-	Erasable Programmable Read-Only Memory
EMS	-	Engine Management System
CDI	-	Capacitor Discharge Ignition
AC	-	Alternating Current
DC	-	Direct Current
ATV	-	All-terrain Vehicle
CANbus	-	Controller Area Network
TDMA	-	Time Division Multiple Access
SMS	-	Short Message Service
IC	-	Integrated Circuit
NMEA	-	National Marine Electronics Association

CHAPTER 1
INTRODUCTION

1.0 Overview

In this chapter,will be explain about background of the study, problem statements, objectives, scope, project implication and conclusion as well as the limitation to completing this project. To make this study more structured in terms of writing, so the organization of this report will be explained briefly.

1.2 Project Background

Malaysia is one of the Southeast Asian countries where motorcycles are the major transport to the workplace, where the second highest number after the car has been registered. The biggest reason for this reason is due to the low cost of fuel consumption, low maintenance cost and time savings to a target. In contrast to other car users sheltered behind the "cage," motorcyclists are exposed to the environment and to any serious accident or even small hazard of injury.

The Electronic Control Unit (ECU) has been used by most engines today as ' brain ' for the motorcycle industry itself. It controls the oil consumption, gives smoother and responsive throttle response, no need for manual choke operation in cold start. In addition, various sensors connected with the ECU to make a motorcycle engine operate well and effectively. One of the sensors connected with the ECU is the Vehicle Down Sensor. It works as a security system, which when the motorcycle position is in a state of fall, the sensor will be triggered then the engine will automatically shut down.

1.3 Problem Statement

Accident is an uncertain thing where and when it will happen. Particularly accidents involving motorcycles and are likely to experience short circuit and leaks on oil tanks that will likely endanger riders and ponies. More worrying if the accident was not realized and detected by the heir or the people around him during a dark night. Therefore, the relationship between the sensor, the Electronic Control Unit and the GSM makes it a more effective and useful security system that can at least save the lives of our loved ones.

1.4 Objective

Several objectives need to be achieved. These are follows:

- To turn off the engine during an accident when it falls either left or right.
- To detect an accident happening faster along with precise location.
- To warn and alert the people around which the accident occurred.

1.5 Scope

They are three scopes that will be carried out. These can be explained in this following point:

- The sensors used in this project are Vehicle Down Sensors (VDS).
- Electronic Control Unit as a drive to send alert signals to the heir or the nearest person.
- The signals and data transmitted are using the Global System for Mobile Communications (GSM) medium.

CHAPTER 2
LITERATURE REVIEW

2.0 Introduction

This chapter will cover about the literature review which will describe briefly about slightly about Electronic Control Unit (ECU). Other than that, this chapter will also describe Vehicle Down Sensor (VDS), the comparison between Vehicle Down Sensor (VDS) and Car Crash Sensor.

2.1 Electronic Control Unit (ECU)

The world today is heading towards advanced technology which is applied to all aspects. Along with the Industry 4.0 revolution which has changed the system as a technological capability that does not necessarily involve human beings directly. The problem of labor dependency can be reduced in order to change the future of the work world. never missed the automotive field, a huge change has occurred over the last decade. If the technology used to use a carburetor system as a 'pulse' for a car or a motorcycle. Now that 90% of vehicles on the road today have used the Electronic Control Unit (ECU) system as 'pulse' which has many advantages over the carburetor system.

2.1.1 History of Electronic Control Unit (ECU)

Before the introduction of electronics in the automotive sector, automobiles were seen as mechanical machines. Each component was a mechanical component working on mechanical gear and mechanical concepts, from the motor to the window, steering to brake. The mechanical systems were minimal and reduced in their precision, which not only resulted in undetected failures, but also threatened the lives of consumers. These parameters made it possible to achieve a great deal of innovation in the automobile industry. In the end, electronics were widely introduced in the automobiles component and system. An Electronic Control Units (ECUs) were implemented in the automobile industry in 1970, and since then, automobiles, from a fully mechanical to a dominant electronic system, have played a huge role in reproduction. More than 100 ECUs are implemented or built into current day automobiles.

Like today as we can see, motorcycles now come with some high tech technical features. So hi-tech machines are controlled by electronic programmable digital controllers such as ECUs.

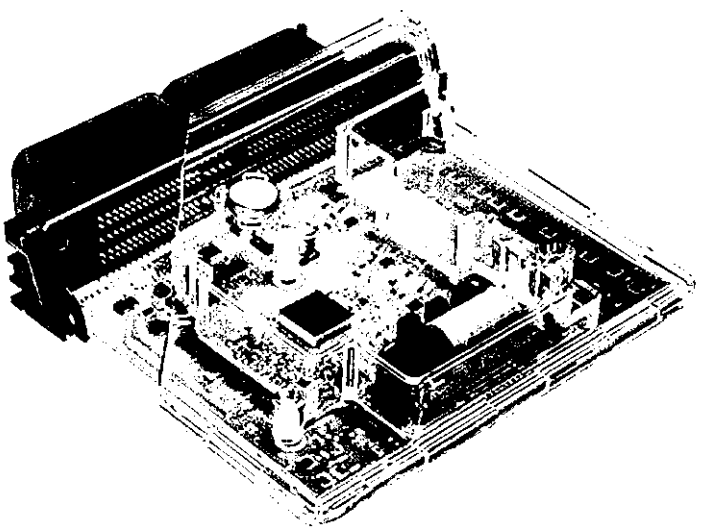

Figure 2.1: Physical unit of basic an ECU.

Modern ECUs use a microprocessor that can structure motor sensor input in real time. The device and system software (firmware) is included in an electronic control unit. The technology is made up of electronic components on a Printed circuit board. A microcontroller chip (CPU) is the main component of this circuit panel. The software can be saved on a Microcontroller and other PCB chips, usually in EPROMs or Flash-Memory, so that the updated code can resoft the CPU. This is also labeled an Engine Management System (EMS). Previous ECU manufactures based more on analog computer circuits, because speed storage is no problem for analog circuits. Digital electronics and embedded discrete components systems were only made fast enough to process engine parameters in real time around 1987[1].

2.1.2 Type of ECU

Electronic Control Units (ECU) are a popular term for every integrated device that regulates one or more of the engine system electric structure or subsystems. Types of ECU is include :

a. Electronic/engine Control Module (ECM)
b. Powertrain Control Module (PCM)
c. Transmission Control Module (TCM)
d. Brake Control Module (BCM or EBCM)
e. Central Control Module (CCM)
f. General Electronic Module (GEM)
g. Body Control Module (BCM)

There are up to 80 ECU's in some contemporary automobiles. The number of lines, completeness and intelligence of the ECU embedded systems rises. The management of the growing specificity and number of ECU's in a automobile has been a significant barrier for the manufacturing companies of original equipment[2].

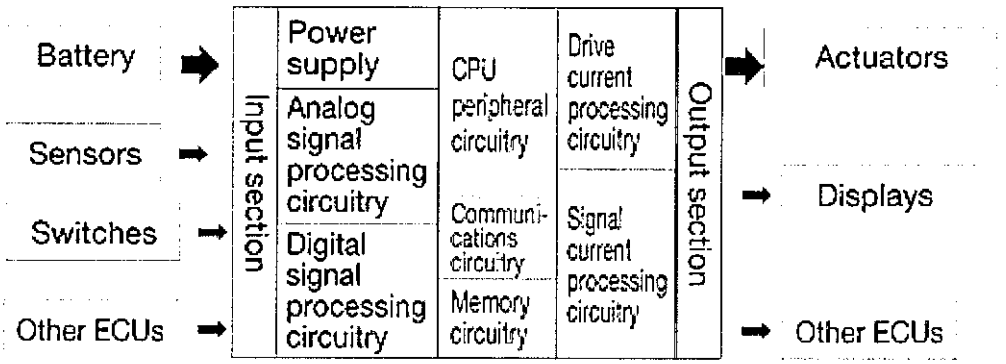

Figure 2.2: Block diagram of an ECU

2.1.3 Features of Electronic Control Unit (ECU) in motorcycle

An electronic control unit (ECU) is also commonly referred to as an internal combustion engine control module, an electronic control unit which controls a number of actuators such as an air sensor and a fuel sensor. The mechanical and pneumatic techniques used before ECUs have been used to control air-fuel mixture, inflammation time, and acceleration.

Generally, the ECU engine monitors fuel injection, and the spark's timing to ignite it in petrol engines. The position of the engine interior is decided by means of a crankshaft position sensor to trigger essentially the injectors and the ignition program. A huge air pump is an internal combustion engine that use fuel itself. When the air is ingested, there has to be that much fuel to obtain power to keep the engine going while a useful volume exists to riding the motorcycle when possible. A' mixture' is called this combination of air and fuel. Too much mixing and the engine is too little, and the motor cannot power itself or the car.

There is no ECU or ECM applicable on normal motorcycles such as low capacity or low-power trainers or even only limited electronic chips like CDI (capacitor release engrossing) but also separately, which are pre-programmed mechanically and which are controlled mechanically[3].

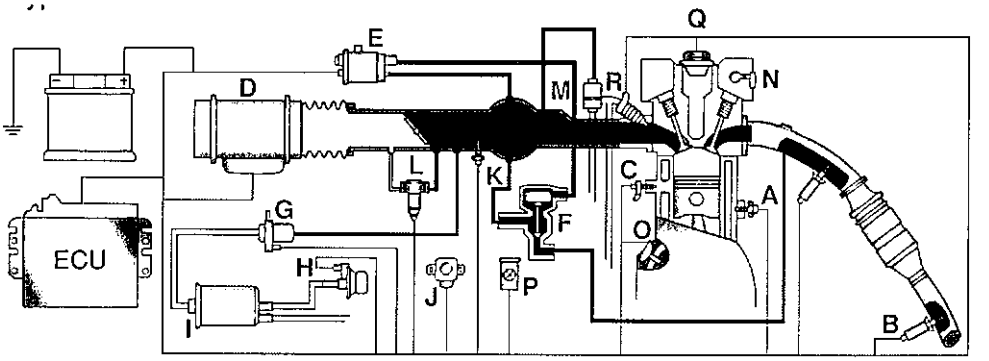

Figure 2.3: The parameter and sensor of ECU control system.

In this project, the scope that has been stated does not involve other large functions as in modern cars today. This is because motorcycles have far more limitations. For example, the most preference of most motorcyclists is the use of fuel that focuses towards saving without reducing the performance of a motorcycle. The valves are tiny electronically regulated docks in the tank that spray petrol as many times a second in the tank upstream across each gas chamber[4].

The motor control system and inner circuitry are so complex that the diagnostics of automobile problems are hard work for most. In the inner surveillance system and feedback of the motor control unit (ECU), the gun location sensor (TPS) is a characteristic. The throttle location detector is one of these devices. This detector tracks throttle position steadily and gives reviews to the ECU, as its name indicates. The throttle is a valve which regulates the amount of oxygen a fuel motor receives. It chooses that much air a engine "breathes"[5].

2.2 Vehicle Down Sensor (VDS)

VDS or Vehicle Down Sensor is a sensor that functions as a safety sensor used on most modern motorcycles today. It is positioned under motorcycle seat not far from ECU position. VDS is very efficient and easy for troubleshooting. This sensor will trigger when it is tilted at certain angles. For example, most accidental motorcycles will down to the left or to the right. So the angle of collapse has been reached and this sensor will be triggered then will send input to the ECU. The ECU will then read the sent input data which will turn off the motorcycle engine directly as a safety measure.

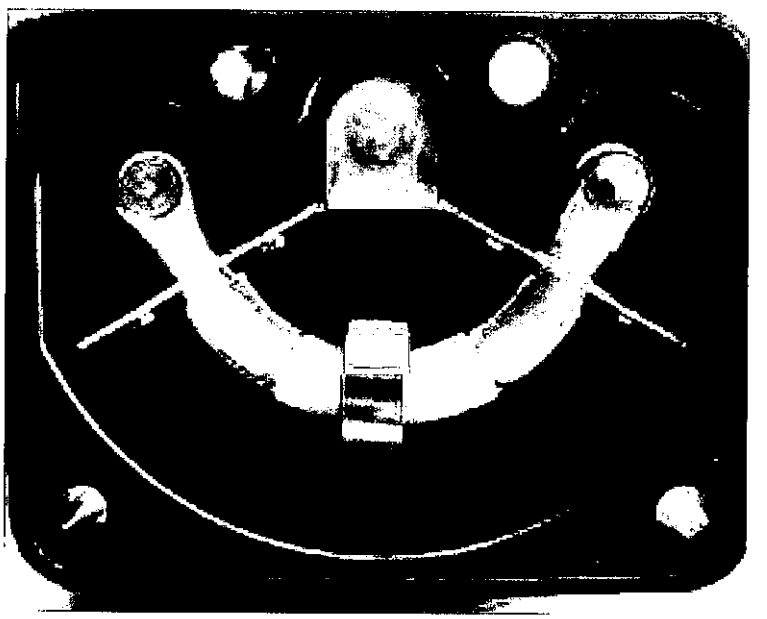

Figure 2.4: The physical of VDS.

Based on the figure above, there is a sensor circuit whose mechanism uses the tilt level, it is like a 'ring' in one coil. When the 'ring' moves from its original position and touches on either side right or left, it will respond quickly. Only one sensor unit can be mounted, and only vehicles powered by the ECU can be mounted. Most motorcycle accidents that apply either violated or otherwise violate other vehicles will be in a lying position where VDS is easy to detect accurately and quickly.

2.3 Vehicle Crash Sensor

2.3.1 Air Bag Crash Sensor

In milliseconds, crash detectors may identify and transform a crash to useful measurements The speeding forces that act on detectors after a crash may be up to 100 g (100 times the gravity strength of the Earth). Once a vehicle is hit by an effect suddenly, the effect velocity will proceed to travel at all the cars or items that are not strongly attached. The sensors evaluate this speed and transmit it as valuable information to the control system. Almost all of in our own vehicles on the road have high-speed force detectors located at the front doors. This devices identify a side crash, which forces the outside bumper inside and creates massive surplus stress. Speed detectors are also equipped close to C-pillars to detect lateral accidents that do not deform the front doors [6].

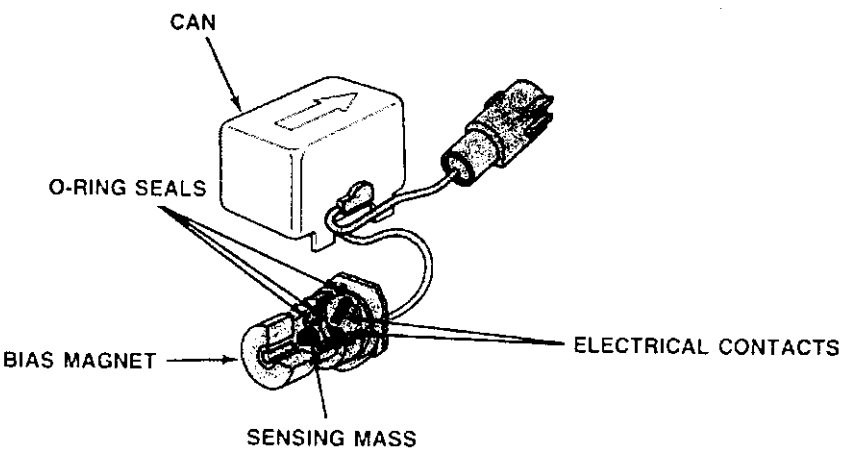

Figure 2.5: The Crash Sensor

Only the control scheme is as nice as an airbag. The bag is opened electrically on most cars. There are one to three crash detectors on the front of most public cars. In the crushed areas these are placed forward and almost immediately respond to the instant deceleration caused by frontal effect (almost 30 degrees on both sides of the core). In the passenger compartment, many European cars use just an electronic collision detector. In many new national cars, the same configuration is now used. A few kinds of crash detectors