CHAPTER 1

INTRODUCTION

1.1 PROJECT BACKGROUND

Safe driving is a major concern of societies all over the world. Thousands of people are killed, or seriously injured due to drivers falling asleep at the wheels each year. Driver drowsiness (‘falling asleep at the wheel’) is a major cause of road accidents, accounting for up to 20% of serious accidents on motorways and monotonous road. Therefore it is essential to develop a safety system for drowsiness related road accident prevention.

Many methods have been develop and some of them currently used to detect the driver drowsiness such as measurements of physiological feature like eeg, eyelid movement, gaze and head movements, are considered as a ways for monitoring alertness.

Sleep is divided into two broad types: rapid eye movement (REM) and non-rapid eye movement (NREM or non-REM) sleep, REM sleep was divided into four stages in the Rechtschaffen and Kales (R&K) standardization of 1968. Rapid eye movement sleep (REM sleep) is a normal stage of sleep characterized by the rapid and random movement of the eyes. This drowsiness occurs in stage one of NREM sleep.

According to the 2007 AASM standards, NREM consists of three stages. There is relatively little dreaming in NREM. Stage N1 refers to the transition of the brain from alpha waves having a frequency of 8–13 Hz (common in the awake state)
to theta waves having a frequency of 4–7 Hz. This stage is sometimes referred to as somnolence or drowsy sleep. Sudden twitches and hypnic jerks, also known as positivemyoclonus, may be associated with the onset of sleep during N1. Some people may also experience hypnagogic hallucinations during this stage. During N1, the subject loses some muscle tone and most conscious awareness of the external environment.

Stage N2 is characterized by sleep spindles ranging from 11 to 16 Hz (most commonly 12–14 Hz) and K-complexes. During this stage, muscular activity as measured by EMG decreases, and conscious awareness of the external environment disappears. This stage occupies 45–55% of total sleep in adults.

Stage N3 (deep or slow-wave sleep) is characterized by the presence of a minimum of 20% delta waves ranging from 0.5–2 Hz and having a peak-to-peak amplitude >75 μV. (EEG standards define delta waves to be from 0 to 4 Hz, but sleep standards in both the original R&K, as well as the new 2007 AASM guidelines have a range of 0.5–2 Hz.) This is the stage in which parasomnias such as night terrors, nocturnal enuresis, sleepwalking, and somniloquy occur. Many illustrations and descriptions still show a stage N3 with 20–50% delta waves and a stage N4 with greater than 50% delta waves; these have been combined as stage N3. From that we can said that drowsiness occurs in stage one of NREM sleep which is the beginning stage of sleep.

The drowsiness can be divided in two category firstly imaging processing and secondly physiological signal defection. In this research I choose the second method that used physiological signal defection.

The purpose of this research is to build one system that can be used to detecting force from the driver through their hand that hold to the steering. This force can be detected by using force sensitive resistor (FSR) that implement on car steering. [1]
1.2 PROJECT SYNOPSIS

The new system has been introduced, to make sure the accident which occurred by driver drowsiness can be reduce from time to time. This force sensitive resistor is defining an analytical device for the detection of an analyte that combines a biological component with a physicochemical detector. This sensor can detect the force from the driver hand and we can know whether the driver sleepy or not, from that if the driver grip force was loose the data will sent to the system and warned a driver, force sensitive resistor ensure that the grip force can be detected.

1.3 PROBLEMS STATEMENTS

The problem that I face to complete this research was I need to study the behaviour of male and female driver hold the steering in Malaysia during day, between ages 20-30 years old. This project more towards male driver because of male always travel far and drive in a long period of time, because of that accident always occurs among male driver compare to woman.

Then I need to define where is the best place to implement a sensor at steering that can easily detect the grip force of drivers.

Other than that I need to take a sample two male and female driver in Malaysia to do an experiment about their grip force, from that I can know the grip force when driver experience the drowsiness.

1.4 PROJECT OBJECTIVES

The purpose of this study basically required students to reduce drowsiness among driver in Malaysia. Hence, objective of this project are:

I. To implement a sensor at steering based on the behaviour of drivers based on grasping steering wheel behaviour to detect driver drowsiness.
II. To study grip force when driver experience drowsiness.