# ALARM SYSTEM FOR SLEEPY DRIVER

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**Tajuk Projek** : ALARM SYSTEM FOR SLEEPY DRIVER

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## ABSTRACT

Recently, traffic accidents have been a serious concern to society. This paper proposes a new approach to detect the eyes opening state for the purpose of alarming drowsy drivers. The input from a sensor is processed in successive steps using a PIC. The programming for the PIC, regardless the period time of eye lid closing and determine the decision whether to give or not an alarm to the driver.

# ABSTRAK

Kebelakangan ini, kemalangan trafik menjadi semakin serius sehingga mendatangkan keresahan di kalangan masyarakat. Kertas kerja ini mengusulkan satu kaedah baru untuk mengesan situasi keadaan mata umtuk di usulkan menjadi sistem penggera kepada pemandu kereta yang mengantuk. Input daripada sensor akan di process dengan sendirinya melalui beberapa langkah mengunakan PIC (Programmable Interface Controller). Program untuk PIC, begantung kepada jangka masa mata manusia tertutp dan di tentukan samada untuk memberi amaran ataupun tidak kepada pemandu kereta.

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# CHAPTER 1

# INTRODUCTION

## 1.1 Introduction

This daytime sleepiness occurs constantly throughout the day and leads to individuals falling asleep, not only during sleep inducing tasks, such as reading or watching television, but also often whilst eating, talking or driving[1].

The alarm system for sleepy driver is a system to prevent a drowsy driver from getting an accident cause by eye lid closing for long time period. These alarm systems are capable of giving an alarm (sound) and physical warning (water splashing). The system will use a sensor to detect the close and open of human eye and count the period time of eye lid close and determine it to give an warning or not.

The development of this system intended to obtain measure of eye closure is the main focus of this paper.

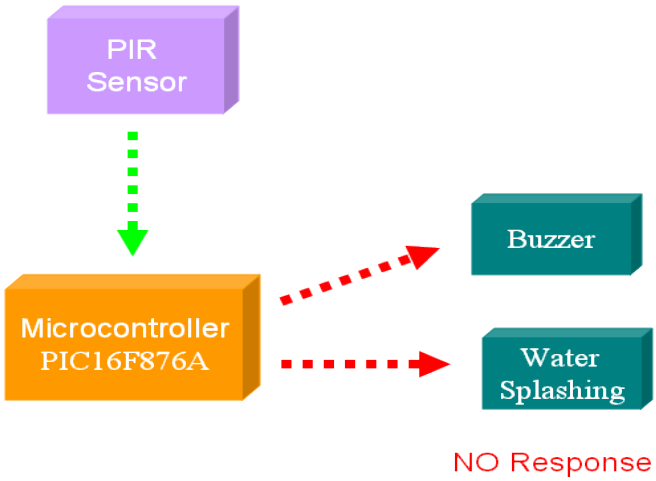


Figure 1.1: System's Concept

## 1.2 **Objective**

The main objective of this project is to design and fabricate a system that can give an alarm to drowsy driver which has to happen in during driving session. This means that, when the driver feel sleepy, it will be determine whether to give an alarm so that the diver notice that he/she is not in aware condition.

To achieve this, a PIR sensor will be use as a device to receive a signal input from the driver. Then, the sensor will be communicated with the PIC. This second objectives was to study the PIC programming for the timing of between the alarm and water splashing

The last objectives of the thesis are to studies an alarm system already been study by others and product in the market similar with this project. Even though there have been many researches done on this topic, the main aim is to control the timing time sequentially and effectively.

## 1.3 Problem Statement

As we all know, each year the cause of death for sleepy driving is increased. To drive a vehicle in aware condition are important to ensure the driver are safe enough to reach he/her destination.

There is a lot of factor of driver feel sleepy during driving session but the sleepy driving are more dangerous among all factor because the driver is not in an aware condition to control any vehicle.

Limitation of this project is when the driver move from the initial condition the alarm system for sleepy driver will be not fully function or will not be accurate as usual.

## 1.4 Work scope

This project basically uses a sensor that detects the eye movement. I will use a circuit that contains a PIC (Peripheral Interface Controller) as a brain to control all the system. Input for this system will be the human eye; a sensor will detect the lid of the eye movement (if the eye closed) and send a signal through to the PIC.

PIC will react after receive a signal that tell an eye are closed and will make the L.E.D and alarm give a warning to the driver to stay aware to the driving session. Meanwhile alarms (audio) that will be use in this system are the buzzer. Initially, the system sounds a warning alarm and splashing water. This system will be applied on the dash board in front of driver.

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## 1.5 Thesis Structure

This report contains of five chapters that explain the details about this project. The first chapter is the project introduction. This chapter contain of project introduction, project objectives, project problem statement, and project work scope.

The second chapter is the literature review which contains the findings of the research regarding the topic of giving an alarm to driver. The project concept that will be done was explained briefly in this chapter such as the types of sensor, component use, micro controller and others.

The third chapter is the Project Methodology. This chapter will explain the project framework from the beginning until it is completed. Flowchart for each of the development was attached for better understanding.

The fourth chapter will be on the current results of the project. This means that the project ware still not finish and are still in development. This chapter will show that what have been done for this project and what have not, possible problems and solution for the problems occurred and others.

The last chapter is about project application of the project, discussion and conclusion of the project. This chapter also contain of suggestion to improve this project for future works. The overall conclusion of this project showed.

# CHAPTER 2

# RESEARCH BACKGROUND

## 2.1 Literature Review

In order to execute this project, literature review must be done to comprehend the whole system and decide the best inputs, outputs and devices. From literature review, there will be an analysis concerning the advantage and disadvantage for each phase in this project. Equipment and part manuals include information such as dimension, operation and specification.

## 2.2 Automatic Eye Detection and Its Validation

In this paper, they first propose a new real time automatic eye detection method. An automatic eye detection algorithm is therefore needed for a fully automatic face recognition system.

### 2.2.2 Brief Review on Automatic Eye Detection

There are two purposes of eye detection. One is to detect the existence of eyes, and another is to accurately locate eye positions. Under most situations, the eye position is measured with the pupil center. There are two purposes of eye detection. One is to detect the existence of eyes, and another is to accurately locate eye positions. Under most situations, the eye position is measured with the pupil center. Current eye detection methods can be divided into two categories: active and passive eye detection [1].

The active detection methods use special types of illumination. Under IR illumination, pupils show physical properties which can be utilized to localize eyes [1]. The advantages of active eye detection methods are that they are very accurate and robust. The disadvantages are that they need special lighting sources and have more false detections with an outdoor environment, where the outdoor illumination impacts the IR illumination.

Figure 2.2.2(a): Face and Eye Detection Results

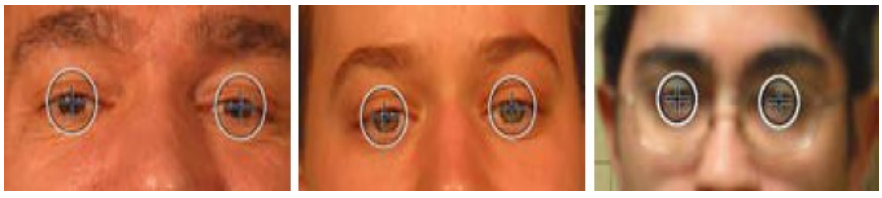

Figure 2.2.2(b): Enlarged Eye Localization Results

## 2.3 Efficient Measurement of Eye Blinking Under Various Illuminations Conditions for Drowsiness Detection Systems

In this paper, they propose an efficient way of measuring the level of eye blinking under various illumination conditions (such as day and night) for drowsiness detection systems which use a single camera. Determining the level of drowsiness by using eye blinking, it is an important way of detection eye positions and measuring eyelid movements. For robust eye detection under various illumination conditions, they propose a simple illumination compensation algorithm and a novel way of measuring of eyelid movements.

In order to estimate the performance of the proposed methods, they collected video data during real driving situations under various illumination conditions, such as during the day and during the night. Experimental results demonstrate an average eye detection rate of over 98% and an accurate measurement of eye blinking when using the proposed drowsiness detection system.

### 2.3.1 Extraction of Eye Candidates

They use an infrared image that remained stable regardless of whether it was used during the day or at night. The camera lens with an infrared band-pass filter as shown in Fig.1 removes all visible light and only allowed infrared light in. The use of an infrared image has some advantages [2]. The light source of infrared light is sunlight during the day and Infrared Light-Emitting Diodes (IR LEDs) during the night or on cloudy days when infrared light is not abundant.

On the other hand, depending on the position of infrared light source in relation to the position of the camera, the pupil reaction can be represented differently [2]. Figure 2.3.1(b) represents a general principle used to generate pupils which appear dark under

both day and night illumination conditions. Only a small amount of sunlight flows into the camera. This is because most sunlight is scattered in all directions. Therefore, pupils that appear bright may not really be clear during the day while pupils that appear dark may actually be clear. Therefore, with this system, only pupils that appear dark can be used during both the day and the night. A camera is installed on the dash board and two infrared illuminators are installed on the ceiling of car as shown in Figure 2.3.1(b).

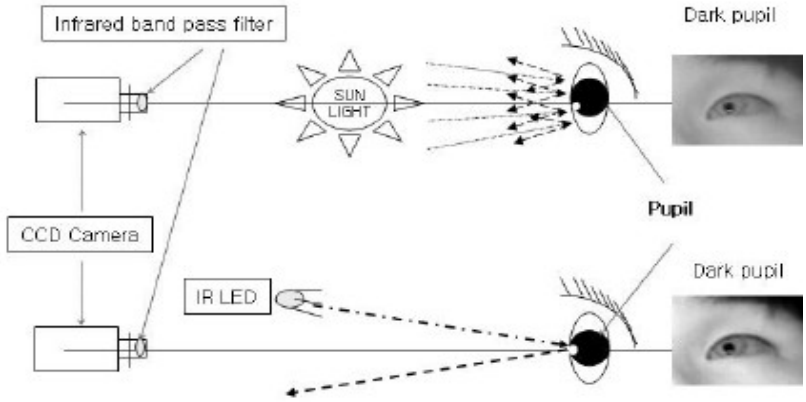


Figure 2.3.1(a): Generation of Dark Pupils That Appear Dark during both the Day and the Night [1].

Figure 2.3.1(b): Configuration of the Camera and the Infrared Illuminators [1]

Meanwhile, the input video includes not only the driver's face but also the background (which showed parts of the vehicle as well as scenery outside the car). In order to measure eye blinking under the rapidly changing circumstances, eye detection must first take place. For this, eye corner filter is a fast and reliable preprocessing method [2].

### 2.3.2 Eye Verification

In this paper, the eye verification is performed by cascaded SVM, which represents the cascade form of a Support Vector Machines (SVM). Filtered candidates of eye region (obtained by the eye corner filter) are classified into eye groups and non-eye groups by hand for the configuration of classifiers.

Eye groups are again separated into open eye groups and closed eye groups. Therefore, the cascaded SVM is used for two classifiers in this paper; open eye classifiers and closed eye classifiers. If open eyes are detected by the open eye classifiers, eyelid movements could be measured. However, if open eyes are not detected by the open eye classifiers, closed eyes are sequentially detected by the closed eye classifiers, in order to measure eyelid movements.

If closed eyes are also not detected, the current frame is ignored for the eye detection because there are no proper eye regions [1]. It is sometimes possible to obtain open eye and closed eye regions within the same feature space. This leads to many false representations because closed eyes and horizontal edges are very similar. Therefore, cascaded SVMs are configured respectively for open eyes and for closed eyes. On the other hand, to measure eye blinking, the measure of eyelid movements has to be measured [1]. Based on the detected eye position, we propose a novel way of measuring eyelid movements.

This can be represented by the sum of the angles between the two eye corner points and the top point of the upper eyelid as Figure 2.3.2. The open degree of the eye is shown in Equation 3. The eye state to measure eye blinking is determined by the threshold for the Degree (Eye). This approach offers the scalability and consistency for eye blobs.

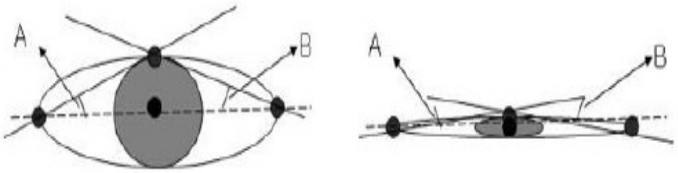


Figure 2.3.2: The Measurement of Eyelid Movements: (a) The Measurement of an Open Eye [1] And (b) The Measurement of A Closed Eye [1]

## 2.4 Invent Hub Product

When driver want to refresh he/she just need to press the button and a mist of cold fresh water will spray at their face and he/she will instantly refresh and awake they[3]. This product consist a push button attach near by driver and a tank of water attach near the of car acceleration paddle.


Figure 2.4: Cool and Safe From Invent Hub Product [3]