VEHICLES ACCIDENT PREVENTION SYSTEM

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Special Dedication for My Lovely Mother and Late Father

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ABSTRAK

Projek ini bertujuan untuk mengaplikasi sistem keselamatan untuk mencegah kemalangan yang melibatkan kenderaan bermotor seperti kereta dan lori terutamanya apabila pemandu dalam keadaan mabuk dengan menggunakan pengesan alkohol dan konsep pengesan nafas beralkahol ataupun biasanya dikenali sebagai breathalyzer iaitu system yang mampu memantau kepekatan alkohol dalam darah seseorang. Produk ini boleh mengesan kehadiran molekul alkahol dari sampel nafas dan memaparkan keputusan merujuk kepada kepekatan alkohol yang dikesan sekaligus memberi amaran kepada pemandu. Dalam projek ini, rekabentuk projek ini meliputi pembangunan modul peranti keras dan modul peranti perisian. Modul peranti keras terdiri daripada litar pengesan, litar PIC mikrokontroller, litar LED dan litar amaran. Pembangunan perisian pula meliputi pengaturcaraan kepada PIC mikrokontroller dengan menggunakan pengaturcaraan PIC C. Semasa ujian, pengesan nafas beralkohol boleh mengesan kehadiran alcohol daripada sampel nafas. Sampel nafas tersebut dianalisis dan nilai dipaparkan dalam unit Blood Alcohol Concentration (BAC). Berdasarkan kepada nilai nafas beralkahol yang telah dikesan, sistem ini akan beroperasi dengan serta merta sekaligus dapat memberi amaran kepada pemandu yang berada dalam keaadan mabuk untuk tidak meneruskan pemanduan melalui amaran dan LED akan mempamerkan tahap alcohol untuk pemandu yang mabuk.

ABSTRACT

This project aims to apply the warning system to prevent accidents which involving vehicles such as cars and trucks when the driver was drunk by using the detection of breath alcohol detector's concept or, more commonly known as a breathalyzer system that can monitor the person's blood alcohol concentration. This product can detect the presence of alcohol molecule in the breath sample and displays the results by referring to the alcohol concentration are detected from the driver once the driver want to start to drive the vehicles. In this project, the design of this project includes the development of hardware and software as the device modules. Hardware part includes of the sensor circuit, the PIC Microcontroller circuit, LED circuits and Buzzer as the alarm circuits. Software part will covers coding programming in the PIC microcontroller by using PIC C programming. During testing, breath alcohol detector can detect the presence of alcohol from the breath sample from drunken driver. Breath sample will analyzed and displayed in units of the Blood Alcohol Concentration (BAC). Breath samples were analyzed and presented in the unit value of Blood Alcohol Concentration (BAC). Based on the values that have been detected alcohol breath, this system will operate and will give warnings to the drunken drivers who are in drunken condition to not continue driving the vehicles via alarm from buzzer and LED will show their BAC.

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LIST OF ABBREVIATIONS

AC	-	Alternative Current
BAC	-	Blood Alcohol Content
DC	-	Direct Current
EDA	-	Electronic Design Automation
IR	-	Infrared
I/O	-	Input/output
LED	-	Light Emitting Diode
PCB	-	Printed Circuit Board
VAPS	-	Vehicle Accident Prevention System

CHAPTER I

INTRODUCTION

1.1 PROJECT INTRODUCTION

There are growing concern about the number of accident caused by a person who driving vehicles especially driving during drunken. Statistic show the accident caused by drunken drivers increased each years. According to the Insurance Information Institute, 16,068 people were killed in 2000 in alcohol-related motor vehicle crashes, a 1.8 percent increase over 1999, and alcohol continues to be a factor in 38 percent of all traffic fatalities.[1] Everything have related to percentage of alcohol in the blood after they drunk.

Blood Alcohol Content (BAC) is usually expressed as a percentage of alcohol in the blood. High BAC of the drunken driver will affect their behaviors likes unconsciousness, emotional swings, and anger or sadness. There is the research about Blood Alcohol Concentration (BAC) and with 0.2mg/l and above, (measured in mg of

alcohol per 100ml of blood, or mg/l) the judgment, coordination and sensory perception are impaired, reaction time slows, performance in intellectual tests falls, and eyesight is weakened.[2]

So there is a need for an effective system to check drunken drivers and this Vehicles Accident Prevention System project can be one of the methods to reduce this problem or more specific to prevent the drunken driver itself to driving the vehicles.

Vehicles Accident Prevention System project will use concept breathalyzer which enable to draw a very accurate reading of driver breath alcohol concentration. In addition to this project, it will evolved alarm as the warning, and maybe with some technologies that will lock the vehicles and make the driver unable to start the car engines if driver have been detected was drank.

1.2 PROBLEM STATEMENT

Drunken drivers have increased very large and so are the deaths and accidents due to drunken drivers. Those accidents could have been avoided if the drunken driver hadn't been able to turn their car on. The main reason for driving during drunk is the alcohol lowers inhibitions and make driver difficult to make rational decisions and that become drunk driver still driving the vehicles.

Another problem, when the drunken drivers drive alone, no one will give warning to them. That will be the main problem because the drunk drivers always drive alone especially during late night with situation unconsciousness and they loss their rationalism.

Another problem is drunken driver itself choose not to follow any safety. That mean either drunken driver itself will follow or not the procedure if any safety systems have been implemented in their vehicles. After that it’s all depend on driver itself to choose what action driver suppose to take. They still choose to drive even they know the dangerous driving during drunk.

So, this project is design to prevent drunk driver to start their car when they in drunk condition. This project has a system which have alcohol sensor to detect alcohol in the air and that includes the alcohol in drunk drivers' breath and an alarm will trigger when alcohol has detected and the BAC will shown via LED indicator.

1.3 PROJECT OBJECTIVES

i. Vehicles Accident Prevention System project have main objectives which want to design the system with have capability give notification to drunken driver before driving the vehicles.
   The project is to set up intelligent technologies for vehicles to generate alarm as the warning and Light Emitting Diode (LED) displaying to drunken driver as the BAC level.

ii. Another objective is to use alcohol sensor TGS 2620 as the main sensor to detect the sense of alcohol gas in the air.
   Basically, the alcohol gas was detected from drunken driver after the driver entered the vehicles. This sensor system has not been considered yet in any automobile accident prevention system.

iii. This project also includes designing coding based on system designed.
   The software which involves are Multisim and Proteus to designed the circuit for alcohol sensor TGS 2620 and LED circuit. Microcontrollers have been use in a lot of devices especially to convert analog input to digital output and this project also will use this microcontroller to incorporate microcontroller in the alcohol detector in order to control its function and output.

1.4 PROJECT SCOPE

In order to achieve the objective of this project, there are several scopes has been outlined. The scope of the project can be divided into two parts which are the hardware design and the software design. For the hardware, it can be categorized into systems:

a) PIC 16F877 Microcontroller

b) The sensing system including the alcohol sensor

c) Output system including the LED display and the alarm (buzzer)

The small and light casing is designed in order to make this alcohol system can be use or placed anywhere and easy to use. The PIC16F877 is the perfect microcontroller for the project. This is due to its high performance and special features.

The sensing system consists of an Alcohol Sensor TGS 2620. It is used to detect presence of alcohol in the breath area while the output system consists of one LED and a Buzzer. The microcontroller requires software design which including some coding.

CHAPTER II

LITERATURE REVIEW

2.1 INTRODUCTION

In recent years, there lot inventions have been created to detect the alcohol in person bloodstream. The basic concept of this project breath alcohol sensor has been explained at the previous chapter. In this chapter will discuss in detail about the hardware development and explains about the sensing system and the output system of the project. It also touches about the software that will be used for the programming, which is PIC microcontroller.

Beside that there are a couple of past related works presented contain useful information about the development of breathalyzer will be discussed.

2.1.1 Infrared Spectroscopy (Intoxilyzer) Model

This device uses Infrared (IR) spectroscopy. Molecule bonds of alcohol compound are identified by the way they absorbs IR light. Each bond absorbs the IR light at different wavelength, which identifies the type of substance detected and the amount of absorption determines amount of alcohol present.

One disadvantage of IR technology is the high cost of achieving specificity and accuracy at low breath alcohol concentration levels. The IR detector's output is nonlinear with respect to alcohol concentration and must be corrected by measurement circuits. But in Vehicles Accident Prevention System project, infrared will have been use as the medium to connect between inputs and outputs.

In addition, it offer very simple drive circuit which will makes connection to microcontroller become less complex.

The analysis and observation is done to select appropriate alcohol sensor for the system. The alcohol sensors are MQ-3 alcohol sensor, TGS2620 gas sensor and MiCS-5521 sensor.

2.1.2 The Talking Breathalyzer Mark II

This is example of Breathalyzer project by using MQ-3 alcohol sensor. This project has some addition in term of using buzzer as the alarm. This project use audio with some conversation to replace an alarm sound and it consists of a direct current (DC) power regulator circuit, an analog alcohol sensor with driving circuit, an audio recording and playback circuit, and the brain, which is a single PIC18F1220 MCU.

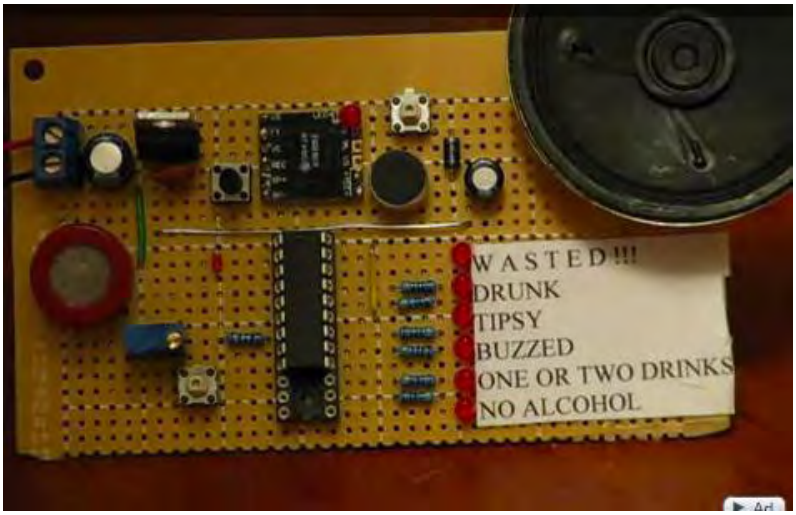

Figure 2.1: Talking Breathalyzer Mark II Circuit

2.1.3 Sensor Report- MQ3 Gas Sensor

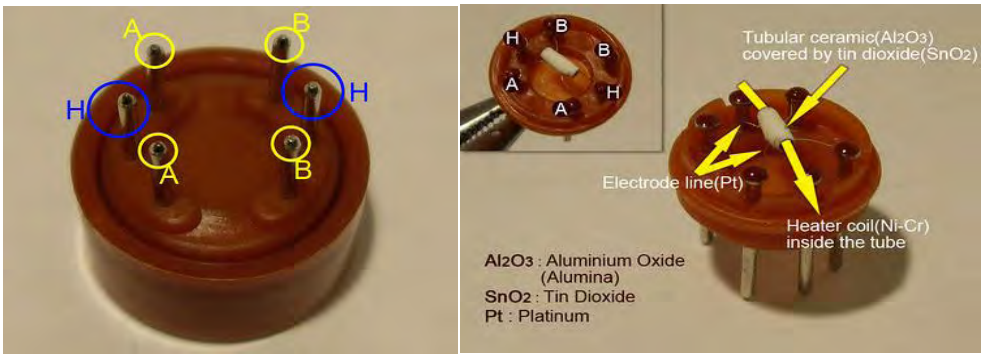

Figure 2.2: MQ-3 Gas Sensor Configuration

Basically, it has 6 pins, the cover and the body. Even though it has 6 pins, PIN can use only 4 of them. Two of them are for the heating system, which call H and the other 2 are for connecting power and ground, which called A and B.

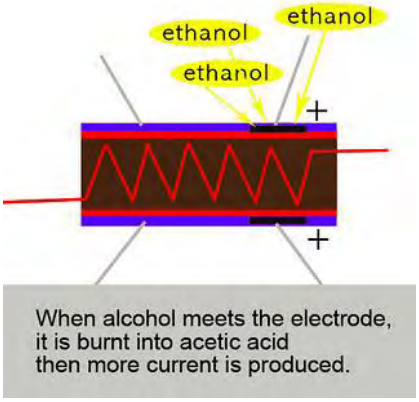

Figure 2.3: MQ-3 Alcohol Sensor Process

Then, when the alcohol molecules in the air meet the electrode that is between alumina and tin dioxide, ethanol burns into acetic acid then more current is produced. So the more alcohol molecules there are the more current we will get. Because of this current change, we get the different values from the sensor.

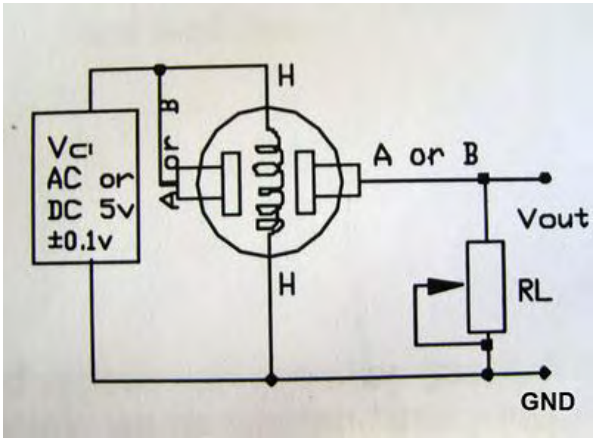

Figure 2.4: MQ-3 Alcohol Sensor Circuit diagram

This is the schematic. It is pretty simple. First, we can use 5v and as see one of H pins goes to the power and the other one is connected to the ground. And the pin A is connected between the power and the pin H and the pin B is goes to the microcontroller.

Also between the ground and the Microcontroller, you need the resistor. Before you connect the resistor if you use the pot, you can tune the resistor for getting more accurate values. In the datasheet they say you can use 100kΩ to 470kΩ.

2.1.4 TGS 2620 - for the detection of Solvent Vapors (FIGARO Data sheet)

The sensing element is comprised of a metal oxide semiconductor layer formed on an alumina substrate of a sensing chip together with an integrated heater. In the presence of a detectable gas, the sensor's conductivity increases depending on the gas concentration in the air.[3] A simple electrical circuit can convert the change in conductivity to an output signal which corresponds to the gas concentration.

The TGS 2620 has high sensitivity to the vapors of organic solvents as well as other volatile vapors. It also has sensitivity to a variety of combustible gases such as carbon monoxide, making it a good general purpose sensor.

The Figure 2.1.4(a) below represents typical sensitivity characteristics; all data having been gathered at standard test conditions (see reverse side of this sheet). [3]

The Y-axis is indicated as sensor resistance ratio (Rs/Ro) which is defined as follows:
Rs = Sensor resistance in displayed gases at various concentrations
Ro = Sensor resistance in 300ppm of ethanol

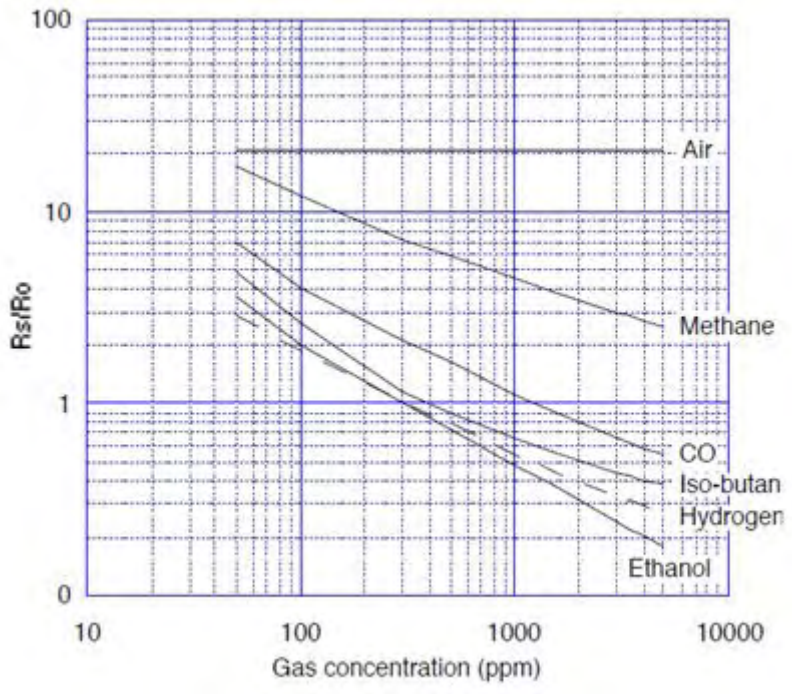

Figure 2.5: Sensitivity Characteristics of TGS 2620