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Microsleep Detector

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This report submitted to the Electrical Engineering Department in fulfilment of the requirement for a Diploma in Electrical Engineering

Department of Electrical Engineering

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CONFIRMATION OF THE PROJECT

The project report titled "Microsleep Detector" has been submitted, reviewed and verified as a fulfills the conditions and requirements of the Project Writing as stipulated

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DECLARATION OF ORIGINALITY AND OWNERSHIP

TITLE   : MICROSLEEP DETECTORSESSION : SESSSION 1 JUN 2022 / 2023

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STATEMENT OF AUTHENTICITY AND PROPRIETARY RIGHTS

MICROSLEEP DETECTOR DESIGN STUDY

1. I'm **ABDUL HADI BIN AMMER (KP NO: 010626-14-1505)** is a final year student of **Diploma in Electrical Engineering, Department of Electrical , POLTEKNIK SULTAN SALAHUDDIN ABDUL AZIZ** which is located at **PERSIARAN USAHAWAN , SEKSYEN U1 , 40150 SHAH ALAM , SELANGOR DARUL EHSAN.**

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ABDUL HADI BIN AMMER
(Identification card No: -)

... …………………………
(ABDUL HADI BIN AMMER)

In front of me,

Dr. FAZIDA BINTI ADLAN
(Identification card No: -)
As a project supervisor, on the date:

.....…………………………
(Dr. FAZIDA BT ADLAN)

APPRECIATION

I would want to express my sincere appreciation to everyone who assisted me in finishing this project. Due to my inexperience and lack of understanding, I experienced many issues during the process, but these individuals supported me in overcoming them and in the final compilation of my idea into a sculpted sculpture.

I want to express my thankfulness to Dr. Fazida binti Adlan, who served as my supervisor, for her leadership and direction, which allowed me to understand the specifics of project implementation. In addition, I want to express my gratitude to my supervisor for her ongoing support and supervision of the project work. I've gained a lot of knowledge and project ideas that will help me finish the job.

Additionally, I'm grateful to my entire class, my fellow students, and most importantly, my parents, who have motivated me to take on all of life's difficulties. Thank you all.

ABSTRACT

Number of accidents caused by microsleep increases rapidly each day. This is due to the current trend of life, for example high workload, long working hours, traffic jams, having too much caffeine, drinking alcohol, age factor, and many others. This microsleep can lead to major accidents, higher number of deaths, injuries, demolition of property and permanent disability. The creation of 'MICROSLEEP DETECTOR' in the Internet of Things (IoT) increases the technology capabilities in transportation sectors, in addition to reduce the number of crashes on the roads. An integration with heart beat detection can be a perfect combination on development of a microsleep detection and prevention. Detecting heart beat changes were used as the method to identify a potential or possibility of microsleep to happen. This work presented a review of current research that supported the integration of IoT . The analysis and discussion on the best solution and method to prevent microsleep accidents was shown. This work has been developed, simulated and run to test it reliability. From the result it.is shown that when the heart beat is below 70 bps it will vibrate and notifications will appear.

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CHAPTER 1

1.1 INTRODUCTION

Microsleep is a very short episode of sleep. It can last anywhere from a millisecond to thirty seconds. During this time, some parts of our brain fall asleep while other stay awake. Microsleep means that, for a very short period of time, a person becomes unconscious. They usually become aware of this when they wake up, or, in some cases, they are not aware microsleep ever happened.

Things that usually precede microsleep are sleep deprivation, doing a repetitive type of work, frequent yawning, difficulty concentrating. Just moments before an episode of microsleep, a person is having trouble staying awake with the eyelids closing slowly, nodding head and droopy eyes.

1.2 PROBLEM STATEMENT

Sleep deprivation is one of the main reasons for microsleep. If someone has been awake for far too long, the brain functions impair significantly. We make more mistakes and are unable to focus. Sometimes it is caused by sleep disorders and sometimes by behavior – working in shifts, or working long hours, drinking too much alcohol and coffee at night, frequently going out late and pulling all-nighters. If you want to be healthy and safe, try to arrange your schedule in such a way that you alwayshave time for rest.

Certain **medication** causes sleepiness, so it's always a good idea to read the instructions before taking any type of medicine. If there is a warning that a particular drug causes sleepiness, either try to consume it in the evening or avoid driving and doing things that require decision making and physical response.

1.3 OBJECTIVE

✓ To develop a device that can detect falling asleep during driving
✓ To prevent accident cause of microsleep
✓ To add safety features while driving

1.4 SCOPE OF PROJECT

✓ The sleepy driver during driving.

1.5 IMPORTANT OF RESEARCH

✓ It is a real -time system to detect drowsiness during driving.
✓ Reduce the number of driver accidents because microsleep.

CHAPTER 2

2.1   LITERATURE REVIEW

This research is based on the Implementation of Home Automation using Eye Blink Sensor on Ranganatha Chakravarthy H.S [1]. Describes Tetraplegia, also known as quadriplegia, as paralysis caused by illness or injury to a human that results in the partial or total loss of use of all their limbs. The loss is usually sensory and motor, which means that both sensation and control are lost. Tetraplegia is caused by damage to the brain or the spinal cord. Typical causes of this damage are trauma, disease, or congenital disorders. The biggest problem that Tetraplegic patients face is leading their own life without anyone else's help. This includes basic day to day operations like switching on an appliance or increasing the speed of fan. Most of the existing systems use sophisticated hardware and software to make the control easier and efficient. But the biggest problem which a Tetraplegic patient faces while using these systems is accessibility. Blink sensor is used to process the input in real time and send appropriate control signal to a microcontroller. The microcontroller takes appropriate decision based on various sets of inputs and the output of the microcontroller board is used to control the appliances. Then, microcontroller board is used to check the correctness of the blink sequence. Opto-couplers are used to isolate the low power circuit from the high-power circuit and a high current driver IC is used to activate the relays which switches ON/OFF the appliances. A 12V regulator IC is used to provide constant voltage to the IC's and relays. LED's are used to indicate the output status of the system. Microcontroller board there used is an Arduino Uno board. Then in this article used is an IR sensor-based blink sensor which gives an output of 0V (Logic '0') when the eyes is open and gives +5V (Logic '1') when the eyes is closed. In addition, they also used Opto-couplers are electrical isolators which are used to isolate the low power circuit from the high-power circuit. It basically consists of a LED and a phototransistor whichare used to isolate the circuit.

According to previous research is based on Prevention of Accident Due To Drowsy By Using Eye Blink on B.Praveenkumar, K.Mahendrakan [2]. A driver state of drowsiness can also be characterized by the resulting vehicle behaviour such as the latera position, steering wheel movements, and time-to-line crossings whom correspondence should be addressed not intrusive, they are subject to several limitations related to the vehicle type, driver experience,

and geometric characteristics and condition of the road. Among these various possibilities, the monitoring of a driver's eye state by a camera is considered to be the most promising application due to its accuracy and Nonintrusiveness. The driver's symptoms can be monitored to determine the driver's drowsiness early enough to take preventive actions to avoid an accident. In addition, driver drowsiness can also be characterized by the resulting vehicle behaviour such as lateral position, steering wheel movement, and time passage to the line that correspondence should be handled unobtrusively, it is subject to some limitations related to vehicle type, driver experience, and geometric features and road conditions. Among these various possibilities, monitoring the driver's eye condition by a camera is considered to be the most promising application due to its accuracy and Unobtrusiveness. The driver's symptoms can be monitored to determine the driver's drowsiness early enough to take precautions to avoid an accident. Thus, eye detection remains a challenging problem without a cheap or commercial solution. For some applications, eye feature detection can be satisfactory, but this only uses frontage images taken with controlled lighting conditions. In cars, ever-changing lighting conditions cause dark shadows and changing lighting, so effective techniques in stable lighting often don't work in these challenging environments.

In addition, this research is based on Accident Prevention System Using Eye Blink Sensor on Suhas Katkar [3]. This system designs the scene of the accident alarm system based on ARM and GPS. When the accident occurred, the manual and automatic alarm can be realized. Vehicles state and user information as well as alarm locations will be transmitted to the Pre-set of treatment centre; after receiving related alarming information, the treatment centre will display this information on its map. after receiving alarm information, the treatment Centre staffs who are on duty will notice the handler who is the nearest to the scene of the accident in time, in order to reach the scene of accident in the first time, and gain more treatment time for the accident injured, and lower the accident mortality, as well as reduce incidents impacting time on the 8 | P a g e traffic. With the problem of global population aging increasing, lack of medical hardware at the near of accident place, inadequate accident sense system performance and other related issues have become increasingly prominent. This paper presents the design and implementation of scene of the accident alarm system based with wireless network communications based on ARM, GPS and GSM, Pre-set of treatment centre as the information processing terminal for the location display and warns the alarm for the treatment people near by the accident location. This project consists of wireless communication for communication with the accident sense system and the Pre-set of treatment centre. The main part is the Pre-set

of treatment unit, which acts as an Information processing unit. Individual vehicle is equipped with a system called as accident sense system, which consists of GSM and GPS. When the accident occurred, Vehicles state and locations will be transmitted to the Pre-set of treatment centre though wireless communication technologies of GSM through short message format.

While according this research is based on Accident Prevention Using Eye Blink Sensor on M Hemamalini [4]. This project presents an accident prevention using eye blink sensor for preventing accident due to drowsy is prevented and controlled when the vehicle is out of control. And also the drunken drive also prevented by installing alcohol detector in the vehicle. The term used here for the recognition that the driver is drowsy is by using eye blink of the driver. In recent times drowsiness is one of the major causes for highway accidents. We can't take care of ours while in running by less conscious. If we done all the vehicles with automated security system that provides high security to driver, also gives alarm. All vehicles should be equipped with eye blink sensor and alcohol sensor in future avoids these types of accidents Vehicle accidents are most common if the driving is inadequate. These happen on most factors if the driver is drowsy or if he is alcoholic. Driver drowsiness is recognized as an important factor in the vehicle accidents. Advanced technology offers some hope avoid these up to some extent. This project involves measure and controls the eye blink using IR sensor. The IR transmitter is used to transmit the infrared rays in our eye. The IR receiver is used to receive the reflected infrared rays of eye. If the eye is closed means the output of IR receiver is high otherwise the IR receiver output is low. This to know the eye is closing or opening Position. This output is give to logic circuit to indicate the alarm. This project involves controlling accident due to unconscious through Eye blink. A from PIC 9 | P a g e and other necessary elements as per our design requirement results as output. As microprocessor designs get faster, the cost of manufacturing a chip (with smaller components built on a semiconductor chip the same size) generally stays the same. Before microprocessors, small computers had been implemented using racks of circuit boards with many medium and small-scale integrated circuits. Microprocessors integrated this into one or a few large-scale ICs. Continued increases in microprocessor capacity have since rendered other forms of computers almost completely obsolete with one or more microprocessors used in everything from the smallest embedded systems and handheld devices to the largest mainframes and supercomputers.
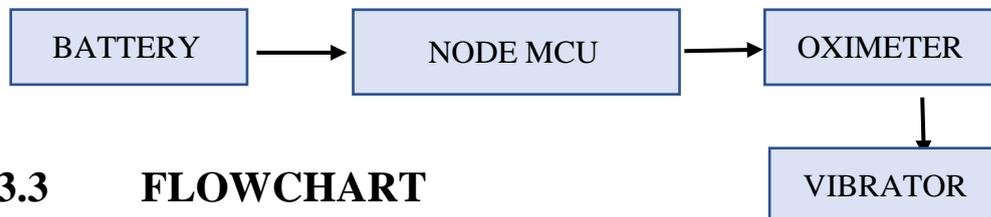
Last but not least , this reasearch is based on Electronic Assistance for Paralysed Using Eye Blink Detection on Abdul Rahaman Shaik. In the era of modern technology, automation is taking place everywhere. From Home to Industries, the blessing of automated system has improved the efficiency by a large magnitude. One of the great examples of the Automation System is the Home Automation. Some of the largest tech giants like, Google, Amazon actually already have flooded the market with the smartest home automation systems. Though, the automation is meant for simplifying our daily life however, a very targeted group of people have always been overlooked by all of these companies. Therefore, we mainly focused on this group of people who are physically challenged or paralyzed. As, this group of people are physically challenged, they mostly rely on other people's assistance. Even, they have to rely on someone else for day to day tasks. The existing home automation systems are mostly designed and developed for general a person who has the access to any device by physical movement. This is not useful for a paralysis patient. Hence, to develop a home automation system for patients which could be used with least or minimal effort to control the home appliances such as light, fan, air conditioner and other communication devices for emergency SMS and call. In this paper we have worked on a Home Automation Project mainly aimed for paralyzed people to develop an IR based eye blink sensor which will be used to control electronic devices as mentioned earlier. The solo purpose of our work is to make a sustainable and effective solution for people with physical disability. Paralysis is the loss of muscle function in part of your body. It happens when something goes wrong with the way messages pass between your brain and muscles. It happens when something goes wrong with the way messages pass between your brain and muscles. Paralysis can be complete or partial. It can occur on one or both sides of your body. It can also occur in just one area, or it can be widespread. Paralysis of the lower half of your body, including both legs, is called paraplegia. Paralysis of the arms and legs is quadriplegia. A treatment plan and outlook for the condition will depend on the underlying cause of paralysis, as well as symptoms experienced. After researching a lot in lab and over the internet, we found an Idea to develop such a system which may help a person to control any appliance which we use in our daily life by less physical effort. We found a concept to develop such a system which we can use by eye blink to automate our home electrical appliance. Though, there are many prototypes developing earlier but most of them are not user friendly or not innovative solutions. The Project aims to develop a system eye blink based sensor for home automation which is compact hardware and simple to use for control home electricity appliance. This will also help to reduce electricity wastage and help a paralysis patient to control light and fan without any assistance of other person.[5]
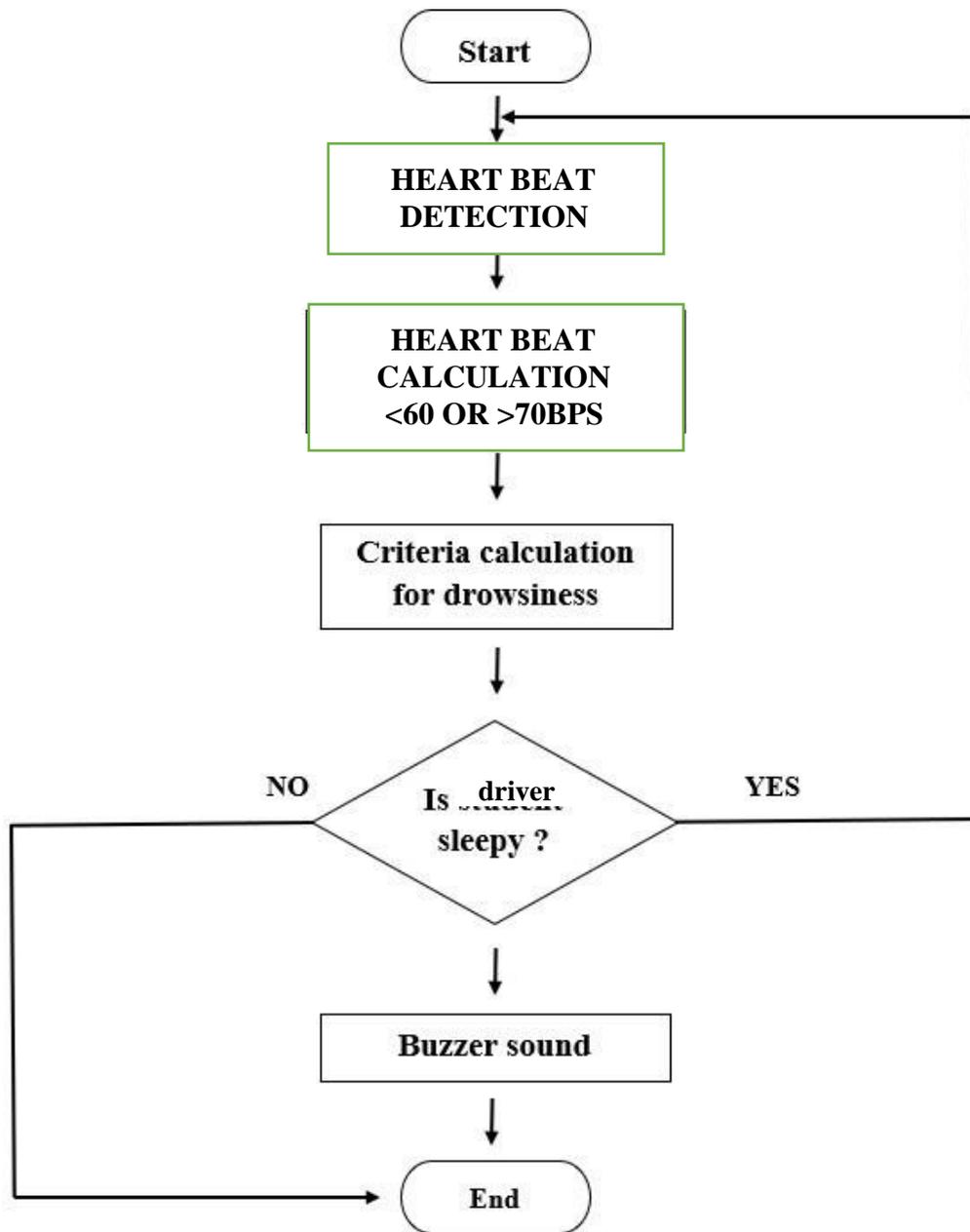
CHAPTER 3 METHODOLOGY

3.1   INTRODUCTION

The numerous research techniques utilised often by researchers studying hardware and software systems are examined in this section. To finish this job, a variety of techniques must be used. The processes employed in the research include data analysis, device development, testing, and research. This section will provide more detailed information on the methods utilised to conduct this study and deal with the methodological research. This part will also describe the product's structure and design, as well as the methods employed to offer informational views to help readers obtain a deeper understanding. Because it is crucial to the execution of this study, this component of the approach is significant in this investigation. This section thoroughly explains all of the methodology's specifics.

3.2   BLOCK DIAGRAM

```
┌──────────┐        ┌──────────┐        ┌──────────┐
│ BATTERY  │ ─────▶ │ NODE MCU │ ─────▶ │ OXIMETER │
└──────────┘        └──────────┘        └──────────┘
                                              │
                                              ▼
                                        ┌──────────┐
                                        │ VIBRATOR │
                                        └──────────┘
```

3.3   FLOWCHART

```
                    ┌─────────┐
                    │  Start  │
                    └────┬────┘
                         │        ←─────────────────────┐
                ┌────────▼─────────┐                     │
                │   HEART BEAT     │                     │
                │   DETECTION      │                     │
                └────────┬─────────┘                     │
                ┌────────▼─────────┐                     │
                │   HEART BEAT     │                     │
                │   CALCULATION    │                     │
                │  <60 OR >70BPS   │                     │
                └────────┬─────────┘                     │
                ┌────────▼─────────┐                     │
                │ Criteria         │                     │
                │ calculation      │                     │
                │ for drowsiness   │                     │
                └────────┬─────────┘                     │
                         │                               │
         NO         ◇────▼────◇        YES               │
      ┌─────────── Is  driver ───────────────────────────┘
      │            sleepy ?
      │                │
      │         ┌──────▼──────┐
      │         │ Buzzer sound│
      │         └──────┬──────┘
      │          ┌─────▼─────┐
      └─────────►│    End    │
                 └───────────┘
```

3.4   SIMULATION ON PROTEUS
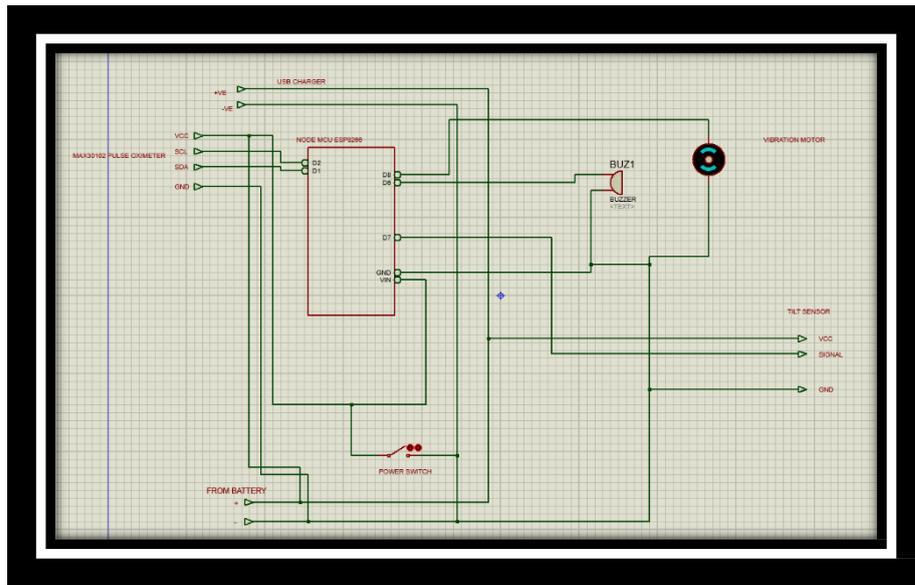
Figure 3.4.1 : Draw circuit on proteus

3.5   PROJECT DESIGN
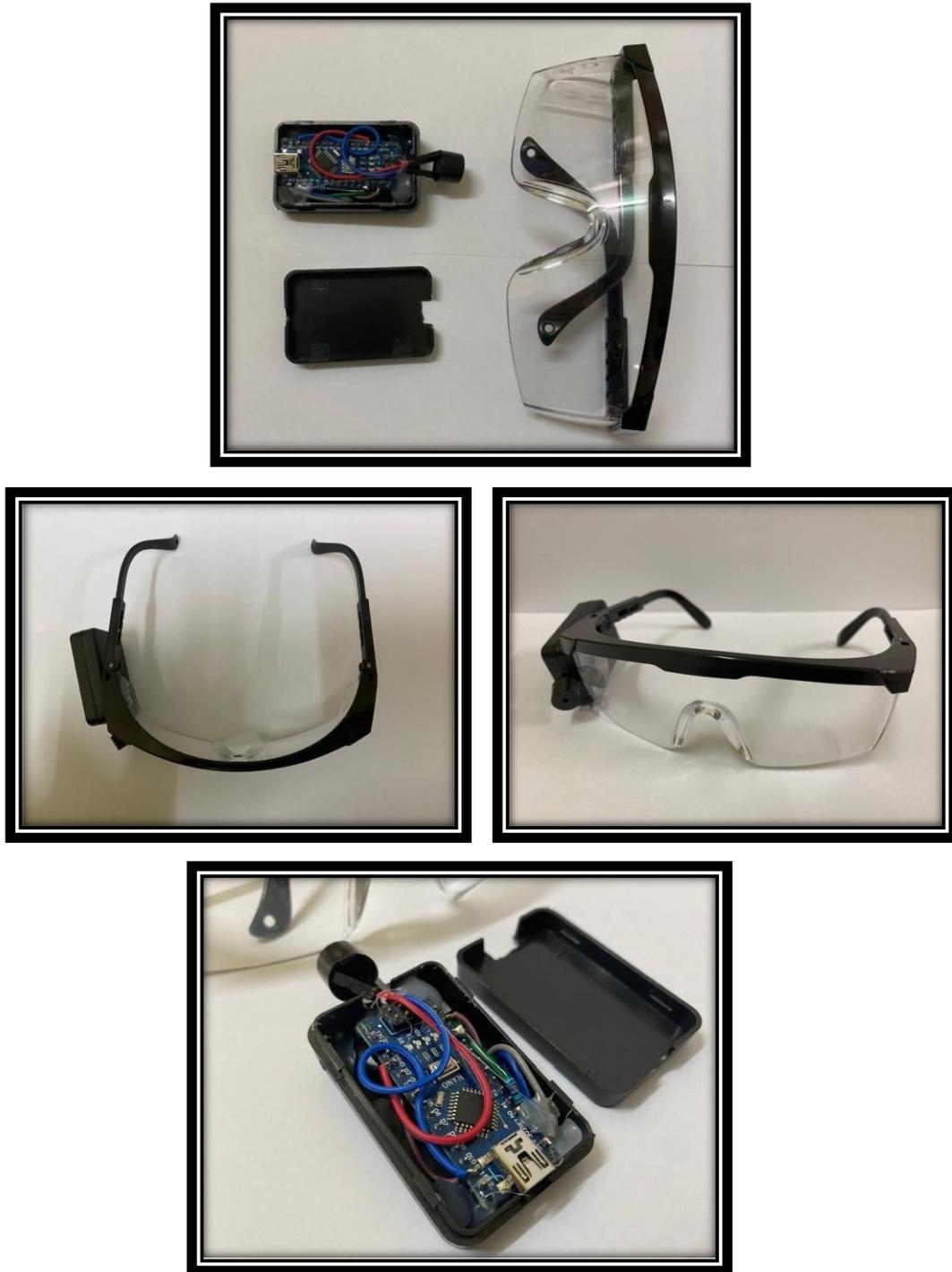
Figure 3.5.1 : Model of detect falling asleep

3.6   SOFTWARE

ARDUINO IDE

The cross-platform Arduino Integrated Development Environment (IDE) was developed using C and C++ functions. Because it is open-source software, users are free to use it in any way they see fit. A few examples of source code from the Examples file on the software's library, which offers numerous standard input and output operations, are provided by the Arduino IDE. For the sketch to start and the main programme loop, user-written code only needs two fundamental functions, which are combined with a code stub main() to create an executable cyclic executive code using the GNU toolchain, which is also distributed with the IDE.
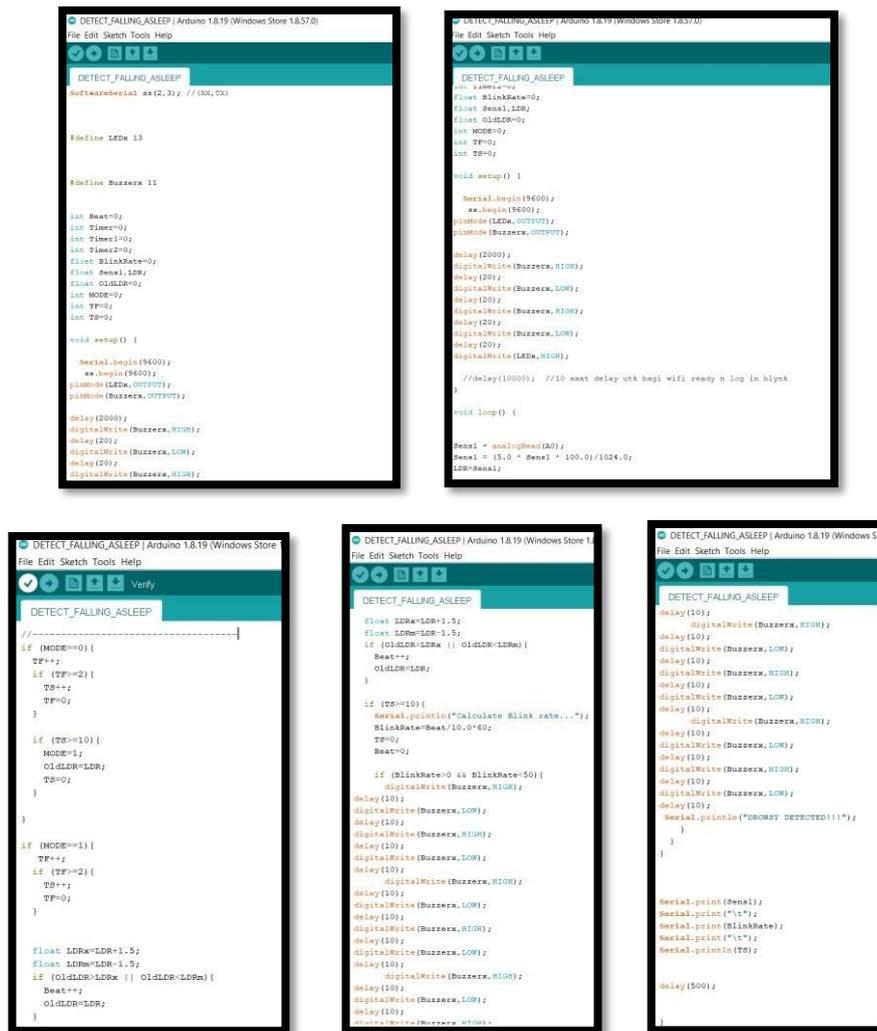
Figure 3.6.1 : Screenshot of the Arduino IDE showing a button programming

It is used to write code, compile the code to look for errors, and upload the code to Arduino. The IDE creates a Hex file for the code after the user writes it and compiles it, utilising a USB cord, and the board will receive the (Hex file, which are Hexa Decimal files that Arduino can understand). The microcontroller on every Arduino board receives the hex file and executes the code according to the written source code.

3.7   MATERIALS AND EQUIPMENT

NODEMCU

NodeMCU was created shortly after the ESP8266 came out. On December 30, 2013, Espressif Systems[6] began production of the ESP8266.[12] NodeMCU started on 13 Oct 2014, when Hong committed the first file of nodemcu-firmware to GitHub.[13] Two months later, the project expanded to include an open-hardware platform when developer Huang R committed the gerber file of an ESP8266 board, named devkit v0.9.[14] Later that month, Tuan PM ported MQTT client library from Contiki to the ESP8266 SoC platform,[15] and committed to NodeMCU project, then NodeMCU was able to support the MQTT IoT protocol, using Lua to access the MQTT broker. Another important update was made on 30 Jan 2015, when Devsaurus ported the u8glib[16] to the NodeMCU project,[17] enabling NodeMCU to easily drive LCD, Screen, OLED, even VGA displays.
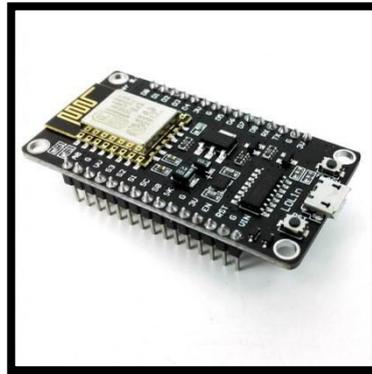
Figure 3.4(a) : Node Mcu

VIBRATE

Vibration sensors are **piezoelectric accelerometers that sense vibration**. They are used for measuring fluctuating accelerations or speeds or for normal vibration measurement.
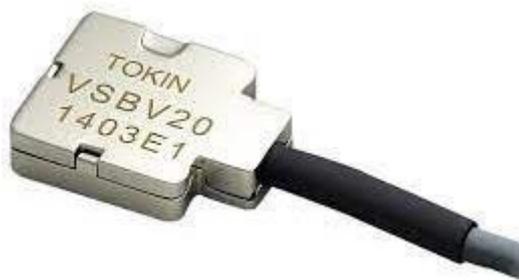
Figure 3.7(b) : Vibrate sensor

OXIMETER SENSOR

Pulse Oximeters are low cost non-Invasive medical sensors used to continuously measure the Oxygen saturation (SPO2) of haemoglobin in blood. It displays the percentage of blood that is loaded with oxygen.
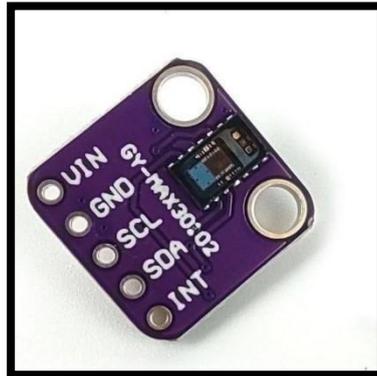


Figure 3.7© : OXIMETER SENSOR

BLYNK APPLICATION

Blynk is an IoT platform for iOS or Android smartphones that is used to control Arduino, Raspberry Pi and NodeMCU via the Internet. This application is used to create a graphical interface or human machine interface (HMI) by compiling and providing the appropriate address on the available widgets.

Figure 3.7 (d) :BLYNK APPLICATION

3.8   DATA SHEET

NODE MCU
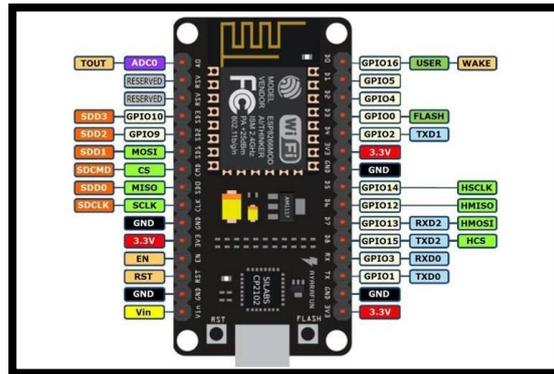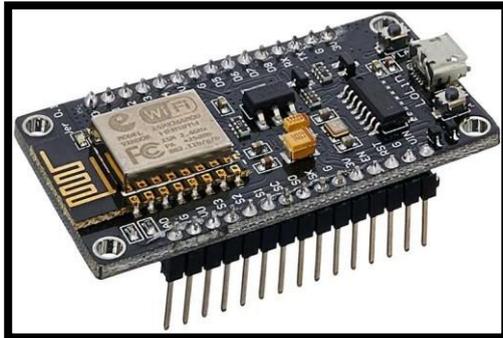
Pin Category	Name	Description
Power	Micro-USB, 3.3V, GND, Vin	**Micro-USB:** NodeMCU can be powered through the USB port **3.3V:** Regulated 3.3V can be supplied to this pin to power the board **GND:** Ground pins **Vin:** External Power Supply
Control Pins	**EN, RST**	The pin and the button resets the microcontroller

Analog Pin	A0	Used to measure analog voltage in the range of 0-3.3V
GPIO Pins	GPIO1 to GPIO16	NodeMCU has 16 general purpose input-output pins on its board
SPI Pins	SD1, CMD, SD0, CLK	NodeMCU has four pins available for SPI communication.
UART Pins	TXD0, RXD0, TXD2, RXD2	NodeMCU has two UART interfaces, UART0 (RXD0 & TXD0) UART1 (RXD1 & TXD1). UART1 is used to upload the firmware/program .
I2C Pins		NodeMCU has I2C functionality support but due to the internal functionality of these pins, you have to find which pin is I2C.

CHAPTER 4 RESULTS AND DISCUSSION

4.1 INTRODUCTION

The analysis performed for the results and findings of this project is covered in this chapter. The detect eye blink sensor device has been tested on a subject that emits a buzzer output when a person blinks for a few seconds, the buzzer will sound. This chapter provides a comprehensive description of the results, including how the data was collected for the study and how it was analayzed. For us to understand effectiveness in terms of accuracy and efficiency in terms of saving time, money, and energy, the results of the analysis are important.

4.2 DATA ANALYSIS

Once the device has been fully built, it must be tested to use the product to determine if the product is correct or not. For the monitoring system, however, the goal of the test is to determine whether the product really works or not on the user. Furthermore, several people have been evaluated for the monitoring system to collect data to identify whether the product works for driver or someone who uses it when feeling sleepy. .

4.3 HARDWARE DEVICE

The hardware devices outside shell is composed of Waterproof Plastic Enclosure Box Electronic that is perfect for any purpose that calls for a reasonably priced, resilient, and flexible material. The small and compact box is suitable for placing such as NodeMCu,Oximeter sensor,vibrate sensor.
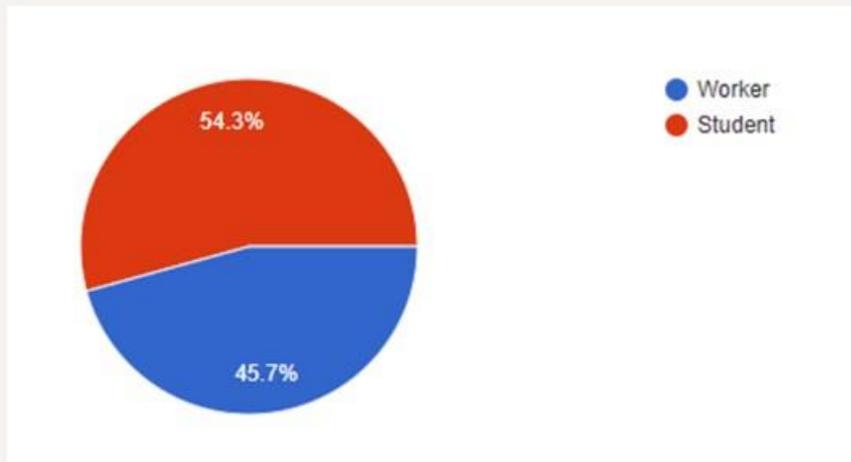
4.4 RESULT ON DESIGN

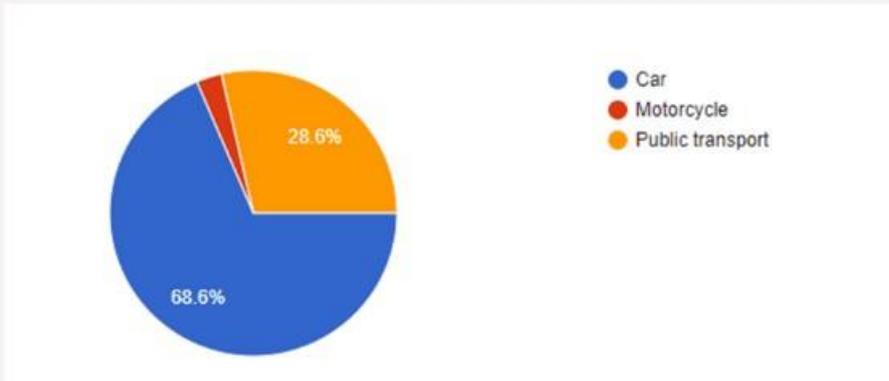Figure 4.4.1 : Test the product on the people

CHAPTER 5

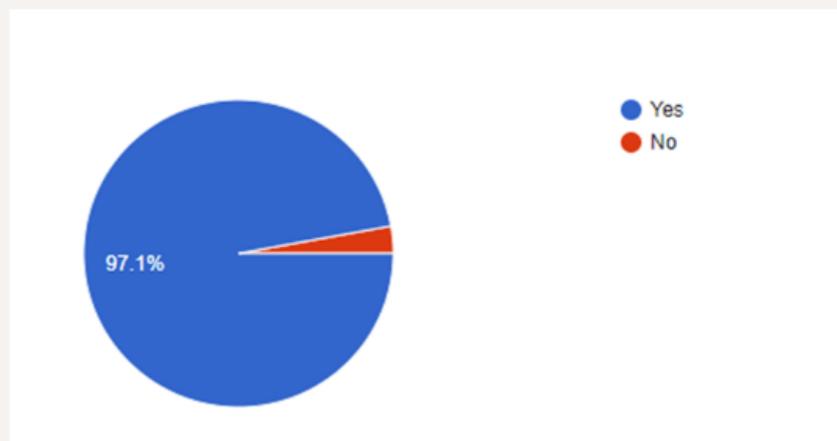# CONCLUSION AND RECOMMENDATONS

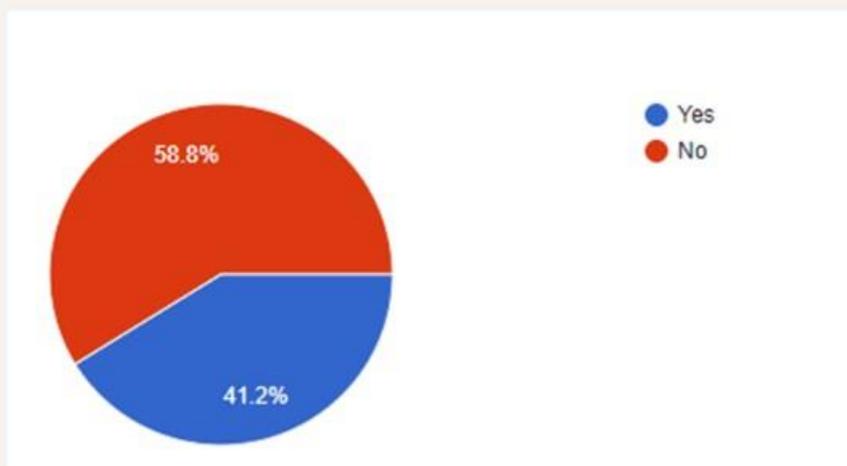## Questionnaire

What is the occupation if the reached audience?

54.3%

45.7%

● Worker
● Student

vehicle used daily by audience

- Car
- Motorcycle
- Public transport

28.6%

68.6%

Did they heard of microsleep accidents before ?

- Yes
- No

97.1%

have they ever experienced microsleep?

- Yes
- No

58.8%

41.2%

have they ever heard of a product that helps reduce microsleep?

- Yes 48.6%
- No 51.4%
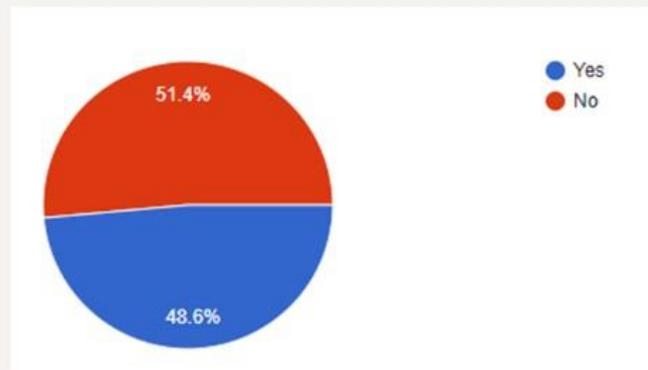
Are they confident that this project can reduce microsleep?

- Yes 62.9%
- No 37.1%
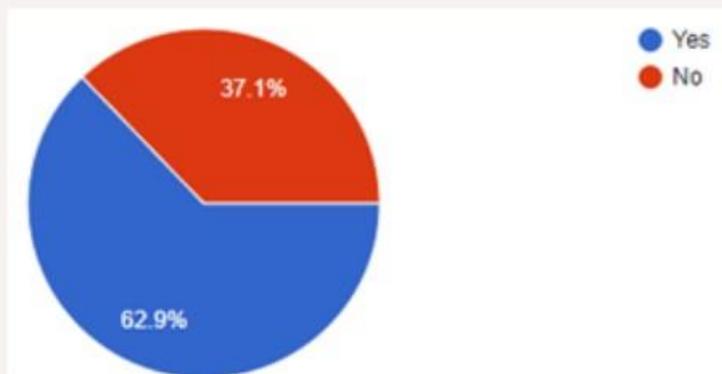
5.1 CONCLUSION

In my final year project, a method has been presented that can detect whether a driver or someone is sleepy while driving. In this era of globalization, students and adults work or study from morning to evening until late at night. So, they want to remain consistent to do the work every day until it is finished. While that, I made a product to keep them consistent when driving. The project is able to develop a device that can detect driver falling asleep in 2 to 3 seconds during drive. Therefore, this project uses an oximeter sensor that can detect the driver asleep while the heart beat below 70bps. Next,the vibrate will vibrate to when detect heart beat below 70 bps . It is very convenient for driver nowadays when driving, its very usefull to who always use car for they vehicle.

5.1 RECOMMENDATIONS

This initiative, to create a collection of thoughts that can be further investigated. The following suggestions are for additional study and can be considered to improve the project specifications. Therefore, add a Waterproof Plastic Enclosure Box Electronic on the left side so that when wearing it is not biased and feels comfortable when wearing the glasses. In addition, reduce the led light because it is very bright when wearing. Therefore, to slow down the LED light by slowing down the voltage so that the user is comfortable when using it .

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