A Project Report

on

IoT BASED ANTI SLEEP ALARM FOR DRIVERS

Submitted in partial fulfillment of the requirements

for the award of degree of

BACHELORS OF TECHNOLOGY

in

Information Technology

by

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June, 2023

DECLARATION

We hereby declare that the work presented in this project entitled " **IoT BASED ANTI SLEEP ALARM FOR DRIVERS** " submitted towards completion of the project in IV year II sem of B.Tech IT at "BVRIT HYDERABAD College of Engineering for Women", Hyderabad is an authentic record of our original work carried out under the esteemed guidance of **Ms. K. S. Niraja, Assistant Professor**, Department of Information Technolo.

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CERTIFICATE

This is to certify that the major-project report on **"IoT BASED ANTI SLEEP ALARM FOR DRIVERS"** is a bonafide work carried out by **Ms. P. Mrunalini (19WH1A1206), G. Raajitha (19WH1A1210), P. Tejaswini (19WH1A1211), R. Teja Sri (19WH1A1237)** in the partial fulfillment for the award of B.tech degree in **Information Techonology, BVRIT HYDERABAD College of Engineering for Women, Bachupally, Hyderabad** affiliated to the Jawaharlal Nehru Technological University Hyderabad under my guidance and supervision.The results embodied in the project work have not been submitted to any other university or institute for the award of any degree or diploma.

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ABSTRACT

Motorist fatigue is one of the major causes of accidents in the world. Doziness is a flash state between knowledge and sleep. Detecting the doziness of the motorist is one of the surest ways of measuring motorist fatigue. In this design we aim to develop a prototype doziness discovery system. This system works by covering the eyes of the motorist and sounding an alarm when motorist is drowsy which cautions the motorist and the passengers. The system so designed is anon-intrusive real- time monitoring system. The precedence is on perfecting the safety of the motorist without being intrusive. In this design the eye blink of the motorist is detected. We'll use a monitoring system grounded on eyelid movement that will work in accord with a micro-controller to check against certain voltage parameters that will determine if the motorist is considered asleep. The proposed system may be estimated for the effect of doziness warning under colorful operation conditions. We're trying to gain the experimental results, which will propose the expert system, to work out effectively for adding safety in driving.

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LIST OF ABBREVIATIONS

Abbreviation	Meaning
IoT	Internet of Things
ESP32	Espressif Systems32
IR	Infrared Rays
Wi-Fi	Wireless Fidelity
USB	Universal Serial Bus
GPS	Global Positioning System
IOS	iPhone Operating System
EAR	Eye Aspect Ratio
MAR	Mouth Aspect Ratio
IDE	Integrated Development Environment
SoC	System on a Chip
RF	Radio Frequency
I/O	Input/Output
RTOS	Real-Time Operating System
GPIO	General Purpose Input/Output pins
DC	Direct current
PWM	Pulse Width Modulation
SPST	Single Pole Single Throw
IC	Integrated Circuit
LED	Light-emitting diode
API	Application programming interface
UML	Unified Modeling Language
ADC	Analog-to-Digital converter
RX	Receiving pins
TX	Transmitting pins

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1. INTRODUCTION

In today's fast-paced world, where long commutes and demanding schedules have become the norm, driver fatigue has emerged as a major concern on our roads. Falling asleep at the wheel can have devastating consequences, leading to accidents, injuries, and even fatalities. Every year, traffic accidents due to human errors cause increasing amounts of deaths and injuries globally.Exhausted drivers who doze off at the wheel are responsible for about 40 % of road accidents. Driver drowsiness is recognized as an important factor in the vehicle accidents. It was demonstrated that driving performance deteriorates with increased drowsiness with resulting crashes constituting more than 20 % of all vehicle accidents.

The dangerous combination of sleepiness and driving or driving while fatigued, and can result from many underlying causes, including excessive sleepiness, sleep deprivation, changes in circadian rhythm due to shift work, fatigue, medications with sedatives and consuming alcohol when tired. The cumulative effects of these factors have severe effects on performance, alertness, memory, concentration and reaction times. Driving while drowsy is a problem almost all drivers have experienced. The sleeping sensation reduces the level of vigilante producing danger situations and increases the probability of an accident occurring. It has been estimated that drowsiness causes between 10 % and 20 % of traffic accidents, causing both fatalities dead and injuries.

The risk of having a crash due to drowsy driving is not uniformly distributed across the population. This is due to two factors. First, crashes tend to occur at times in keeping with one's circadian rhythms when sleepiness is most pronounced, for example, during the night and in the mid afternoon. Thus, individuals who drive at night are much more likely to have fall-asleep crashes. Second, people who are excessively sleepy either because of lifestyle factors or because of an untreated sleep disorder are more likely to have crashes related to excessive daytime sleepiness. Research has identified young males, shift workers, commercial drivers and people with untreated sleep disorders or with short-term or chronic sleep deprivation as being at increased risk for having a fall-asleep crash. Individuals at an increased risk of drowsy driving include those who have had less than 7 to 8 hours of sleep.

Driving after being awake for more than 12 hours, taking medication that causes drowsiness, driving at mid-night or the early afternoon. Consistently have difficulty getting to sleep or staying asleep at night. Drivers having untreated organic sleep disorders such as sleep apnea, narcolepsy or periodic limb movement disorder. Driving frequently for long periods on monotonous highways or rural roads. People working in the night shift, especially when driving to home after the shift is completed.

These days, it might be really difficult to stay active all the time due to hectic schedules. A driver who falls asleep behind the wheel risks catastrophic repercussions, including accidents and potential fatalities. We observe that this circumstance is considerably more typical as well, making the need to address this issue absolutely crucial.

Because of the peril that doziness presents on the road, strategies need to be created for checking its influences. Loss of mindfulness because of frazzle causes many changes in the mortal body and conditioning. These side goods and parameters empower us to effectively measure the doziness position. This design has the implicit to keep them awake or at least to tell them when they are overtired and need to stop driving. This has the implicit to save lives on the road. This design intends to develop a device or a system that will help the motorist in minimizing road accidents. Now, we are showing the specific users for specific work that can be done.

In our country where road accidents claim nearly three lives every minute. A major public health concern and a factor in injuries and fatalities is road safety. According to a report by the Ministry of Road Transport and Highways Transport Research Wing, 3,84,448 people were injured and 1,53,972 people lost their lives as a result of traffic accidents in 2021. Unfortunately, the age group most severely affected by traffic accidents—which accounts for nearly 67 percent of all accidental deaths—is 18 to 45 years old. Driver drowsiness is a serious issue that contributes to numerous auto accidents every year.

Accidents brought on by driver inattention are much more likely to result in fatalities or serious accidents because the driver is unable to stop or swerve to avoid or lessen the impact. Fatigue affects attentiveness, alertness, and concentration, which inhibits the accomplishment of tasks. Several

factors can lead to driving fatigue. Situations, such as sleep loss, driving patterns that disregard the normal sleep-wake cycle or represent driving increased time or miles (exposure), the use of sedating medication, sleep disorders such as Sleep Apnea Syndrome (SAS) and narcolepsy, over the counter medication, and consuming alcohol. Generally, accidents take place between midnight and 4 am and in the post-lunch period of between 3 pm and 6 pm are more in number.

People experience a decline in their circadian rhythm, the body's biological clock that regulates sleep, between midnight and six in the morning or in the late afternoon. Young drivers, shift workers, people with Sleep Apnea, and professional drivers are all more likely to experience an accident if they have slept for less than six hours. There are various types of alarms available in the market. Most of the road accidents during night occur due to driver's poor vision caused by the continuous exposure of their eyes to the bright light from the headlamps of approaching vehicles or due to drowsiness. The poor vision is due to exhaustion of the visual pigment in the eyes, which induces sleep to restore the pigment.

Drowsiness-related accidents have all the earmarks of being more serious, because of the higher speeds involved distraction and the driver being not able to take any avoiding activity, or even brake, before the accident. The improvement of innovations for recognizing or preventing the tiredness of the driver is a significant test in the field of accident-preventing systems.

Because of the danger that drowsiness presents on the road, strategies need to be created for checking its influences. Loss of awareness because of tiredness causes a few changes in the human body and activities. These side effects and parameters empower us to effectively measure the drowsiness level. This project has the potential to keep them awake or at least to tell them when they are overtired and need to stop driving. Nowadays most of the products of driver anti-sleep detection sold in the market are simply earphone making intermittent noises, which is quite annoying and inefficient. As such, there is a high demand for cheap and efficient driver sleep detection. Therefore, we came up with an idea and successfully developed a sleepy detection and alarming system, which could effectively meet this demand. This has the potential to save lives on the road. This project intends to develop a device or a system that will help the driver in minimizing road accidents.

As per road safety experts' recommendations, drivers should not drive continuously for more than three hours without a break of 15 to 30 minutes. In one day, a driver's total number of hours at the wheel should not exceed eight hours to ensure that he stays alert.
It is important to recognize that drowsiness affects everyone differently, and it can occur at any time of the day, not just during nighttime driving. It is crucial for drivers to be aware of the signs of drowsiness, such as yawning, heavy eyelids, difficulty focusing, and frequent blinking. Taking breaks, getting adequate rest before long trips, and utilizing tools like anti-sleep alarms can help mitigate the risks associated with drowsy driving, ensuring the safety of both the driver and others on the road.

Other causes of accidents apart from sleepy drivers are poor safety, infrastructure on highways, faulty design of roads, overloading of vehicles, over speeding and tyre bursts in ill-maintained vehicles that use retreaded tyres are some of the other reasons responsible for fatalities on roads.

To mitigate the risks associated with drowsiness, it is essential for drivers to prioritize their well-being by getting sufficient sleep, taking regular breaks during long journeys, and recognizing the signs of fatigue. The use of anti-sleep alarms can also serve as an effective tool to alert drivers when they are showing signs of drowsiness, providing an additional layer of protection and enhancing road safety.

To address this pressing issue, innovative technologies have been developed, one of which is the anti-sleep alarm for drivers. The anti-sleep alarm serves as a reliable companion for long journeys or late-night drives when the risk of drowsiness is high. It employs various mechanisms to detect signs of drowsiness in the driver and alerts them to take immediate action. By monitoring the driver's vital signs or detecting specific behaviors associated with drowsiness, this alarm system helps prevent accidents and promotes safer driving practices. An anti-sleep alarm is a device designed to detect signs of drowsiness or fatigue in a driver and alert them before they fall asleep. It serves as a safeguard against potential accidents caused by driver fatigue, ensuring road safety for both the driver and other commuters. This technology has gained significant popularity and recognition in recent years due to its ability to mitigate the risks associated with drowsy driving.

1.1 Internet of Things

The Internet of Things (IoT) is the networking of physical objects that contain electronics embedded within their architecture in order to communicate and sense interactions amongst each other or with respect to the external environment. It is non-standard devices that connect wirelessly to a network with each other and able to transfer the data. The concept behind IoT is to create a vast ecosystem where everyday objects can be connected to the internet,allowing them to collect and exchange data through embedded sensors, software, and network connectivity. This connectivity opens up numerous possibilities for automation, remote control, data-driven decision-making, seamless communication between devices, enabling them to perform tasks, share information, and make intelligent decisions without human intervention.

It is an advanced automation and analytics system which deals with artificial intelligence, sensor, networking, electronic, cloud messaging etc. to deliver complete systems for the product or services. The system created by IoT has greater transparency, control, and performance.The key Components of IoT are Devices and Sensors,Connectivity,Data Processing and Analytics,Cloud Infrastructure,User Interface and Applications.

The IoT as a whole consists of different modules and devices which include various embedded systems, sensors, processors, and other information-sharing devices to provide efficient communication. These devices work as the backbone for an IoT system in collecting data and analyzing them either by sending them to the cloud or analyzing them logically, depending on the requirement of the end-user. These act according to the functions or the operations that are given to them in the setup. As said earlier, the main advantage of using an IoT system is to operate without people's intervention.

The Internet of Things has the potential to revolutionize various aspects of our lives, from smart homes and cities to industrial automation and healthcare. By enabling intelligent connectivity and data-driven insights, IoT can enhance efficiency, convenience, and sustainability while presenting new challenges and opportunities in the rapidly evolving digital landscape. By connecting physical objects to the internet, IoT enables the integration of the digital and physical worlds, opening up a wide range of possibilities across various industries and sectors. However,the entire preliminary

setup is to be done by people interacting with the devices. A lightbulb that can be switched on using a smartphone app is an IoT device, as is a motion sensor or a smart thermostat in your office or a connected streetlight. An IoT device could be as fluffy as a child's toy or as serious as a driverless truck. Figure specifies the basic block diagram and working of IoT.

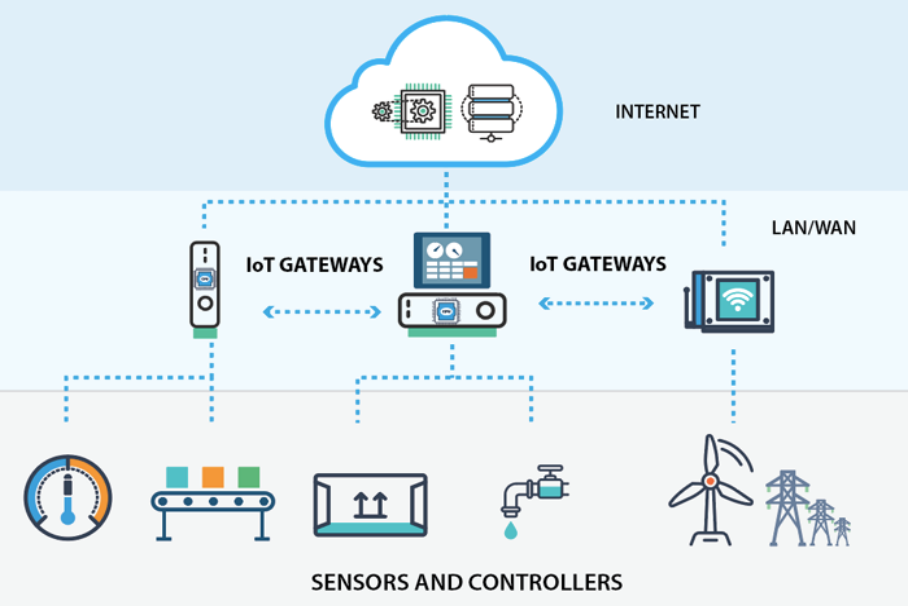

Figure 1.1.1: IoT Block Diagram

IoT technology allows objects to be remotely controlled, monitored, and accessed through a network infrastructure. These objects, often referred to as "smart"devices or çonnected"devices, can include anything from smartphones, wearable fitness trackers, and home automation systems to industrial machinery, environmental sensors, and smart city infrastructure.

The deployment of IoT requires robust infrastructure, reliable connectivity, and effective data management strategies. Ensuring the security of IoT devices and networks is crucial to prevent unauthorized access and potential cyber threats. IoT represents a transformative technology with the potential to revolutionize various industries and aspects of our daily lives. By connecting devices, collecting and analyzing data, and enabling intelligent decision-making, IoT has the power to drive efficiency, innovation, and sustainability in the digital age.

The internet of things helps people live and work smarter, as well as gain complete control over their lives. In addition to offering smart devices to automate homes, IoT is essential to business. IoT provides businesses with a real-time look into how their systems really work, delivering insights into everything from the performance of machines to supply chain and logistics operations.
IoT enables companies to automate processes and reduce labor costs. It also cuts down on waste and improves service delivery, making it less expensive to manufacture and deliver goods, as well as offering transparency into customer transactions.

IoT in Anti-Sleep Alarm for Drivers

According to Royal Society for Prevention of Accident (RoSPA), nearly 1.3 million people die in road accident each year worldwide. On an average 3,287 deaths per day, with an additional 20-50 million are injured or disabled due to road accident. Fatigue or dizziness among drivers is a major cause of these road accidents. To reduce the accidents due to fatigue or dizziness, anti sleep alarm helps a lot. There are two types of anti-sleep alarms. There are various types of alarms available in the market. One of the type of alarm is built into the car and uses its sensors, cameras and other high-tech tricks to identify the driver's fatigue and handles the situation accordingly. Another type of alarm fits over the driver's ear and it acts promptly when the driver fall asleep. This device is designed by using eye sensor and Arduino Nano. The eye sensor consists of transmitter and receiver. The transmitter transmits very high amount of IR rays when the eyes are open and in case of closed eyes it will transmit very less in turn.

A narrow-band light beam from this emitter is aimed across the surface of the driver's eye, just above the eyeball, between the eyelids, and it is sensed in the opposite corner of the eye by means of a light sensor, which has a narrow band light filter mounted in front of it. For waking up the driver, whose eyes have been closed for a longer time period than about one second or less, an electronic circuitry is activated by means of the closed-eye signal from the light sensor, turning on an alarm signal, a buzzer or similar, after three second or longer time delay. A pair of eyeglasses include a sensing lever that is in constant contact with one of the driver's upper eyelid muscles. Downward motion of the eyelid moves the sensing lever downward and actuates a microswitch that is coupled to the sensing lever.

A normal blink of a driver's eye does not produce an audible alarm. However, if the driver's eyelid fails to open in a predetermined time, the audible alarm will sound. As soon as the driver's eyelid opens, a yellow caution light and the audible alarm are reset. Normal eye blinks produce illumination of the yellow caution light in view of the driver, thereby assuring the driver that the sleep awakening device is functioning properly.

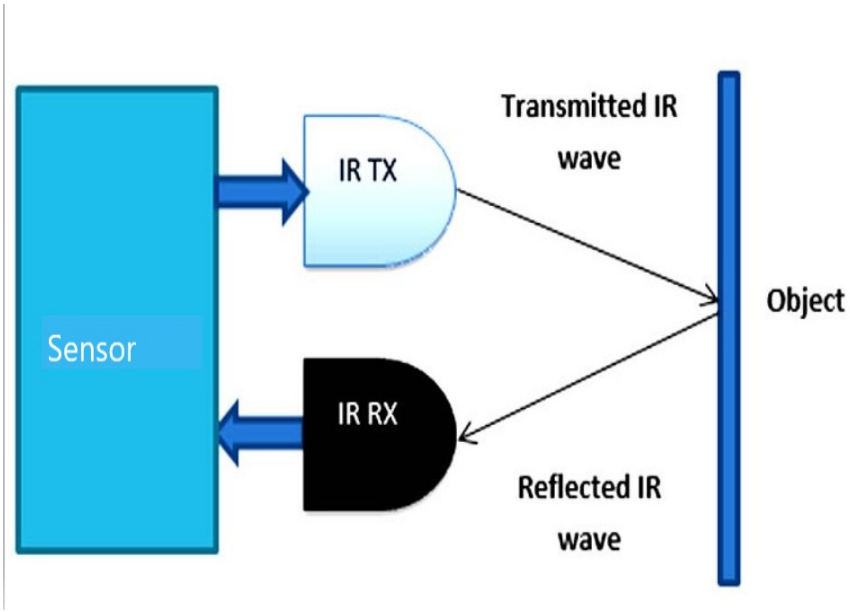

Figure 1.1.2: Working of Eye Blink Sensor

1.2 Objective

The objective of an anti-sleep alarm for drivers is to enhance road safety and prevent accidents caused by drowsiness or fatigue while driving. It helps mitigate the risks associated with driver fatigue, promotes responsible driving practices, and contributes to a safer road environment. It also helps to reduce the risk of accidents caused by drowsiness. In this project we to develop a model that detects the sleepiness of the driver and alert the person by alarm accordingly.

- There will be an eye blink sensor, which detects the closures of an eye.
- This sensor uses an infrared sensor to detect, if the person's eye is closed or not and the corresponding data received can further processed by ESP 32 micro-controller.
- This model comes with an IR sensor mounted on glasses so that the user can wear it like regular glasses.
- The ESP 32 micro-controller sends a notification from a telegram bot with the help of Wi-Fi.
- The notification includes the output provided from an ESP 32 micro-controller.

1.3 Problem Definition

Driver exhaustion is a significant variable in an expansive number of vehicle accidents. Late insights assess that yearly 1,200 deaths and 76,000 injuries can be credited to weariness-related accidents. Less attention leads the driver to be distracted and the likelihood of a street accident goes high. Drowsiness-related accidents have all the earmarks of being more serious, because of the higher speeds involved distraction and the driver being not able to take any avoiding activity, or even brake, before the accident.

The improvement of innovations for recognizing or preventing tiredness of the driver is a significant test in the field of an accident preventing systems. Because of the danger that that drowsiness presents on the road, strategies need to be created for checking its influences. Loss of awareness because of tiredness causes a few changes in the human body and activities. These side effects and parameters empower us to effectively measure the drowsiness level. Every year, 1.25 million people around the world die due to road crashes – a global problem that the World Health Organization (WHO) says is both predictable and preventable.

We are proposing an anti-sleep alarm device for drivers which detects the drowsiness of driver and alerts them. These devices are designed to detect signs of drowsiness and alert the driver, helping to prevent accidents caused by falling asleep at the wheel. Anti-sleep alarms utilize various sensors and technologies to monitor driver behavior and detect signs of drowsiness. These devices can be worn on the body or integrated into the vehicle itself, offering an extra layer of safety for drivers during long trips or late-night drives. By detecting signs of fatigue, such as changes in head position, eye movement, or even changes in steering patterns, these alarms can effectively warn drivers and prompt them to take necessary actions to stay awake and focused.

The primary goal of anti-sleep alarms is to ensure driver safety and prevent accidents caused by drowsiness. By providing timely alerts and reminders, these devices contribute to reducing the risk of road accidents and potentially saving lives. They are particularly beneficial for professional drivers, such as truckers, delivery personnel, or taxi drivers, who spend extended periods on the road and are more prone to fatigue.

2. Literature Survey

Now a days, there is increasing research interest on developing remote access model for driver drowsiness detection. Dr.K.S.Tiwari, et al.[1] IoT Based Driver Drowsiness Detection and Health Monitoring System paper analyze and design the driver drowsiness detection and health monitoring system using IoT. Their system consists of raspberry pi3,sensors, GPS, USB camera, speed limiter and buzzer. USB Camera is provided for continuously monitoring the position of eyes of driver. When driver's eyes are closed for more than 5seconds then buzzer will on. Heart beat sensor and temperature sensor are taken as an input to Raspberry Pi-3 .These sensors are used to measure the health parameters. Whenever the driver feels drowsy and closes his eyes for more than a second, the buzzer is blown. They used temperature and heartbeat sensor to measure the health parameters of the driver. Alcohol sensor is used to check the alcoholic state of driver. When alcohol is detected then the vehicle will go at low speed. The whole data sent to the health monitoring system of server. The information is about driver's condition are sent to the driver's colleague through message.Even if any emergency condition occurred the location of driver can be tracked via GPS so that the driver get help from the hospitals. This paper presents an analysis and design of an IoT-based system for driver drowsiness detection and health monitoring. The primary goal of this project is to provide a cost-effective solution to a real-life problem. When the driver experiences drowsiness and closes their eyes for more than a second, a buzzer is activated to alert them. The system utilizes temperature and heartbeat sensors to monitor the driver's health parameters. An alcohol sensor is also incorporated to detect if the driver is under the influence of alcohol, which results in the vehicle operating at a reduced speed. In the event of an emergency, doctors or colleagues can locate the driver using GPS technology. Implementing this system has the potential to reduce the occurrence of accidents, thus significantly contributing to the preservation of precious lives.

Adnan Ahmad, et al.[2] Microcontroller Based Anti Sleep Alarm System is an attempt to help in decreasing and/or preventing traffic accidents that happen due to drivers drowsiness and fatigues. Using the anti sleep alarm system the drivers will be benefited and be alert while driving. This anti sleep alarm system is designed using eye sensor and Arduino(ESP8366) They developed a customized goggles, which is micro controller based anti sleep alert system for the drivers. In their device the inbuilt infrared sensor detect the obstacle and transfer signal to Arduino then Arduino supply signal to buzzer. The micro-controller will wait for 3 seconds. Then if it finds that the eyes

are still closed, micro-controller sounds the buzzer this kit involves measure and controls the eye blink using IR sensor. The IR transmitter is used to transmit the infrared rays in our eyes. The IR receiver is used to receive the reflected infrared rays of the eyes. If the eyes are open then the output of IR receiver is high otherwise the output is low. The eye blink sensor activates the alarm if anybody closes his/her eyes for more than 3 seconds. This device can be used by the physical paralysed person to communicate with others, can be used by the security personnel at night.

Aileni Eenaja, et al.[3] Advanced System for Driver's Drowsiness Detection With Alarm Buzzer acknowledged that drowsiness is a complex phenomenon which states that there is a decrease in alerts and conscious levels of driver. The most precise technique to detect driver's drowsiness is through Face/eye monitoring using Face detection camera. Even if the speed of car cross the limit of 20mph (when drowsiness detected) then the sensor device will be alert a buzzer via audible sound and the car left indicator will be generated using Arduino Uno processor. So that the driver can able to drive the car into a limit of 100mts to 150mts distance only to stop the vehicle. The buzzer and left indicator will not have stop button and it will not turned off unless the car engine stops for at least couple of minutes. This project is not to provide comfort to the driver but to save the life. So apparently driver will stop the vehicle to stop the alarm.This is an affordable project where an auto-driver, cars, trucks, mini-trucks etc,. All the small scale industry and vehicle owners can emerge this system to their vehicles. This project programming code data is very less compared to the existing system. And when drowsiness is detected it will get executed within 0.132 to 0.141 milliseconds.

Ashwini, Veda M, et al.[4] T Based Driver Drowsiness and Health Monitoring System paper introduces driver drowsiness and health parameters detection system. Road accidents sometimes may be caused by lack of health and fatigue among drivers. Driver fatigue is a very serious problem which is a root cause for many road accidents. It is not possible to calculate the exact number of accidents because of drowsiness but research shows 20 percent of accidents happens only because of fatigue (rospa).This "IOT BASED DRIVER DROWSINESS AND HEALTH MONITORING SYSTEM" provides USB Camera for Eye-Blink Monitoring System and includes a buzzer that alerts the driver when he is drowsy. Driver's location can be tracked using GPS. In the proposed application design the admin will be monitoring the system parameters and send a message

to the friends/relatives in case of emergency. The driver's health is monitored by wearable heart beat sensor and temperature sensor. Alcohol sensor is provided to detect the alcoholic condition of the driver, and when the alcohol level crosses the set threshold value, the vehicle speed goes down and after some point of time engine seizes and the vehicle stops. This paper implements the driver drowsiness detection and health monitoring system using IoT. Purpose of this project is to help in solving real life problem in a very cost effect way. Whenever the driver feels drowsy, the buzzer will be on and the driver in turn gets an alert. This system uses temperature and heartbeat sensor to measure the health parameters of the driver. Alcohol sensor is used to check the alcoholic state of the driver. When the alcohol is detected the vehicle speed goes low and eventually the vehicle will be stopped. Also in case of an emergency, a doctor or driver's friends can reach him by knowing his location via GPS. As a result the accident ratio can be reduced. Thus, our project if commercially developed will help in saving the precious lives of drivers and co-passengers.

Anil Kumar Biswal, et al.[5] IoT-Based Smart Alert System for Drowsy Driver Detection research provides a robust method for detecting drowsiness of drivers and collision detection. Their system's main components are the Raspberry Pi3 model B module and Pi camera module that are used for persistent recording of face landmarks that are localized through facial landmark points then to calculate EAR. However, if the calculated EAR value increases from the threshold range, then the eyes are kept open and no change in the state of system occurs. Similarly, if the EAR value falls from the threshold range, then the system urgently alerts using speech speaker and warning e-mail to the authority (owner) for extra supportive alertness to the driver. The mail is received by an authorized one, who can alert the sleepy driver by ringing to him, if that drive is still not awake after turning on the voice alert message in the speaker. When the EAR value is greater than 0.25, it indicates the eyes are open. The Internet of Things (IoT) is helping to manage various real-time complexities like handling complex sensing environments and also provides a very flexible platform to control multiple connectivities. The IoT module is a very reliable way of capturing images of the drowsiness of the driver as well as sending an alert message to the owner for awareness.

Mr. Aniket Ashok Bhamani, et al.[6] IoT Based Approach For Remotely Monitoring And Alarming A Drowsy Driver provided an IoT based approach for monitoring the face of the driver while he or she is driving the vehicle. Their project can run machine learning algorithms to predict if

the driver is about to fall asleep or not and render real time accurate results. They further used these results to alarm the driver and prevent him/her from falling asleep by generating an instant automated voice call to the driver's registered cell phone number. Additionally, an instant text message is sent to the driver's emergency contact so as to assure that there is someone to check up on the driver in case the driver happens to run into an accident. Their project is a unique implementation towards detecting drowsy driving as it offers an approach to remotely monitor the driver. This project is completely based on accessing the camera of the device remotely. It is independent of the underlying platforms, such as Android, IOS etc. All of the functionalities which are provided are not platform specific and can be dispensed on any device irrespective of the operating system being used by that device. It makes the implementation not only cross platform, but also device independent that is, it is designed in such a way that it does not matter what the monitoring device is, it can be a cell phone, a tablet etc. As long as the device supports the minimum requirements of having a camera, calling features and a stable internet connection, this project can be used to successfully alert a sleepy driver and prevent accidents. As long as any device has an integrated camera, active internet connection and calling features, it can be used to implement this approach.

Hazizi Satiman [7] IoT-Based Driver Drowsiness and Fatigue Detection System Therefore, in this study, behavioral based drowsiness detection system has been used since this method has its non-intrusive nature. This research has been conducted to evaluate the accuracy of the behavioral based drowsiness detection system. In order to achieve the objective of this research, Haar cascade classifier algorithm, eye aspect ratio (EAR) algorithm and mouth aspect ratio (MAR) have been implemented to detect drowsiness and fatigue. The system can detect drowsiness if the value of EAR is frequently below a threshold value (0.23), and the system will alert the driver through a speaker. Based on MAR value, this system is able to determine the driver is yawning or not. It is said that these algorithms are good enough to detect drowsiness and fatigue. IoT based driver drowsiness and fatigue detection system has been successfully developed. The implementation of image processing based on three types of algorithms which are Haar cascade classifier algorithm, eye aspect ratio (EAR) algorithm and mouth aspect ratio (MAR) algorithm, have been successfully developed and tested in this study. Based on the experiment conducted, overall, the accuracy of these algorithms are good enough to detect drowsiness and yawning but in certain conditions only (which are when subjects are in different lighting conditions (morning and night) and when a subject's face is right

and left position). It can be said that this system is useful and safe to be tested in a car environment if the driver is in those conditions only.

N. Qureshi, et al.[8] n Effective IoT based Driver's Drowsiness Detection and Monitoring System to Avoid Real-Time Road Accidents research provides many people know that driving while drowsy is dangerous, but they may not know how to detect their own level of sleepiness. The proposed solution will provide you with information on how to look for signs of potential driver drowsiness and take appropriate action. The existing techniques are classified into three major classes namely: vehicular based, behavioral based and physiological based methods. The vehicular based methods utilize parameters like steering control, brake control, acceleration on the pedal and lane deviations. The behavioral based methods utilize parameters like eye blinking, mouth ratio for yawning and head pose. The physiological based methods utilize parameters like heart rate activity, muscle activity and brain activity. These systems are designed to monitor the driver's sleepy state and alert him for prevention of road accidents. However, the accuracy for detecting sleepiness is very low and hence the proposed system will combine these methods to introduce a hybrid system to improve the detection rate. A buzzer is placed to alert the driver when the sleepiness is detected. This would allow the driver to rest or have a coffee instead of driving for long periods without realizing that he is too tired. The proposed solution will also detect the collision of the vehicle and send the location information of the driver through a SMS to the vehicle owner, in case if he is not awakened by the buzzer and met with any minor accident.

Akshara M. C., et al.[9] OT Based Driver Drowsiness Detection and Smart Alerting System paper provides drowsy driving is one of the main causes of road traffic accidents around the world of around 21 percent and counting. By contrast, around 28 percent of accidents are caused by drunk driving and is increasing rapidly. According to the study of all the research papers at hand, each paper had a different approach with detecting driver drowsiness but followed similar practices in reducing/preventing it. From the comparations between other drowsy detection techniques, we have found that the eye state analysis-based techniques are the better methodology for detecting drowsiness/fatigue. Eye-state analysisbased methods has many benefits such as being non-intrusive and having low computation costs, high robustness, high accuracy and so on. Some of the research papers also measures certain parameters like pulse rate, temperature, alcohol consumption and based

on that the vehicle stops/reduces its speed. Based on these findings, they implemented a system that ensures the safety of the driver and avert vehicle accidents. This project has a capability of detecting the drowsiness, alcohol, pulse rate and obstacle detection to reduce accidents. If the alcohol and drowsiness is detected the ignition key is turned off and the SMS will be sent to the respective family member and the location of the driver. Having that feature allows the driver's family or relatives to locate the driver quickly if gotten to any accidents. Their proposed system consists of two microcontrollers: Arduino Nano and ESP32 where the ignition key, Ignition relay, buzzer, Eye-blink sensor, pulse sensor, ultrasonic sensor and alcohol sensor are connected to the Arduino Nano board. The GPS, GSM and the water sprinkler are connected to the ESP32 board. All the values from these sensors are being sent to the cloud server. The reason why we are using two microcontrollers is that the Arduino Nano does not have internet connectivity hence the usage of the ESP32. The software requirements used in this project are Arduino Software IDE and Thinger.io Console.

Saranya. S S, et al.[10] owsiness Detection for Drivers using IoT, in this paper to overcome the challenges existing sleep monitoring system generate alarm sounds notification to the drivers when they are drowsy. They used computer vision method in that recognized face to detect drivers not eye. These are the current technology tenser flow, Keras etc. While driving there with a lot of noise in the surrounding, the drivers can easily divert from sleep. Alert the drivers by message to take some rest for sometimes is useless while driving driver don't use the mobile then it is not possible to see message. To overcome this problem, the proposed system helps to prevent driver drowsiness. Then set a vibrate motor under a driver seat. It does not affect the driver in any manner. By using vibrate methodology, it can help the driver awake from the sleep These are tools used in this project raspberry pi, pi camera, and vibration motor. Video can store the live recordings in external storage. Even though a network issue can prevent data from being stored if the car is in a hilly area, external storage is provided here to record video. Rotary encoder will measure steering wheel. The car will automatically switch off if the steering radius is not consistent.

3. SYSTEM ANALYSIS & DESIGN

3.1 Architecture Design

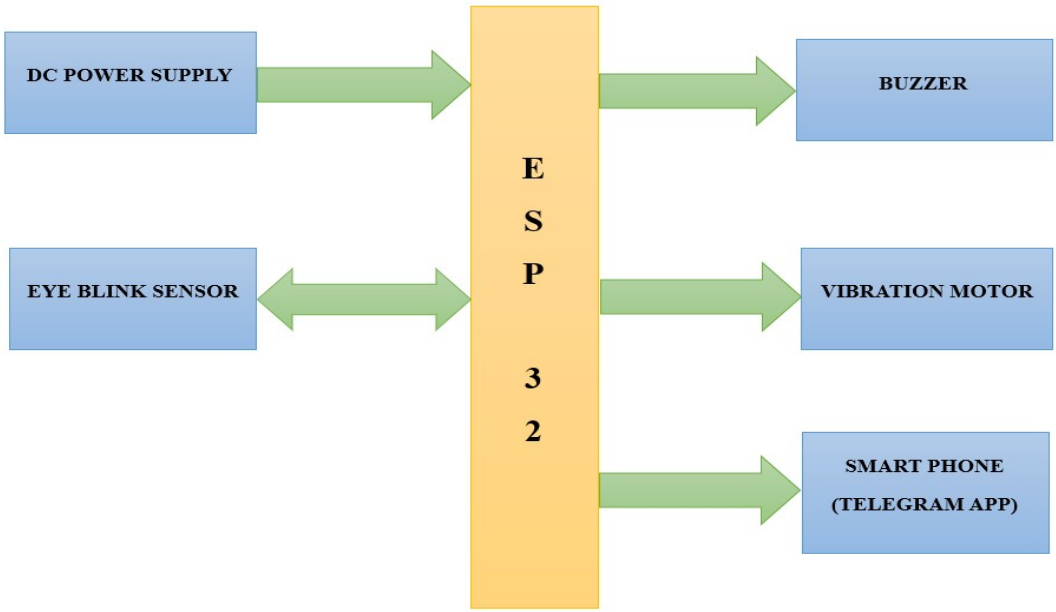

Figure 3.1: Block Diagram of Anti-Sleep Alarm

Driver Anti Sleep Alarm Device,is a system that alerts the user if he/she falls asleep at the wheel thereby, avoiding accidents and saving lives. This system also sends an alert notification to the contacts. The first step in the implementation of the project is to detect eye blink of the user. This can be achieved by using eye blink sensor. The eye blink sensor has two sections, the IR transmitter and the IR receiver. The IR transmitter is used to transmit the infrared eyes to our eye. The receiver is used to receive the reflected infrared rays of eye. If eye is closed then output of IR receiver is high otherwise the IR receiver output is low. And if they close their eye for more than 6 seconds it activates an alarm and a buzzer which in turn wake up the user.

The second feature is to send alert notification to user's pre-selected contact, when the user shows signs of drowsiness or fatigue are detected, allowing them to take immediate action to prevent

accidents or lapses in concentration. The message is sent through Telegram App.

Another important feature is to make this device usable on any spectacles, so the device has to be made detachable and attachable easily. And also it should be made compact in size to avoid trouble to the user while using it.The device has to be comfortable to the user because any kind of inconvenience can disturb the driver.

In order for all these components to be embedded into one system, they have to be connected to the ESP32. After making connections, the board has to be programmed using the Arduino IDE for all the hardware components to perform their respective functions.

3.2 Flowchart

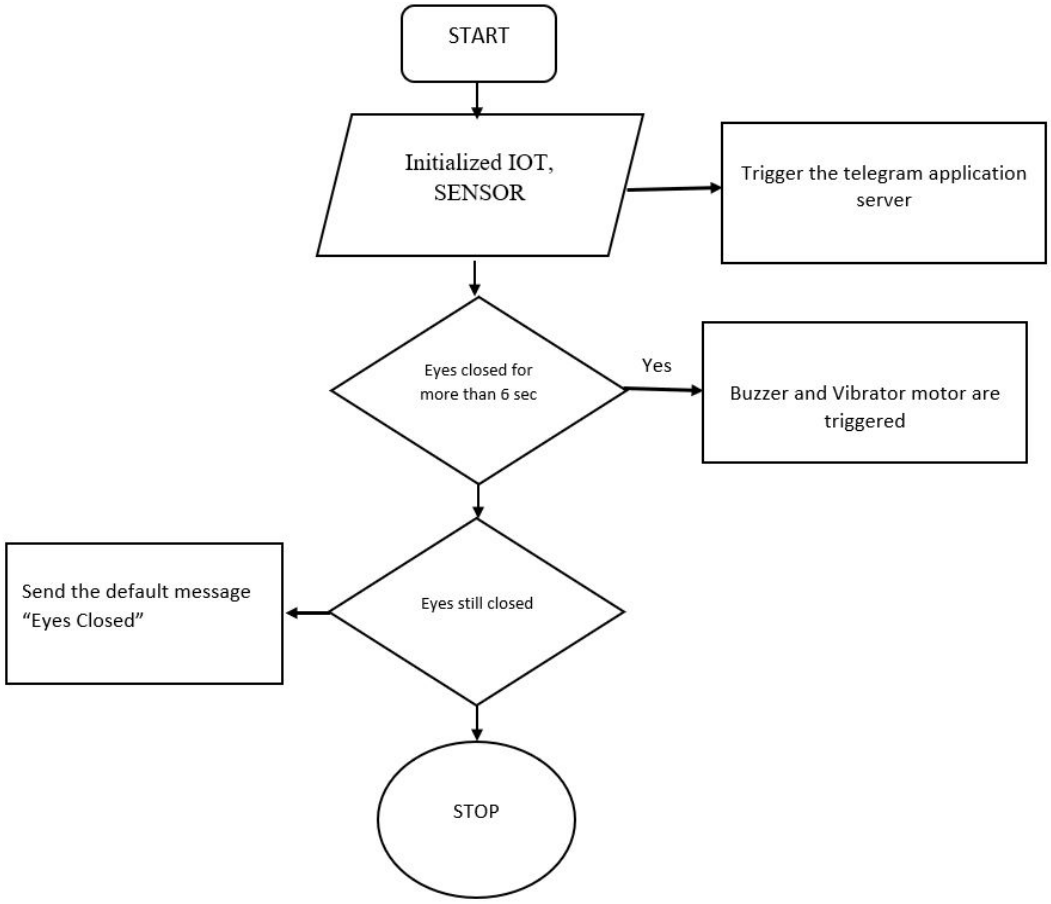

Figure 3.2: Flowchart of Anti-Sleep Alarm Device

The flowchart represents the logical sequence of actions and decisions involved in the functioning of the anti-sleep alarm device.

First is the initialization phase, where the necessary components and connections are set up. This may include initializing the IoT connection, setting up communication protocols, and configuring the alarm system.

Setting Alarm Time: The user sets the desired alarm time. This is a crucial step as it defines when the alarm should be triggered to wake the user up.

Loop: The flowchart enters a loop where it continuously checks the current time against the set alarm time. This loop ensures that the program keeps monitoring the time until it matches the alarm time.

Alarm Trigger: When the current time matches the alarm time, the flowchart sends an alarm trigger signal to the IoT device. This signal notifies the device to start the alarm sequence.

Response from IoT Device: After sending the trigger signal, the flowchart waits for a response from the IoT device. This response confirms whether the device is successfully connected and ready to sound the alarm.

Alarm Sounding: If a response is received, indicating a successful connection, the flowchart proceeds to sound the alarm on the IoT device. This could involve playing a loud sound, activating vibration, or any other mechanism designed to wake the user up.

Snooze Option: While the alarm is sounding, the flowchart checks for user interaction. If the user chooses to snooze the alarm, the flowchart sends a snooze signal to the IoT device. This signal triggers a delay in the alarm for a specified duration, allowing the user to get a few more minutes of sleep.

Alarm Off: If the user decides to turn off the alarm, the flowchart sends a stop alarm signal to the IoT device. This signal instructs the device to stop the alarm sequence.

End: The flowchart ends, indicating the completion of the program.

The flowchart allows for an organized representation of the various steps and decision points involved in an anti-sleep alarm system. It illustrates the logical flow of actions, ensuring that the alarm is triggered, user interactions are handled, and the alarm is eventually turned off or snoozed based on user preferences.

3.3 Hardware and Software Requirements

Hardware Requirements

1. ESP32

ESP32 is created by Espressif Systems with a series of SoC (System on a Chip) and modules which

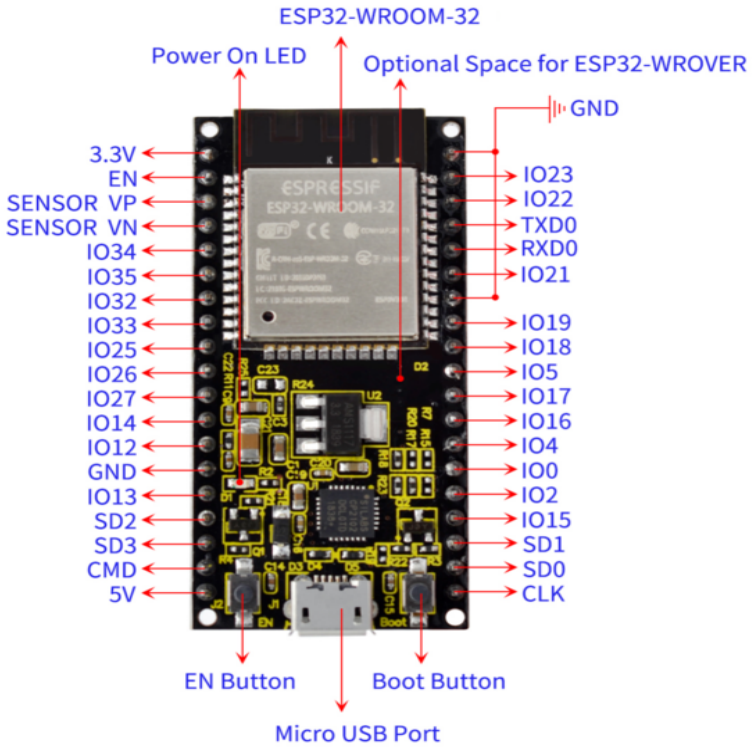

Figure 3.3.1: ESP32

are low cost with low power consumption. This new ESP32 is the successor to the well-known ESP8266(became very popular with its inbuilt WiFi). ESP32 not only has Built-in WiFi but also has Bluetooth and Bluetooth Low Energy. In other words we can define ESP32 as “ESP8266 on Steroids”. ESP32 chip ESP32-D0WDQ6 is based on a Tensilica Xtensa LX6 dual-core microprocessor with an operating frequency of up to 240 MHz.The small ESP32 package has a high level of integrations such as: Antenna switches, Balun to control RF, Power amplifier, Low noise reception amplifier, Filters and power management modules. On top of all that, it achieves very low power consumption through power saving features including clock synchronization and multiple modes of operation. The ESP32 chip’s quiescent current is less than 5microampheres which makes it the ideal tool for your

battery-powered projects or IoT applications.

This keyestudio ESP32 core board is a Mini development board based on the ESP-WROOM-32 module. The board has brought out most I/O ports to pin headers of 2.54mm pitch. These provide an easy way of connecting peripherals according to your own needs. When it comes to developing and debugging with the development board, the both side standard pin headers can make your operation more simple and handy. The ESP-WROOM-32 module is the industry's leading integrated WiFi + Bluetooth solution with less than 10 external components. It integrates antenna switch, RF balun, power amplifiers, low noise amplifiers, filters and power management modules. At the same time, it also integrates with TSMC's low-power 40nm technology, so that power performance and RF performance are safe and reliable, easy to expand to a variety of applications.

ESP32 is power packed with hardware features. The high speed dual core processors along with the numerous built in peripherals it is set to replace micro-controllers in connected products. The WiFi, Bluetooth Classic and BLE make it great choice to build anything connected. Even if a project does not require a particular feature initially, it could be utilized as required. The built-in hardware accelerator enables secure code storage and securely connecting to the Internet with TLS (SSL). Apart from this the peripheral like the Infrared Remote Controller will be used in numerous hacks!. The software/firmware will be key to success of ESP32. It uses freeRTOS to handle multitasking. The number of peripherals, wireless connectivity, dual core processors and the overall architecture needs to be understood thoroughly to build reliable, responsive , secure and robust products and projects.
The ESP32 microcontroller is a popular platform for developing Internet of Things (IoT) applications due to its built-in Wi-Fi and Bluetooth connectivity, as well as its low power consumption and affordability. Here are the basic steps to use the ESP32 microcontroller for IoT:

Set up the development environment: You'll need to install the Arduino IDE and the ESP32 board package in order to program the ESP32. You can find detailed instructions on the official ESP32 website.

Write your code: You can program the ESP32 using the Arduino IDE, which uses C++ syntax. The ESP32 comes with a variety of libraries to help you connect to Wi-Fi networks, Bluetooth devices,

and sensors.

Connect your sensors: You can use the ESP32's built-in GPIO pins to connect to sensors and other devices. You'll need to write code to read data from these sensors and send it over Wi-Fi or Bluetooth.

Connect to the cloud: You can use cloud services like AWS IoT or Google Cloud IoT to store and analyze data from your ESP32. You'll need to write code to connect to these services and send data over the internet.

Deploy your application: Once you've tested your code and connected your sensors, you can deploy your application to the ESP32. You can either upload your code using the Arduino IDE or use over-the-air (OTA) updates to update your code wirelessly.

Overall, using the ESP32 for IoT involves writing code to connect to sensors, sending data over Wi-Fi or Bluetooth, and connecting to cloud services to store and analyze data. With its built-in connectivity and low power consumption, the ESP32 is a great platform for developing IoT applications.

2. Eye Blink Sensor

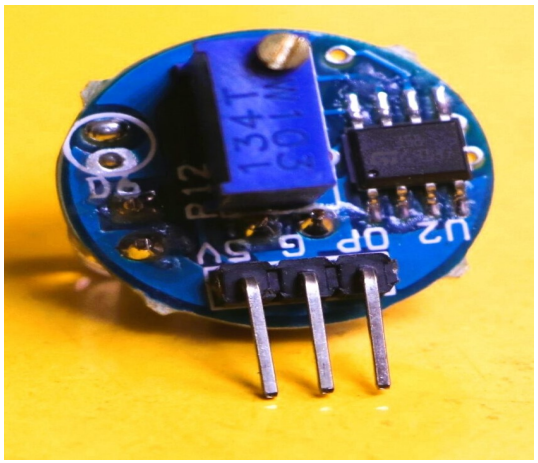

Figure 3.3.2: Eye Blink Sensor

An eye blink sensor, also known as an eye blink detector or eye blink tracker, is a device or system that detects and measures the blinking of a person's eyes. It is often used in various applications, including human-computer interaction, fatigue detection, eye-controlled devices, and biomedical research.

There are different types of eye blink sensors, but one common approach is to utilize infrared (IR) light and sensors to detect changes in reflection or absorption patterns caused by blinking. The choice of an eye blink sensor depends on the specific application, requirements, and constraints such as accuracy, comfort, cost, and ease of integration. Different sensors have different sensitivities to various eye movements, and their performance may vary depending on factors like lighting conditions and user characteristics.Eye blink sensors can be implemented using different hardware configurations and signal processing algorithms. Some advanced eye tracking systems also combine eye blink detection with other techniques like gaze tracking to provide more comprehensive eye-related information.

The eye blink sensor is an infrared sensor. It contains two parts. A transmitter and a receiver. The transmitter continuously emits infrared waves onto the eye. While the receiver continuously looks for variations in the reflected waves which indicates that the eye has blinked.

The IR Emitter emits an IR light towards the eye. The IR Photo-diode is designed to detect if the radiation of the same wavelength is reflected back and detected. If the eye is closed, the IR rays will reflect back with a larger intensity and the photo-diode will detect it.

3. Buzzer

A buzzer is an electronic device that produces a continuous or intermittent sound or tone. It is commonly used in various applications as an alert or notification mechanism to draw attention or indicate a specific event or condition. Here are some key aspects of buzzers:
Working Principle: A buzzer typically consists of an electromechanical transducer that converts electrical energy into mechanical vibrations, which in turn produce sound. The basic working principle involves the following steps:

Figure 3.3.3: Buzzer

Electric Current: When an electric current flows through the buzzer, it energizes an electromagnetic coil or a piezoelectric element.

Vibrations: The energized coil or piezoelectric element creates mechanical vibrations due to electromagnetic forces or the piezoelectric effect.

Sound Generation: The vibrations are transmitted to a diaphragm or a sound-producing element, which amplifies the vibrations and converts them into audible sound waves.

Applications of Buzzers:

Alarms and Safety Systems: Buzzers are commonly used in alarm systems to alert people in emergency situations, such as fire alarms, burglar alarms, or smoke detectors.

Industrial and Machinery: Buzzers are used in industrial settings to indicate various conditions, such as equipment malfunctions, low fuel levels, or completion of a process.

Automotive and Transportation: Buzzers are employed in vehicles to provide audible alerts for seatbelt reminders, turn signal indicators, parking assistance systems, or low fuel warnings.

Consumer Electronics: Buzzers are found in devices like clocks, timers, microwave ovens, home appliances, and electronic toys to provide audible notifications or signals.

Medical Devices: Buzzers are used in medical devices and equipment to indicate alerts, such as low battery levels, abnormal conditions, or patient alarms.

Buzzers can vary in sound intensity, frequency, and design based on specific application requirements. They are an essential component for providing audible feedback or alerts in various electronic systems and devices.

4. Vibrator

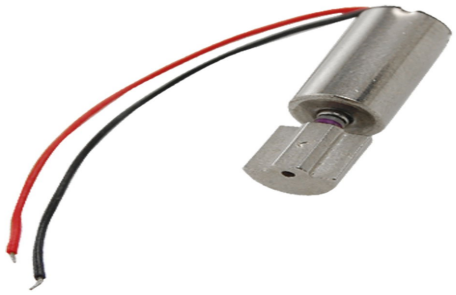

Figure 3.3.4: Vibrator

Vibration motor is a DC motor in a compact size that is used to inform the users by vibrating on receiving signals. Vibrator motor, is also known as a vibration motor or vibrating motor, is a small-sized device commonly used in various electronic devices such as cell phones, game controllers, and haptic feedback systems. It is designed to produce vibrations or oscillations when an electrical current is applied to it.It generally has no sound.

This small built-in module uses a high-quality vibration motor. When the input is high, the motor will vibrate just like your cell phone. You can control the ON/OFF or vibration intensity through digital signal or PWM signal. The module adopts a high-quality mobile phone vibration motor; the vibration effect is evident, it is amplified and suitable as a non-audible indicator. The module can easily complete the conversion of the electrical signal to mechanical vibration.

By adjusting the electrical current applied to the coil, the speed and intensity of the vibrations can be controlled.Vibrator motors are often used to provide tactile feedback or alerts in electronic devices. The vibrations produced by the motor can be felt by the user, adding a sense of touch or providing notifications. The specific design and control mechanisms of vibrator motors can vary depending on the application and device in which they are used.

5. Battery

Figure 3.3.5: Battery

A battery is a device that converts chemical energy into electrical energy, and it is commonly used as a portable power source in electronic projects. Batteries consist of one or more electrochemical cells, each containing two electrodes—a positive electrode called the cathode and a negative electrode called the anode—separated by an electrolyte.It's important to note that different types of batteries employ various chemistries and designs, resulting in variations in voltage, capacity, and performance. Common battery types include alkaline batteries, lithium-ion batteries, lead-acid batteries, and nickel-metal hydride batteries. The specific characteristics of a battery determine its suitability for different electronic projects, based on factors such as power requirements, size constraints, and reusability.A battery is an electrochemical device that converts stored chemical energy into electrical energy. It serves as a portable and self-contained power source for various electronic projects and devices.

The specific chemistry of the battery determines its voltage, capacity, and other characteristics. Common types of batteries used in electronic projects include alkaline batteries, lithium-ion batteries, nickel-cadmium batteries, and lead-acid batteries. Each type has its own unique chemical composition and performance characteristics, making them suitable for different applications based on factors such as energy density, discharge rate, and rechargeability.

6. SPST Switch

Figure 3.3.6: SPST Switch

A switch is a mechanical or controlling device that changes the flow of current direction or interrupts the flow of current within a circuit. SPST switch stands for “Single Pole Single Throw” which includes a single input and a single output. The switch works like a one-way switch to ON/OFF the circuit. Once a user pushes the switch button, then the switch plates will be connected. So that current starts flowing within the circuit.Continuously power supply to micro controller will destroy the board, we can avoid this by connecting a switch between the battery and Amicro controller. When the user needs to use the device then he/she can switch it on.

The construction of this switch can be done through two metal plates that can touch each other to create a physical contact to allow the flow of current. This contact separates the two metal plates from each other to interrupt the current flow.In the Single Pole Single Throw switch, the pole refers to the maximum input connections whereas throw refers to the maximum output connections from the switch. So in this switch, we can give single input and gets single output. This switch controls a single circuit at a time. In this switch, the contact portion can be designed with silver alloy material to oppose the high current.This contact can be insulated through Polyvinyl chloride material to keep away from exterior contact. So this insulation material can be changed based on the operating voltage.

7. Insulated Wire

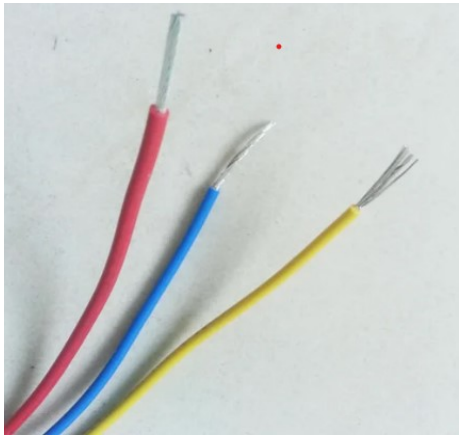

Figure 3.3.7: Insulated Wire

Insulated Wire is flexible metallic conductor, used to carry electric current in a circuit. We have used insulated wire for our device for connecting all the components. For connecting the wires, we need to solder it to the components. The obvious benefit of insulated wire is the color. While this may seem simple, it's very important, especially in sophisticated wire and cable applications. Colored insulation can help you determine the difference between wires when there are many running together. Designated wires for different applications can help the wired network remain organized. Wires that are insulated are also corrosion and crush resistant. Ensuring your wire will last is essential to the longevity of your installation.

Not only is insulated wire corrosion-resistant, but it is also cost-effective. It's better to buy insulated wire than wire that needs to be repaired or replaced. Replacement or repair of wire will lead to service disruption and cost, which is not ideal. Safety is essential in wiring applications. Wires carry current that can cause electric shock when touched or cause electrical explosions, shorted wire systems, and more. Insulated wire is the safest choice.

8. Charging Port

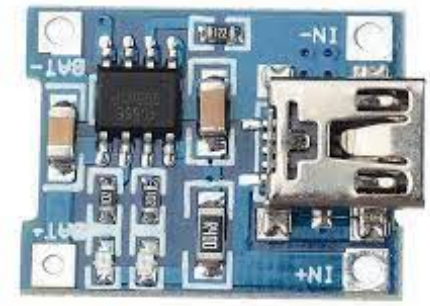

Figure 3.3.8: Charging Port

A battery charging board with a micro USB port is a compact and convenient solution for charging lithium-ion or lithium-polymer batteries. These boards are designed to handle the charging process efficiently and safely. With a micro USB port, you can easily connect the board to a power source such as a USB wall adapter, power bank, or computer USB port.

The board incorporates a charging circuit, typically including a charging IC, that regulates the charging process. This IC monitors the battery's voltage and current during charging to ensure safe and efficient charging. It also provides various protection features like overcharge protection, over-discharge protection, short-circuit protection, and thermal protection to safeguard the battery from damage and ensure safe charging.

To charge the battery, you connect its positive and negative terminals to the appropriate connectors or pads on the charging board. It's important to ensure correct polarity to avoid any damage or safety hazards. Once connected, the charging board takes care of the charging process, adjusting the charging current and voltage as required.

Many charging boards also incorporate a charging indicator, often an LED, that displays the charging status. For example, the LED may turn red when the battery is charging and green when it's fully charged. This indicator allows you to monitor the progress of the charging process easily.

Software Requirements

1. Arduino IDE

Figure 3.3.9: Arduino IDE

The Arduino IDE (Integrated Development Environment) is a software application used for programming Arduino boards. It provides a user-friendly interface for writing, compiling, and uploading code to Arduino microcontrollers. The Arduino IDE is designed to simplify the process of programming Arduino boards, making it accessible to beginners and experienced users alike. It provides a convenient platform for writing and uploading code, allowing you to bring your Arduino projects to life.

Some key features and components of the Arduino IDE:

Code Editor: The IDE includes a code editor where you can write and edit your Arduino code. It supports the Arduino programming language, which is based on C/C++.

Sketches: Arduino programs are called sketches. In the Arduino IDE, you create a new sketch, which consists of two main functions: setup() and loop(). The setup() function is executed once when the board starts, while the loop() function runs repeatedly.

Libraries: Arduino IDE provides a library manager that allows you to easily add and manage external libraries. Libraries are collections of pre-written code that provide additional functionalities and simplify complex tasks.

Serial Monitor: The IDE includes a serial monitor that allows you to communicate with your Arduino board via the serial port. It can display data sent from the board or send commands to it for testing and debugging purposes.

Board Manager: Arduino supports a wide range of boards. The board manager in the IDE helps you install and manage the board-specific packages required for programming different Arduino boards.

Compilation and Upload: Once you have written your code, you can compile it using the IDE. The compiler translates the code into machine-readable instructions. After successful compilation, you can upload the compiled code to the connected Arduino board via a USB cable.

2. Telegram App

Figure 3.3.10: Telegram App

Telegram is a cloud-based messaging app that allows users to send messages, make voice and video calls, share files, and engage in group chats. It was developed by Pavel Durov and his brother Nikolai Durov, and it focuses on speed, security, and user privacy. Telegram offers strong encryption and security measures, the privacy and security of a conversation also depend on user behavior and the handling of sensitive information. Telegram is a versatile messaging app that can be utilized for various project-related purposes.

Team Communication: Telegram provides a platform for real-time messaging and group chats, making it suitable for team communication.

File Sharing: This feature can be handy for sharing project documents, design files, progress updates, and any other relevant files among team members.

Bots and Automation: Telegram offers bot functionality, allowing you to create custom bots or use existing ones to automate certain tasks. Bots can be programmed to provide automated responses, notifications, reminders, or perform specific actions based on predefined triggers, enhancing project management efficiency.

Reminders and Notifications: Telegram allows you to set reminders and receive notifications for important deadlines, milestones, or tasks. This feature can help you stay organized and ensure that project-related activities are not missed.

Integration with Other Tools: Telegram provides API access, allowing you to integrate it with other project management tools or services.

Privacy and Security: Telegram emphasizes privacy and security by offering end-to-end encryption for messages and media shared within the app.

Telegram provides a robust platform for project-related communication, collaboration, and organization. It offers flexibility, ease of use, and a range of features that can enhance project management and teamwork.

3.4 UML Diagrams

Activity Diagram

Activity diagram is basically the activity can be described as an operation of the system.The activity diagram helps in envisioning the workflow from one activity to another.As per the activity diagram, first the device checks for the eye movements using the eyeblink sensor attached to the device. In the next operation if eyes are closed then it moves to next operation otherwise it goes back to the eyeblink sensor for next operation. If eyes are closed for more than 6 seconds alarm and vibration is given, and it goes for next operation. Even after alarm sound is given the user doesn't wake up and eyes are closed for more duration then next operation is to send wake up alert notification ****to the emergency contacts.

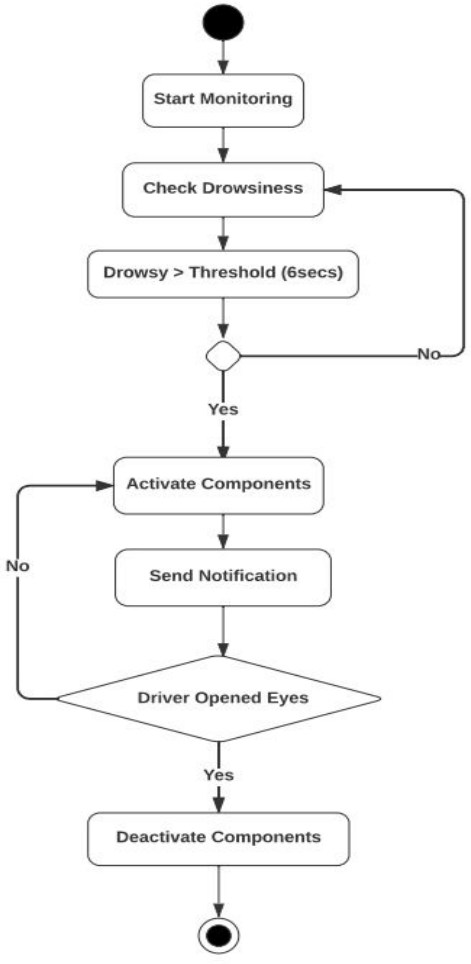

Figure 3.4.1: Activity Diagram

Use Case Diagram

A use case diagram is a way to summarize details of a system and the users within that system. It is generally shown as a graphic depiction of interactions among different elements in a system.

The Anti-sleep alarm use case is associated with the System entity, as it is responsible for continuously monitoring the driver's alertness. The Send Alert use case is triggered by the System entity when drowsiness or fatigue is detected. The Activate Buzzer,Vibrator and Send Alert via Telegram Bot use case is activated by the System entity when drowsiness is detected.

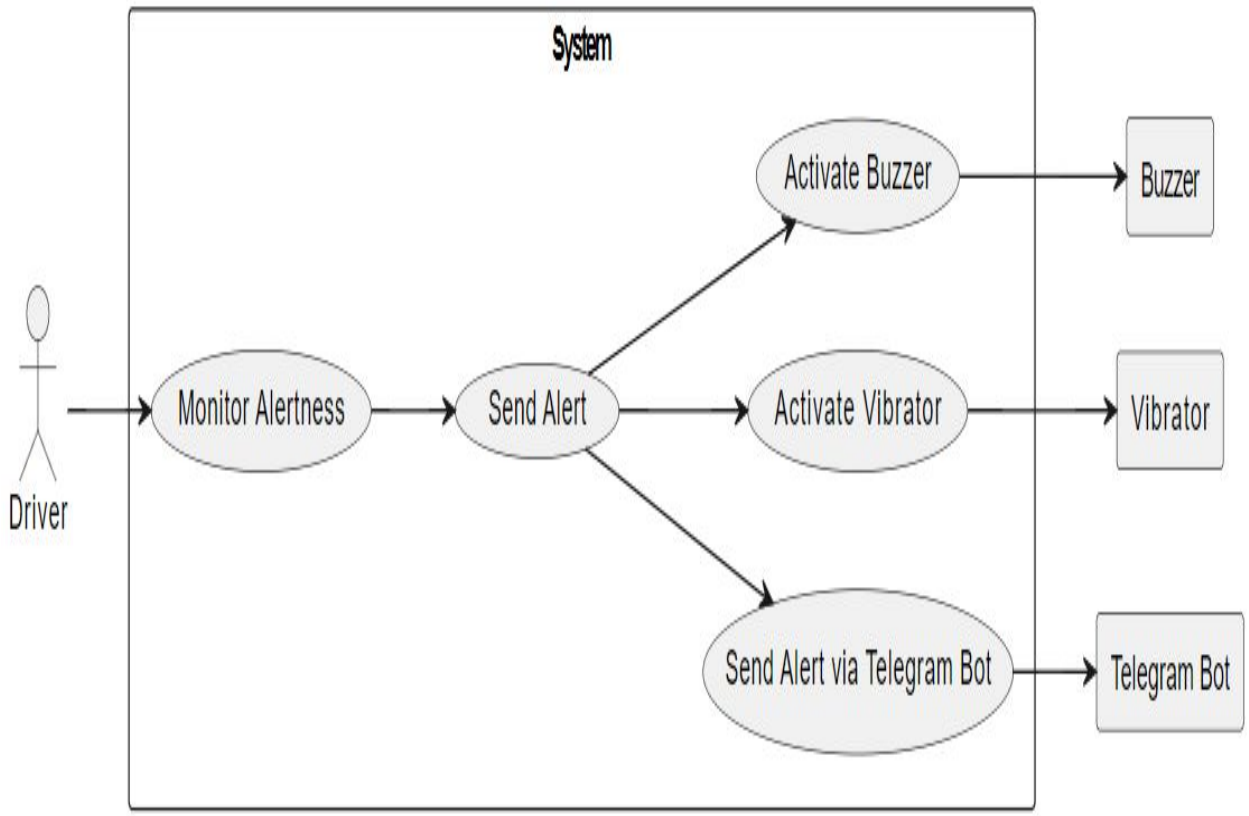

Figure 3.4.2: Use Case Diagram

Class Diagram

A class diagram is an illustration of the relationships and source code dependencies among classes in the Unified Modeling Language (UML). In this context, a class defines the methods and variables in an object, which is a specific entity in a program or the unit of code representing that entity. The Driver class represents the driver who interacts with the system. The System class contains the methods MonitorAlertness() and SendAlert() responsible for monitoring the driver's alertness and sending alerts when necessary. The "Systemçlass has associations with the "Buzzer,Vibrator,.ªnd "TelegramBotçlasses, representing the integration of these components within the system. This class diagram provides a visual representation of the main classes and their relationships in the IoT-based anti-sleep alarm project

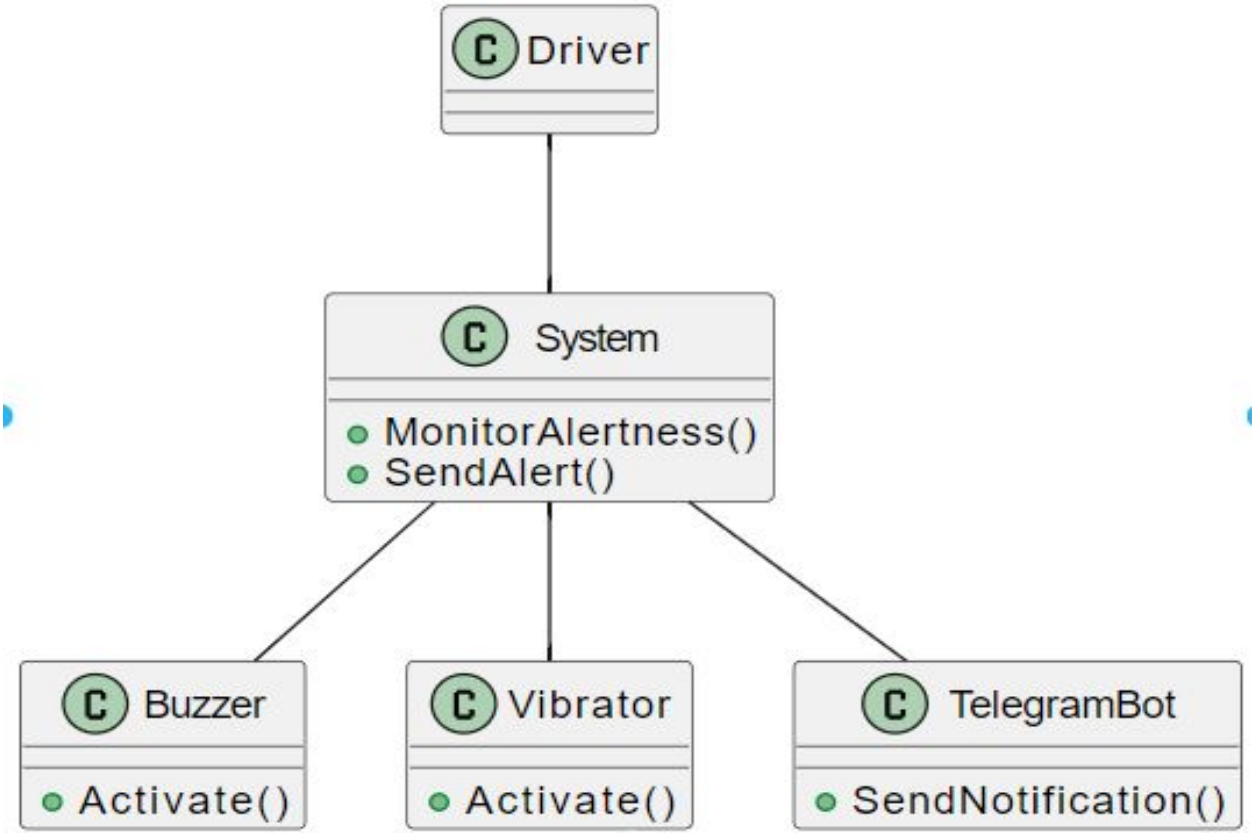

Figure 3.4.3: Class Diagram

Sequence Diagram

A sequence diagram is one of the multiple types of system interaction diagrams used within Unified Modeling Language (UML) to visually represent interactions between the objects that live within a system. The sequence diagram shows the flow of actions in the system. It starts with the Driver initiating the monitoring process by sending the Start Monitoring message to the System. The system then continuously checks for drowsiness, and if drowsiness is detected, it activates the buzzer, vibrator, and sends an alert via the Telegram bot. The diagram includes a loop to represent the continuous monitoring process. If the alert is acknowledged, the system stops alerting by sending messages to the buzzer, vibrator, and Telegram bot.

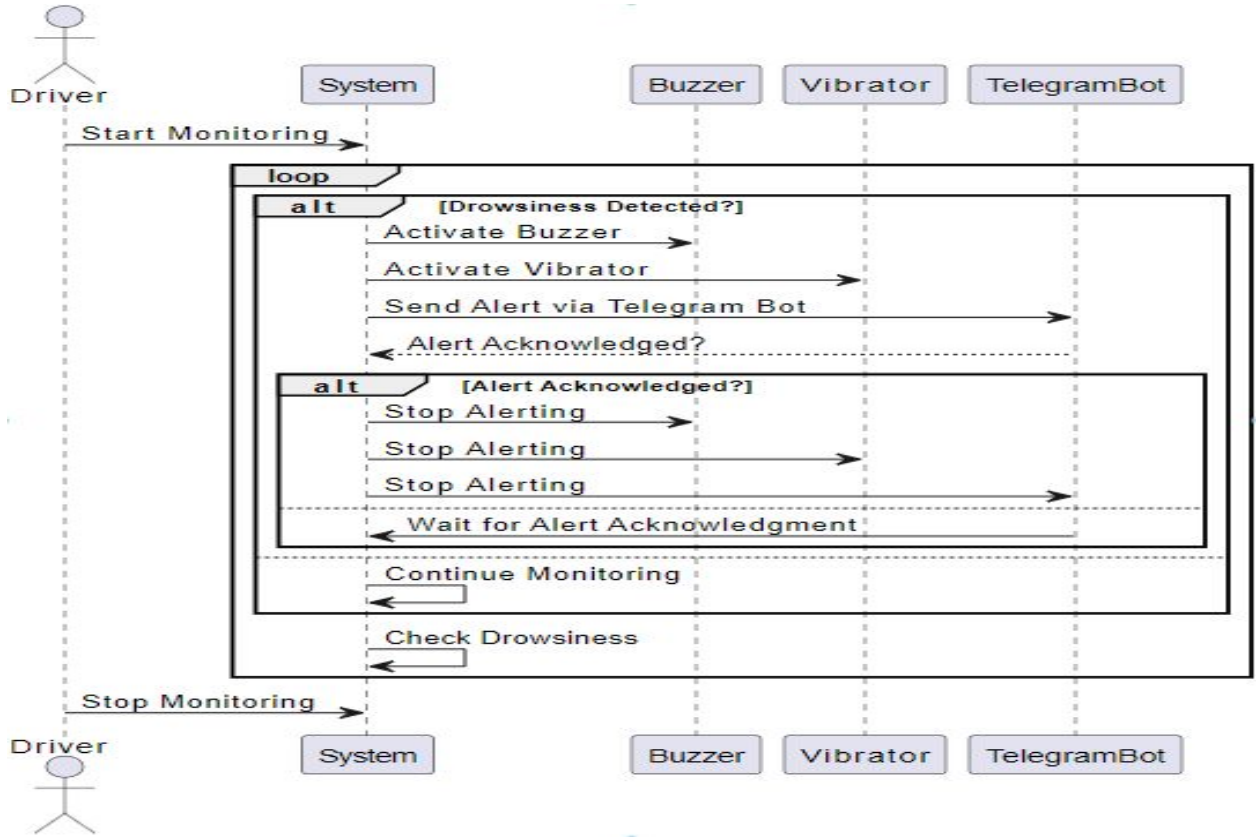

Figure 3.4.4: Sequence Diagram

Communication Diagram

A communication diagram is an extension of object diagram that shows the objects along with the messages that travel from one to another. The diagram illustrates the sequence of interactions between the actors and components. The driver monitors alertness, and the system periodically checks the alertness level using the IR sensor. The system then activates the components (buzzer, vibrator) through the ESP32, and sends a notification via the Telegram bot.

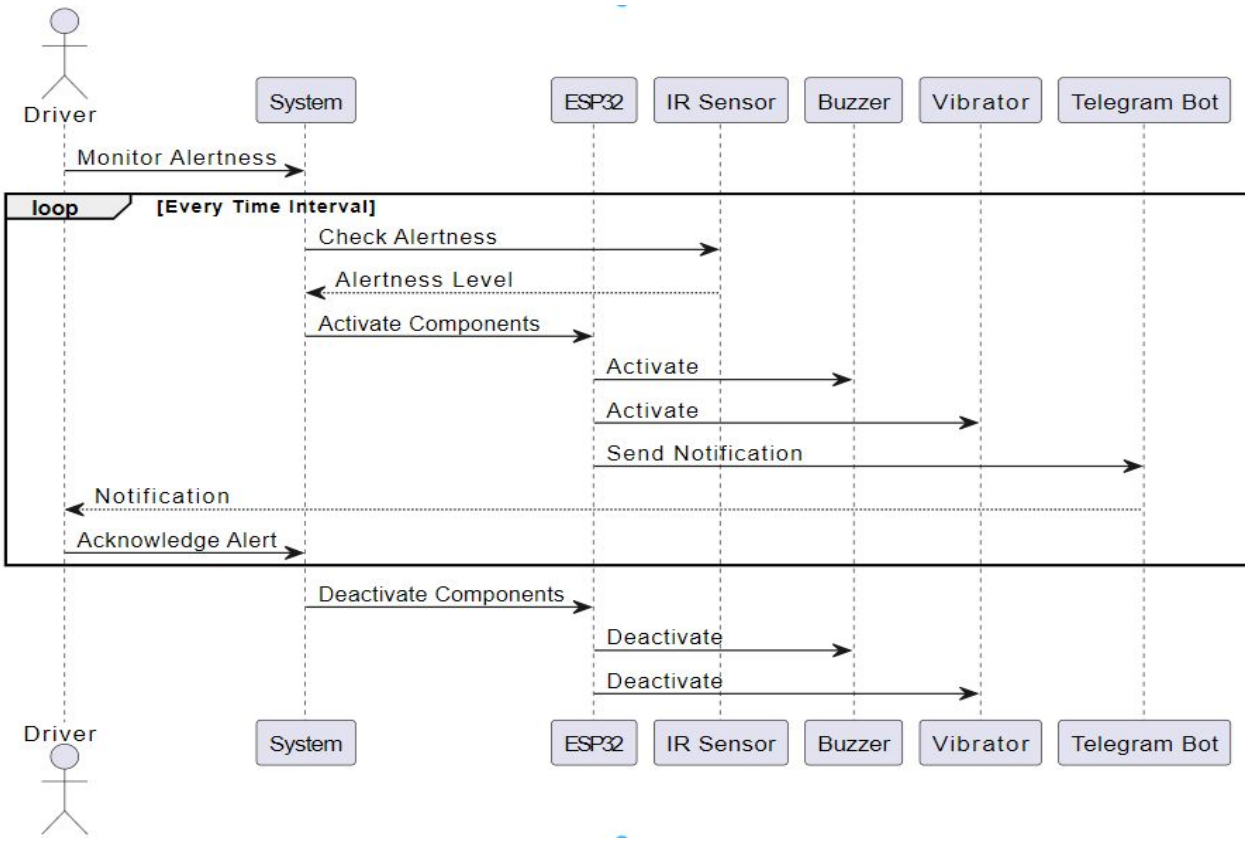

Figure 3.4.5: Communication Diagram

4. MODULES

4.1 Wireless anti-sleep alarm

A wireless anti-sleep alarm is a device designed to help prevent drowsy driving or fatigue-related accidents. It serves as a safety feature that alerts drivers when they show signs of falling asleep behind the wheel. The device typically consists of a sensor or detectors that monitor the driver's alertness level and a wireless transmitter that sends signals to an alarm system.

How does this wireless anti-sleep alarm work:

Sensors or Detectors: The device uses various sensors or detectors to monitor the driver's physical or behavioral changes that indicate drowsiness. These sensors can include eye movement sensors, head position sensors, or even steering wheel sensors.

Alarm Activation: When the device detects signs of drowsiness, it triggers an alarm system to alert the driver. The alarm can take the form of a loud sound, vibration, flashing lights, or a combination of these signals. The purpose is to awaken the driver and draw their attention back to the road.

Wireless Transmission: The sensor or detector is wirelessly connected to the alarm system. This allows for flexibility and ease of use, as the driver can wear the device without being physically tethered to the alarm system.

Wireless anti-sleep alarms offer the advantage of increased mobility and convenience compared to wired systems. Users can wear or place the device comfortably without being constrained by physical wires. Additionally, the wireless connectivity enables integration with other devices or platforms, allowing for enhanced functionality and data analysis.

Audible Alarm: Produces a loud sound or beep to wake up the user and alert them to their drowsy state.

Vibration : Activates a vibration motor to physically shake or vibrate the device, providing a tactile stimulus to wake up the user.

Visual: Uses LED lights or visual indicators that flash or display a warning signal to catch the user's attention.

Wireless alarms are typically easier to install and set up compared to wired systems. They eliminate the need for complex wiring or cable management, simplifying the initial setup process. By utilizing wireless communication, a wireless anti-sleep alarm offers flexibility, mobility, and convenience. It allows users to move freely without being tethered to the alarm unit by wires or cables.

4.2 Wake up call with vibration

A wake-up call with vibration for wireless anti-sleep alarm glasses refers to a feature that provides a tactile alert to the user when they show signs of drowsiness or fatigue. These glasses are designed to monitor the wearer's level of alertness and use vibrations to awaken them and decrease the risk of accidents caused by falling asleep. The vibrations act as a tactile alert that interrupts the onset of sleepiness and prompts the wearer to regain their focus and attention. This intervention aims to prevent accidents and keep the wearer alert and awake.

By adding a Vibration motor to wireless anti-sleep alarm, we can achieve the following:

Non-Intrusive Alert: The vibration alert is subtle and localized, meaning it does not disturb others in the vicinity. It provides a discreet method of intervention to prevent drowsiness without causing unnecessary distractions.

Personalized Response: The vibration strength and patterns can often be customized based on the user's preferences and sensitivity levels. This allows for a personalized response that suits the individual's needs.

Hands-Free Operation: Since the alarm system is integrated into the glasses, it operates in a hands-free manner. The user doesn't need to rely on external devices or remember to activate the alarm manually.

The vibration motor can provide personalized feedback to the user, alerting them specifically without disturbing others nearby. The intensity and pattern of the vibrations can be adjusted based on the individual's preferences and sensitivities, ensuring an effective and tailored alert. The vibrations act as an additional layer of stimulation, helping to wake the user or maintain their alertness more effectively compared to relying solely on auditory signals. This anti-sleep alarm is designed for drivers, vibrations can be felt even when wearing headsets or ear protection, ensuring the user receives the alert regardless of external noise levels. Vibrations can also be helpful for individuals with hearing impairments who may not respond well to audible alarms.Compared to audible alarms, vibration motors typically consume less power, making them energy-efficient and suitable for battery-powered devices. This helps prolong the battery life of the anti-sleep alarm system, allowing for extended use without frequent recharging or battery replacement. Combining multiple sensory

cues, such as vibration and sound, can increase the effectiveness of the anti-sleep alarm system. By incorporating a vibration motor into an anti-sleep alarm, users can benefit from an additional sensory alert that enhances the effectiveness, versatility, and user experience of the system.

4.3 Sleep Alert Notification to contacts

A sleep alert notification to contacts is an additional feature found in some wireless anti-sleep alarm systems. It allows the device to send an alert or notification to pre-selected contacts, such as family members or friends, when the user shows signs of drowsiness or fatigue. This feature provides an extra layer of safety by ensuring that someone else is aware of the user's condition and can take appropriate action if needed.

By adding sleep alert notification feature works in anti-sleep alarm. It is beneficial to the user as :

Contact Information Setup: The user can pre-configure the system with the contact information of trusted individuals, such as family members, friends, or emergency contacts. This information is typically stored within the system or connected mobile application.

Alert Transmission: When the system detects significant signs of drowsiness, it triggers the sleep alert notification. It sends an alert or notification to the pre-selected contacts, informing them about the user's condition and potentially indicating a need for assistance or intervention.

Communication Options: The sleep alert notification is sent in form of text messages or push notifications via dedicated mobile apps to alert to the designated contacts.

Benefits of Sleep Alert Notification in Anti-Sleep Alarm Device:

Emergency Response: The sleep alert notification ensures that trusted individuals are promptly informed about the user's drowsy state. This enables them to take appropriate action, such as contacting the user, offering assistance, or initiating emergency procedures if necessary.

Support Network: By notifying pre-selected contacts, the system creates a support network for the user. This can provide peace of mind to both the user and their loved ones, knowing that someone is aware of the situation and ready to help if needed.

Enhanced Safety Measures: The sleep alert notification feature adds an extra layer of safety to

the anti-sleep alarm system, complementing other alarm mechanisms. It helps mitigate the risk of accidents by involving external parties who can intervene or assist in a timely manner.

Customization and Privacy: The user has control over the selection of contacts and can choose who receives the sleep alert notifications. This allows for customization based on personal preferences and privacy considerations.

4.4 Converting into detachable device

Converting a wireless anti-sleep alarm device into a detachable device involves making modifications to the original design to allow for easy attachment and removal. This modification enables the device to be conveniently used across different items or accessories, providing flexibility and adaptability for the user. Here's an overview of the process and potential benefits:

Design Modification: The device needs to undergo design modifications to incorporate detachable features. This may involve creating a detachable module or component that can be securely attached to different items.

Attachment Mechanism: A reliable attachment mechanism is needed to ensure that the device remains securely in place during use. This can include options such as magnetic attachments, clips, hooks, or fasteners that allow for easy and secure attachment to different surfaces.

Wireless Connectivity: The detachable device should maintain its wireless connectivity to ensure it can transmit data or alerts to the alarm system without interruption. This may involve incorporating wireless transmitters and receivers within the detachable module.

Benefits of a Detachable in Anti-Sleep Alarm Device:

Versatility: The detachable design allows the device to be used with different items or accessories, catering to the preferences and needs of the user.

Convenience: Users can easily attach or remove the device as needed, providing a hassle-free experience and allowing them to use it when and where they require it most.

Portability: The detachable design enhances the device's portability since it can be carried separately or attached to multiple items. This makes it easier to transport and use in various situations, such as during travel or while using different modes of transportation.

Cost-Effectiveness: Instead of purchasing separate devices for each item or accessory, a detachable

device allows users to have a single device that can be used interchangeably. This can potentially reduce costs and the need for duplicate devices.

User Preference: Different users may have varying preferences for how they want to wear or use the device. A detachable design provides the flexibility to accommodate individual preferences and comfort levels.

5. IMPLEMENTATION

WORKING OF IR:

An infrared (IR) sensor is an electronic device that detects and measures infrared radiation in its surrounding environment. It uses infrared light, which has longer wavelengths than visible light, to detect the presence or absence of objects or changes in temperature.

Signal Processing: The electrical current produced by the photodiode is processed by the sensor's circuitry. This circuitry may include amplifiers, filters, and comparators to enhance the signal and distinguish it from ambient noise.

Output: Based on the processed signal, the IR sensor generates an output that indicates the presence or absence of an object or the changes in temperature. The output can be in various forms, such as a digital signal (e.g., high or low voltage), an analog voltage level, or a frequency.

Overall, IR sensors are widely used in various fields, including security systems, automation, robotics, temperature measurement, and many other applications that require object detection or temperature sensing in a non-contact manner.

Working of IR sensor is very simple and working principle is totally based on change in resistance of IR receiver. Here in this sensor we connect IR receiver in reverse bias so it give very high resistance if it is not exposed to IR light. the resistance in this case is in range of Mega ohms, but when IR light reflected back and fall on IR receiver. The resistance of Rx it comes in range between Kilo ohms to hundred of ohms. We convert this change in resistance to change in voltage . Then this voltage is applied to a comparator IC which compare it with a threshold level. if voltage of sensor is more than threshold then output is high else it is low which can be used directly for microcontroller.

Using the ESP32 for IoT involves writing code to connect to sensors, sending data over Wi-Fi or Bluetooth, and connecting to cloud services to store and analyze data. With its built-in connectivity and low power consumption, the ESP32 is a great platform for developing IoT applications.

Interfacing the IR sensor with ESP32:

Interfacing an IR sensor with the ESP32 microcontroller involves connecting the IR sensor to the GPIO pins on the ESP32 and reading the sensor data using the ESP32's built-in ADC (analog-to-digital converter). Here are the basic steps:

Choose an IR sensor: There are several types of IR sensors available, including IR photodiodes, IR phototransistors, and IR receivers. Choose a sensor that is compatible with your project and has the necessary range and sensitivity.

Connect the sensor to the ESP32: Connect the IR sensor's signal pin to one of the ESP32's ADC input pins (GPIO32-GPIO39). Connect the sensor's ground pin to one of the ESP32's GND pins and the sensor's power pin to a 3.3V or 5V power source.

Write your code: You'll need to write code to read the sensor data using the ESP32's ADC.

Calibrate the sensor: IR sensors can be affected by ambient light and other factors, so you may need to calibrate the sensor for your specific application. This can involve adjusting the sensor's sensitivity, adding a filter to the sensor, or using an external amplifier to boost the sensor's signal.

Deploy your code: Once you've tested your code and calibrated the sensor, you can deploy your code to the ESP32 using the Arduino IDE or OTA updates.

Overall, interfacing an IR sensor with the ESP32 involves connecting the sensor to the ESP32, reading the sensor data using the ESP32's ADC, and calibrating the sensor for your specific application. With an IR sensor, you can detect the presence or absence of objects, measure distance, or detect motion in your IoT project.

Setting up the Telegram application for ESP32:

Telegram is a popular messaging app that can be used for IoT applications. Here are the basic steps to set up Telegram for the ESP32 microcontroller:

Create a Telegram bot: You'll need to create a bot on Telegram in order to send and receive messages from the ESP32. You can do this by messaging the BotFather on Telegram and following the instructions to create a new bot.

Get your bot token: Once you've created your bot, you'll need to get your bot token, which is a long string of characters that identifies your bot. You can get your bot token from the BotFather by messaging him and asking for your bot's token.

Add the Telegram library to your ESP32 project: You can use the Universal Telegram Bot library to connect your ESP32 to Telegram. You can download the library from the Arduino Library Manager or from the GitHub repository.

Write your code: You'll need to write code to connect to Telegram using your bot token, send messages to Telegram, and receive messages from Telegram.

Software Implementation:

Arduino IDE:

We downloaded the Arduino Software package for our operating system. When we downloaded and open the application we will see something like this:

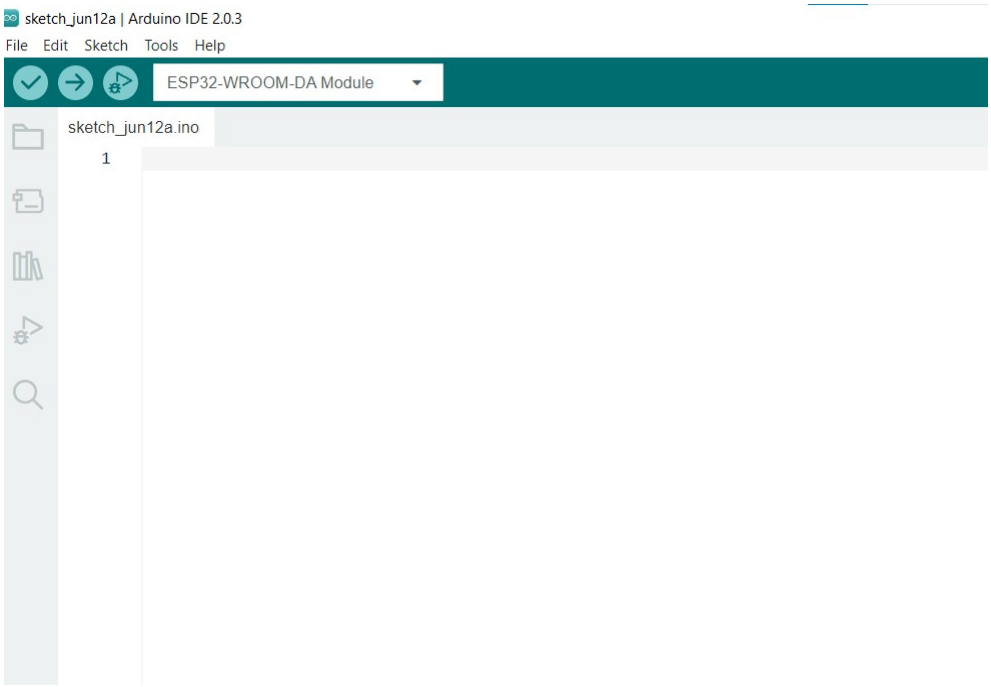

Figure 5.1: Aurdino IDE Window

This is where we type the code we want to compile and send to the Arduino board.

The Initial Setup: We need to setup the environment to Tools menu and select Board.

Then selected the type of Arduino we want to program, in our case it's the ESP32.

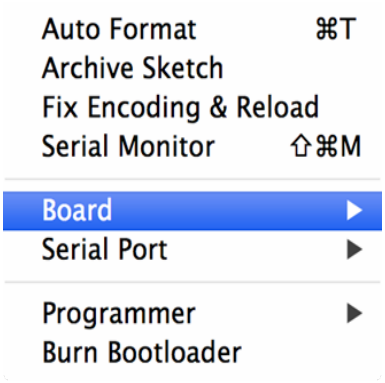

Figure 5.2: Selecting Board for ESP32

Coding:

The code you write for your Arduino are known as sketches. They are written in C++.

Every sketch needs two void type functions, setup() and loop(). A void type function doesn't return any value.

The setup() method is ran once at the just after the Arduino is powered up and the loop() method is ran continuously afterwards. The setup() is where you want to do any initialisation steps, and in loop() you want to run the code you want to run over and over again.

So, your basic sketch or program should look like this:

```
void setup()
{

}
void loop()
{

}
```

Headers and Pins:

If you notice on the top edge of the board there's two black rectangles with several squares. These are

called headers. Headers make it easy to connect components to the the Arduino. Where they connect to the board is called pins. Knowing what pin something is connected to is essential for programming an Arduino.

The pin numbers are listed next to the headers on the board in white. The onboard LED we want to control is on pin 13.

In our code above the setup() method let's create a variable called ledPin. In C++ we need to state why type our variable is before hand, in this case it's an integer, so it's of type int.

```
int ledPin = 13;
void setup()
{

}
void loop()
{

}
```

Each line is ended with a semicolon (;).

In the setup() method we want to set the ledPin to the output mode. We do this by calling a special function called pinMode() which takes two variables, the first the pin number, and second, whether it's an input or output pin. Since we're dealing with an output we need to set it to a constant called OUTPUT. If you were working with a sensor or input it would be INPUT.

```
int ledPin = 2;
void setup()
{
pinMode(ledPin, OUTPUT);
}
void loop()
{

}
```

In our loop we are going to first switch off the LED to make sure our program is being transferred to

the chip and overriding the default. We do this by calling another special method called digitalWrite(). This also takes two values, the pin number and the level, HIGH or the on state or LOW the off state.

```
int ledPin = 13;
void setup()
{
pinMode(ledPin, OUTPUT);
}
void loop()
{
digitalWrite(ledPin, LOW);
}
```

Next we need to compile to machine code and deploy or upload it to the Arduino.

Compiling the Code:

If this is your first time you've ever compiled code to your Arduino before plugging it in to the computer go to the Tools menu, then Serial Port and take note of what appears there.

Here is how it looks like before plugging in the Arduino UNO:

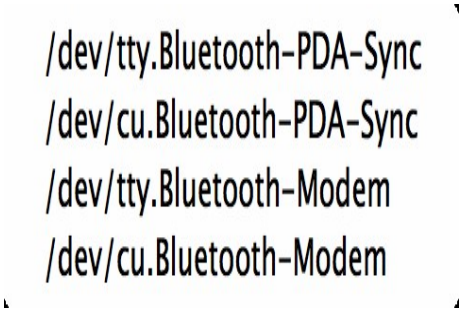

Figure 5.3: Serial Port

Plug the Arduino UNO board in to the USB cable and into the computer. Now go back to the Tools then Serial Port menu and we will see at least 1 new option.

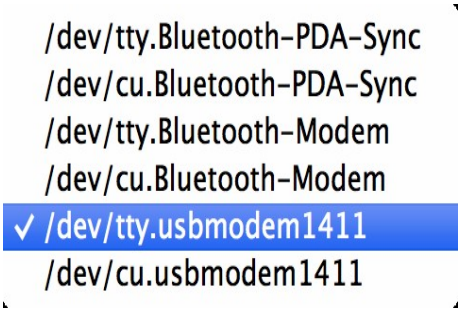

Figure 5.4: Selecting Serial Port for ESP32

The tty and cu are two ways that computers can talk over a serial port. Both seem to work with the Arduino software so we selected the tty.* one. On Windows we will see COM followed by a number. Select the new one that appears.

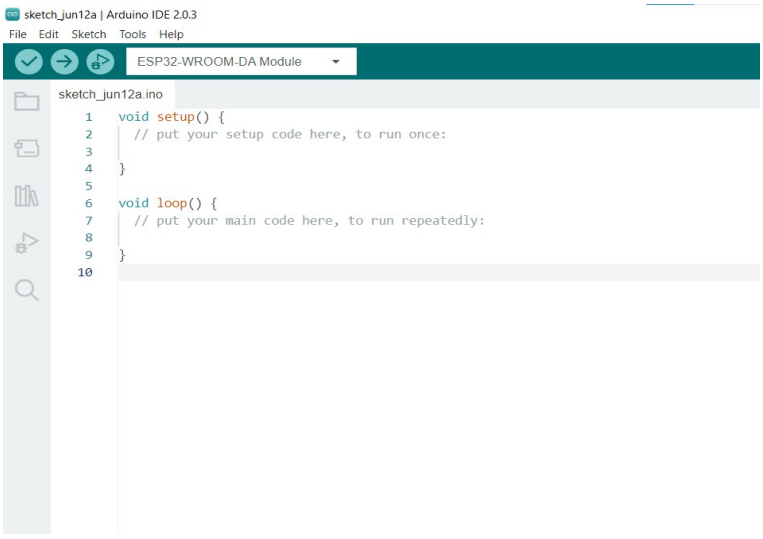

Figure 5.5: Sketch in Arduino IDE

Once we select the serial or COM port we can then press the button with the arrow pointing to the right. Once that happens we will see the TX and RX LEDs below the L LED flash. This is the communication going on between the computer and the Arduino. The L may flicker too. Once this dance is complete the program should be running. And the LED should be off.

We also tried to switch it on using the HIGH constant.

```
int ledPin = 13;
void setup()
{
pinMode(ledPin, OUTPUT);
}
void loop()
{
digitalWrite(ledPin, HIGH);
}
```

Press Upload again and we will see our LED is on. We also used another method called delay() which takes an integer of a time interval in milliseconds, meaning the integer of 1000 is 1 second. So after when we switch the LED on we added delay(2000) which is two seconds, then digitalWrite(ledPin, LOW) to switch it off and delay(2000) again.

```
int ledPin = 13;
void setup()
{
pinMode(ledPin, OUTPUT);
}
void loop()
{
digitalWrite(ledPin, HIGH);
delay(2000);
digitalWrite(ledPin, LOW);
delay(2000);
}
```

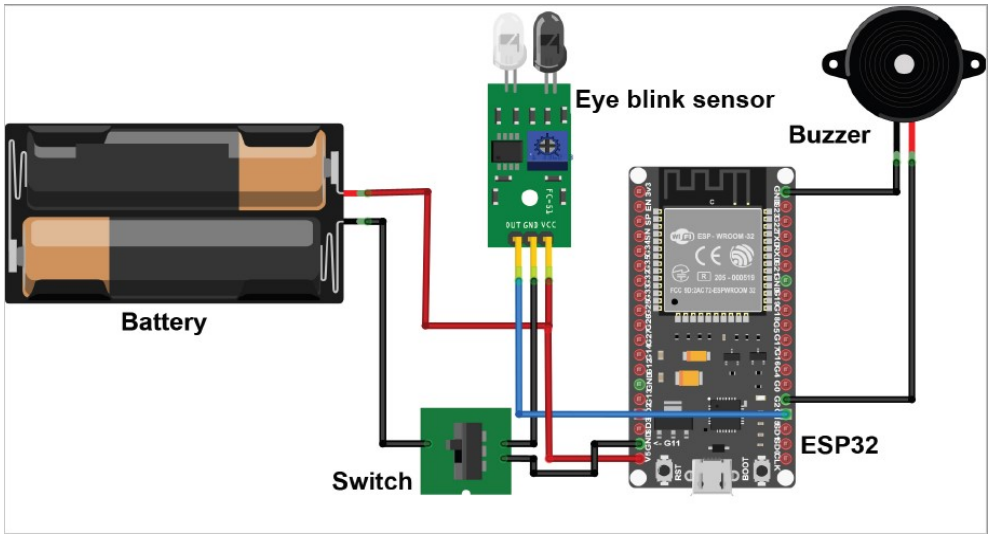

Figure 5.6: Circuit Diagram

Circuit Diagram: An IoT-based anti-sleep alarm for drivers is designed to detect drowsiness or fatigue in drivers and alert them to prevent accidents. Here's a description of the circuit diagram for this system: The circuit consists of several key components. Firstly, there is a battery,which provides power to the whole device. The batteries are connected to a switch. The switch is connected to the IR sensor and the ESP32 microcontroller. When the switch is turned ON the power is supplied to the IR sensor and the ESP32 microcontroller.

The ESP32 microcontroller is the central processing unit of the system. It receives the input from the IR sensor and analyzes the data to determine if the driver is becoming drowsy. The microcontroller is connected to a buzzer and a vibrator which turns ON when the IR sensor detects the drowsiness.

Code:

```
#include<WiFi.h>
#include<WiFiClientSecure.h>
#include<UniversalTelegramBot.h>
#include<ArduinoJson.h>

// Network credentials
const char* ssid = "bvrith"; //moblie phone hotspot username
const char* password = "1234"; //mobile phone hotspot password

// Initialize Telegram BOT Token and Chat ID
#define BOTtoken "6191825753:AAFW0eFCSu3WWEZ7r7SFEYpy-G39-66IqG4"
#define CHAT_ID "5519950251"

const unsigned long eventInterval = 6000;
unsigned long previousTime = 0;
const int buzz = 2;
const int motor = 18;
const int vib = 5;
const int buttonPin = 15;
int buttonState = 0;

WiFiClientSecure client;
UniversalTelegramBot bot(BOTtoken, client);

void setup()
{
Serial.begin(9600);

//WiFi.mode(WIFI_STA);
WiFi.begin(ssid, password);
```

```
pinMode(buttonPin, INPUT);
pinMode(motor, OUTPUT);
pinMode(buzz, OUTPUT);
pinMode(vib, OUTPUT);
digitalWrite(buzz, LOW);

client.setCACert(TELEGRAM_CERTIFICATE_ROOT);
bot.sendMessage(CHAT_ID, “Device Started”, “”);
}

void loop()
{
buttonState = digitalRead(buttonPin);
unsigned long currentTime = millis();

if (currentTime - previousTime >= eventInterval)
{
delay(500);
if (buttonState == LOW)
{
// turn LED on:
Serial.println(“Eyes Closed”);
digitalWrite(buzz, HIGH);
digitalWrite(motor, HIGH);
digitalWrite(vib, LOW);
String message_=“EYES CLOSED”;

previousTime = currentTime;
}
```

```
if(buttonState == HIGH)
{
digitalWrite(buzz, LOW);
digitalWrite(motor, LOW);
digitalWrite(vib, HIGH);
}
}
```

6. RESULTS

Figure 6.1: Anti-Sleep Alarm Device

The above figure display the anti sleep alarm device that is built by us. It is a goggle consisting of switch, IR based eye blink sensor, buzzer, vibrator and a battery. We used the ESP32 microcontroller in our device because of its in-built wifi and bluetooth modules. We also included a charging module which is used to charge the battery. This device is a detachable device, that is the components can be removed and attached to the personalized spectacles or goggles. Instead we can also replace only the temples of the device according to the person's comfort.

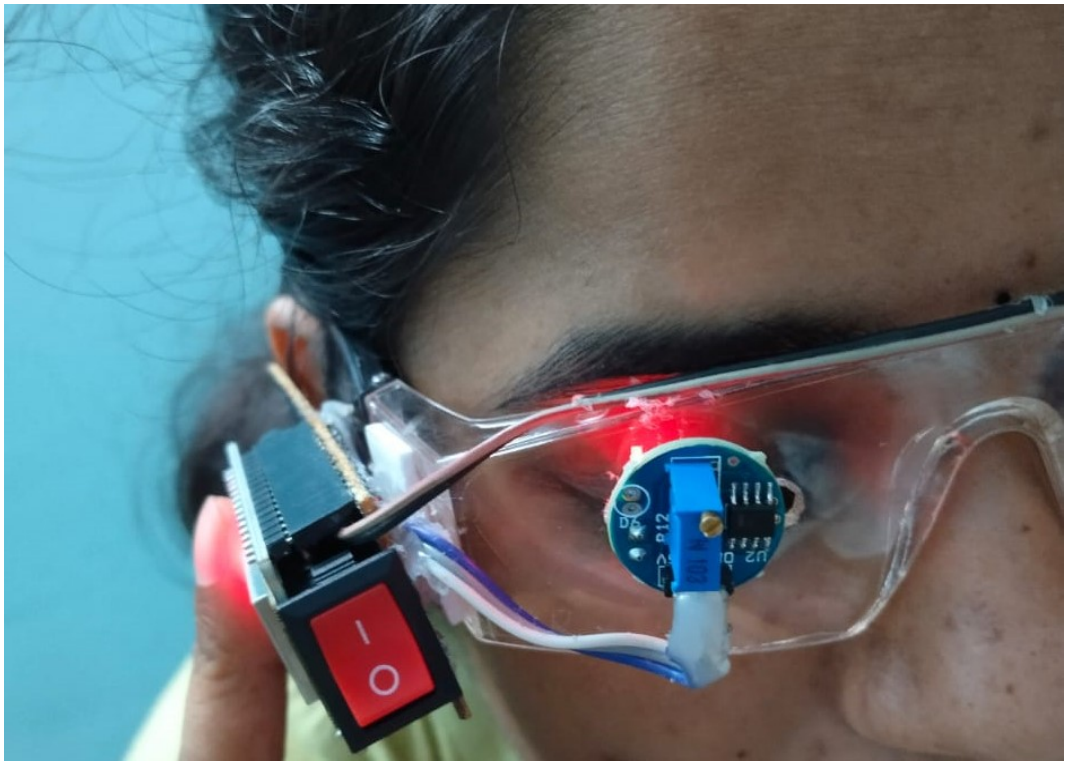

Figure 6.2: Working of Device

After we put the goggle, we should switch on the device. It then starts working. The eye blink sensor displays a light indicating that it is on working mode. When we close our eyes for 6 seconds and more it then activates the buzzer and the vibrator. The buzzer starts ringing until the driver opens the eyes indicating he/she is awake. The vibrator gives vibration sensation to the driver which helps the driver to get over the drowsy feeling. As soon as the buzzer stops ringing, the vibrator also stops automatically. The buzzer again starts ringing and the vibrator starts rotating when the driver closes the eyes for 6 seconds anytime later.

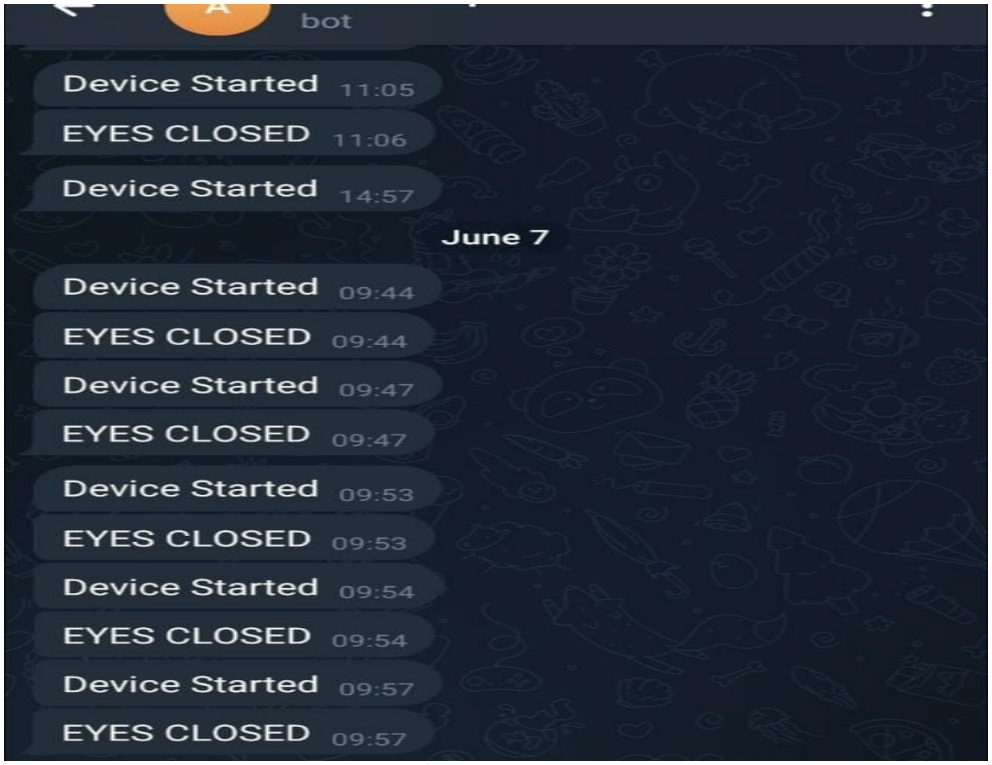

Figure 6.3: Sleep Alert Notification Message in Telegram App

As the buzzer is activated, The ESP32 microcontroller recognises and using its in-built wifi and bluetooth module, it is connected to the telegram bot initially. When the buzzer starts ringing it sends a notification to the person registered to the bot. In this project the notification is in the form of a telegram message which is 'Devise started' indicating that the switch is on and the device is in working mode. Later it sends the message 'EYES CLOSED' when the driver closes eyes for 6 seconds continuosly which indicates that the driver is drowsy. Our project is implemented in such a way that only any one person can register to the telegram bot who is capable and responsible to take an action.

7. CONCLUSION & FUTURE SCOPE

In conclusion, the IoT Based Anti-Sleep Alarm for Drivers project has demonstrated its effectiveness in addressing the issue of drowsiness-related accidents and promoting safety in various scenarios. This project harnesses the power of IoT technology to monitor and detect signs of fatigue or drowsiness in real-time, providing timely alerts and notifications to ensure the well-being of individuals.

By integrating ESP32, a versatile microcontroller, the project enables the seamless data collection from an IR sensor, which is crucial for monitoring the driver's eye movements and detecting signs of drowsiness. The IR sensor, capable of tracking changes in the driver's eye behavior, provides reliable data for analysis. This data, combined with the advanced capabilities of the ESP32, allows the system to accurately determine the driver's level of alertness and intervene when necessary.

The inclusion of a buzzer and vibrator in the project serves as an effective means of alerting the driver once drowsiness is detected. The buzzer emits a loud sound, while the vibrator provides physical stimulation, both acting as powerful wake-up signals to counteract drowsiness. This multi-modal approach ensures that the driver is promptly alerted, increasing their chances of regaining focus and preventing potential accidents caused by fatigue.

Additionally, the integration of a notification system through a Telegram bot allows for real-time alerts and notifications to be sent to relevant parties, such as the driver, fleet managers, or family members. The Telegram bot acts as a reliable and efficient communication channel, delivering notifications to smartphones or designated devices. This feature ensures that appropriate actions can be taken promptly, reducing the risk of accidents due to drowsiness.

The IoT Based Anti-Sleep Alarm for Drivers project has showcased the immense potential of IoT technology in enhancing safety measures. By utilizing the capabilities of ESP32, the IR sensor, and integrating a notification system, this project offers a comprehensive solution to mitigate the risks associated with driver fatigue. The real-time monitoring, accurate detection, and prompt interventions provided by this system contribute significantly to preventing accidents and protecting lives.

While the project has demonstrated its effectiveness, there are opportunities for further improvement and expansion. For instance, additional sensors or algorithms could be incorporated to enhance the system's accuracy in detecting drowsiness. Integration with other IoT devices or platforms could enable more comprehensive data analysis and insights. Moreover, the project could be extended to other domains, such as industrial or healthcare settings, where monitoring and alerting individuals' fatigue levels are crucial.

In conclusion, the IoT-based anti-sleep alarm project utilizing ESP32, an IR sensor, buzzer, vibrator, and a notification system through a Telegram bot represents a significant advancement in addressing the risks associated with driver fatigue. By leveraging IoT technology, this project offers a proactive and intelligent solution to ensure the safety of individuals. With further advancements and innovations, this project has the potential to revolutionize safety measures across various domains and contribute to a safer and more secure environment for all.

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