DESIGN & IMPLEMENTATION OF ENGINE STARTING BASED ON ALCOHOL CONSUMPTION LEVEL AND ACCIDENT ALERTING SYSTEM

A Main Project Thesis in partial fulfilment of the requirements for award of the degree

BACHELOR OF TECHNOLOGY

IN

ELECTRICAL AND ELECTRONICS ENGINEERING

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

RAJEEV GANDHI MEMORIAL COLLEGE OF ENGINEERING & TECHNOLOGY

(AUTONOMOUS)

(Affiliated to JNTUA- Anantapuramu, Approved by AICTE-New Delhi,

Accredited by NBA-New Delhi,

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2023-2024

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CERTIFICATE

This is to certify that the thesis titled "DESIGN & IMPLEMENTATION OF ENGINE STARTING BASED ON ALCOHOL CONSUMPTION LEVEL AND ACCIDENT ALERTING SYSTEM" is the bonafide work of S.VASEEM(20091A0294), P.ANUSHA (21095A0203), K.KEERTHANA (21095A0211), T.M. SUJENDRA RAGHUVEER (20091A0285), Ph.SIVA KUMAR (20091A0275), K.UPENDRA(20091A0290) who carried out the main project for the fulfilment of the award of Bachelor of Technology in Electrical and Electronics Engineering, Rajeev Gandhi Memorial college of Engineering & Technology(Autonomous) during 2023-24. The results embodied in this project work have not been submitted to any other university or institute for the award of any degree.

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ACKNOWLEDGEMENT

We earnestly take the responsibility to acknowledge the following distinguished personalities who graciously allowed us to carry out our project work successfully.

First we express our thanks to **Dr. J.SURYA KUMARI**, Associate professor of the Electrical and Electronics Engineering department, as a project guide with whose skilful concomitance the excellence has been exemplified in bringing out this main project work with artistry and for the encouragement which contributed to the successful completion of the main project.

We manifest our capabilities and heartier thankfulness pertaining to our Head Of Department **Dr.V.NAGA BHASKAR REDDY**, with whose adroit concomitance the excellence has been exemplified in bringing out this main project work with artistry.

We are perspicuous to divulge our sincere thanks to our principal **Dr.T. JAYA CHANDRA PRASAD** garu, who has been observed posing violence in abundance forwards our individuality to our main project work tendentiously.

We would like to thank our electrical department for giving us permission to do the main project. At the outset we thank our honourable chairman **Dr.M. SANTHI RAMUDU** garu, for providing us with good faculty and for his moral support throughout the course.

A heart full and sincere gratitude to our beloved parents for their tremendous motivation and moral support. Finally we express our gratitude to our friends and others who have helped us directly and indirectly in carrying our project work successfully.

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ABSTRACT

Instances of driving under the influence are unfortunately common, often resulting in accidents causing damage to property and loss of life. To address this issue, we propose an innovative system designed to monitor and prevent such occurrences. Our system continuously monitors the driver's breath for alcohol content, either by placing a sensor near the steering wheel or integrating it within the wheel itself. If the system detects alcohol, it disables the vehicle, preventing it from starting.

Moreover, if a driver who was initially sober begins drinking while operating the vehicle, the sensor detects the alcohol in their breath and halts the vehicle. Additionally, in the event of an accident, a touch sensor or SOS button triggers the system to alert authorized personnel, allowing them to locate the vehicle and provide assistance promptly. Our system utilizes an AVR family microcontroller in conjunction with an alcohol sensor and LED with buzzer for notifications. The microcontroller processes signals from the alcohol sensor and activates alerts when high alcohol levels are detected.

As the population grows, the use of vehicles has become ubiquitous, leading to increased road hazards and accidents due to inadequate emergency systems. The aim of our design is to locate vehicles and detect accidents swiftly by implementing a communication system within the vehicle itself. Often, it's challenging to pinpoint accident locations immediately. In the event of an accident, the SOS button or touch detector triggers a signal, which is transmitted to the Arduino microcontroller. The microcontroller then relays an alert message, including the vehicle's position, via the GSM modem to the police station or rescue team. This enables authorities to promptly locate the vehicle using the GPS modem after receiving the information.

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CHAPTER -1

INTRODUCTION

1.1.Introdution

The elucidation provided in this organizational report serves a critical purpose: to deter intoxicated drivers by immobilizing the vehicle. When implemented within a vehicle atop the dashboard, this system utilizes a liquor sensor to identify inebriated drivers. In simulated scenarios, the vehicle is depicted with a DC motor, which is forcibly halted upon detection of intoxication, effectively serving as a mechanical deterrent. Addressing challenges such as the impracticality of a change sensor and the need for a comprehensive solution, the report advocates for the integration of a versatile sensor capable of detecting various types of harmful vapors, including those emanating from alcohol.

The MQ3 sensor emerges as a prime candidate for its ability to detect a wide range of harmful vapors with ease and efficiency, positioning it as a viable solution for widespread adoption.This innovative detector is engineered to detect the presence of alcoholic vapors. Its current application primarily caters to goods transport vehicles, owing to their solitary nature without passenger accommodation. However, when deployed in vehicles, it encounters difficulty in pinpointing intoxicated individuals amidst the presence of merry passengers. Therefore, its exclusive utilization is recommended for commercial exchanges, where trucks boast segregated compartments for the driver and their accompanying personnel.

Nevertheless, with the adoption of a specialized detector, its integration into buses becomes viable. A distinct advantage of this detector lies in its inability to differentiate minimal alcohol traces, thus maintaining a discreet approach. This attribute proves invaluable as it safeguards against mistakenly identifying individuals who may be mildly affected but are distanced from the driving responsibilities.

The optimal positioning of the detector, prominently above the dashboard and near the steering wheel, ensures its effectiveness in discerning an intoxicated driver within the cabin. This strategic arrangement capitalizes on the detector's robust sensitivity, a critical feature especially in dynamic environments such as rallies. Direct exposure to alcohol vapor is essential for the detector's operation, emphasizing the importance of its placement for accurate and reliable detection

To achieve this, a small amount of alcohol, such as brandy or whiskey, can be poured into a shallow container or mug. The detector should then be placed slightly above the container, with a gap of approximately 2 to 3 centimeters. Depending on the concentration of alcohol vapor in the surrounding air, the detector's conductivity will vary, leading to fluctuations in voltage levels within the system. These voltage changes are monitored by operational amplifiers, which produce a robust signal whenever alcohol vapors are detected. The MQ-3 detector's output triggers a sequence of actions, activating the operational amplifier configured as a voltage comparator. This specific setup allows the operational amplifier to generate a distinct high signal when the detector's output falls below the reference voltage threshold. Utilizing this signal, the microcontroller, acting as the central processing unit, orchestrates the simultaneous activation of the alarm and a flashing red light.

Additionally, a cleverly integrated simulated ignition mechanism, taking the form of a drive button, adds a layer of sophistication to the system. However, despite its activation, the engine remains dormant, leading to a scenario of machine arrestment. While this pioneering invention finds initial application as a rally module, its true potential shines in real-world scenarios. For genuine operations, it is imperative that every vehicle be equipped with advanced detectors capable of detecting even the minutest traces of alcohol vapors in the surrounding atmosphere

As our population continues to grow, the proliferation of vehicles has reached unprecedented levels. Unfortunately, this surge in vehicle usage has brought about a rise in both business hazards and road accidents. These accidents often result in tragic loss of life, exacerbated by insufficient emergency infrastructure.The essence of this design lies in its mission to locate vehicles in real-time and detect accidents promptly. This is achieved through a sophisticated communication system integrated within the vehicle's infrastructure. Given the unpredictable nature of accidents, it is often challenging to anticipate their precise location beforehand. Therefore, the focus is on establishing seamless communication with vehicles, ensuring rapid response and assistance regardless of where the accident occurs.

In the event of a vehicle accident, an instantaneous response is triggered by a vibration detector, which swiftly detects the distress signal. This signal is then relayed to an Arduino

microcontroller, serving as the central control unit. Subsequently, the microcontroller initiates a rapid alert communication via a GSM modem, transmitting vital information including the precise location to either the nearest police station or a dedicated rescue team.

1.2.Feasibility Study

The feasibility study phase is a critical step where the project is thoroughly examined, and a business proposal is presented along with a preliminary design and cost estimates. The main goal is to guarantee that the proposed system does not impose a financial strain on the company. Three crucial factors are essential to the feasibility assessment.

1.2.1 Economical Feasibility:

This aspect assesses the financial impact of implementing the system within the organization. The study aims to determine whether the company can allocate funds for the exploration and development of the system without straining its budgetIn this scenario, the advanced system fits comfortably within the budget primarily because many of the utilized technologies are freely accessible. Costs were minimized by limiting the use of customized products.

1.2.2 Technical Feasibility:

The technical feasibility study evaluates the system's technical requirements and their compatibility with the existing technical resources. It ensures that the system's development does not place excessive demands on available technical coffers, minimizing the burden on both the organization and the end-users. The advanced system was designed to have modest technical demands, requiring minimal or no changes for its implementation.

1.2.3 Social Feasibility:

Social feasibility examines the system's acceptance among end-users, encompassing the training process aimed at ensuring users can effectively operate the system.. It is essential for users not to feel overwhelmed by the system but rather to perceive it as a necessary and beneficial tool. User acceptance relies heavily on the effectiveness of training methods employed to familiarize users with the system. Building user confidence is crucial, allowing them to provide constructive feedback as the final users of the system

By addressing these three feasibility aspects, the study ensures that the proposed system is not only financially viable but also technically and socially acceptable within the organization. The emphasis on user acceptance and effective training underscores the importance of creating a positive user experience, ultimately contributing to the success of the system implementation.

1.3.Literature Survey

In today's landscape, the prevalence of accidents stemming from alcohol-impaired driving poses a significant concern. To safeguard passengers inside vehicles, the integration of alcohol sensors has emerged as a critical safety measure. Implementing an alcohol breath analyzer directly within vehicles adds an extra layer of protection, detecting any impairment in the driver's condition.

Exciting advancements are on the horizon, with innovative fabrics being developed to prevent vehicle operation if the driver is incapacitated. Scientists laud this breakthrough, likening its potential impact to the revolutionary introduction of seat belts. This represents a sophisticated and proactive approach to combatting the dangers of drunk driving, signaling a new era of vehicular safety initiatives. Judicial authorities are pioneering two cutting edge approaches: the Breath and Touch methods. The Breath approach involves a framework that extrapolates blood alcohol levels from a driver's breath, utilizing sensors discreetly positioned in front of the driver. It's crucial that the driver remains unaware of being monitored.

On the other hand, the Touch method utilizes a unique strategy to detect alcohol levels when the driver interacts with designated touchpoints in the vehicle, such as the ignition button or another surface. Alcohol levels are assessed beneath the skin's surface using an infrared light scanner embedded in the seat upholstery or dashboard.

Breath analyzers is a comprehensive overview: A breathalyzer is a device designed to determine blood alcohol content (BAC) through a breath test. Breath analyzers don't measure BAC levels directly like blood tests do. Instead, they estimate BAC levels by examining the alcohol concentration in exhaled breath. Calibration is integral to the process, involving the

adjustment of internal settings based on known alcohol standards to ensure accurate test results.

Maintaining and calibrating policing analyzers is paramount to ensure their accuracy and reliability. Two distinct methodologies exist for calibrating precise breathalyzer devices, Both the Damp Shower and Dry Gas methods require specific equipment and trained technicians. This means that untrained individuals or those lacking the proper equipment cannot carry out these approaches.

Mouth alcohol remains a prevalent source of erroneous alcohol detection. During the analysis of a person's breath sample, the breathalyzer's internal computer operates under the assumption that the detected alcohol came from alveolar air, which is exhaled from deep within the lungs. However, alcohol could potentially originate from other sources such as the mouth, throat, or stomach due to different factors. To minimize the possibility of mouth alcohol contamination, certified breath test administrators undergo extensive training to carefully monitor a subject for approximately 15-20 minutes prior to conducting the test.Detecting mouth alcohol presents a difficulty because it doesn't undergo absorption through the stomach and intestines, meaning it doesn't travel through the bloodstream to the lungs. As a result, the breathalyzer's computer incorrectly applies the partition ratio, leading to inaccurate readings. Even a small quantity of alcohol from the mouth, throat, or stomach can greatly impact the breath alcohol measurement.. In light of the escalating risks associated with data duplication and the potential loss or damage of lorry attestation records, there's an urgent need for a comprehensive solution. The current scenario presents a significant loophole, wherein crucial information regarding accidents and their whereabouts remains elusive, ultimately resulting in tragic outcomes. To address this pressing issue, the proposal of a "GSM and GPS grounded accident discovery system" emerges as a beacon of hope within the transport logistics industry. This innovative system capitalizes on the widespread readiness of stakeholders to embrace advanced mobile solutions, offering a seamless means of tracking shipments from inception to delivery. By leveraging GPS technology for real-time vehicle tracking and GSM for efficient communication, coupled with the utilization of ARM regulators to store essential contact information, this system ensures swift and reliable

alerts in the event of an accident. Moreover, it extends its functionality to navigate through challenging terrain or areas with limited network coverage, thus bridging the gap in monitoring capabilities. Through the amalgamation of these cutting-edge technologies, the proposed system not only mitigates the risks posed by data manipulation but also stands as a beacon of safety, safeguarding lives and assets within the transport ecosystem.

The adoption of a homemade system marks a significant step forward in addressing the pressing challenges within the transport logistics industry. Central to this system is the pivotal process of accident tracking, which serves as a cornerstone for ensuring timely response and intervention in critical situations. In instances where accidents occur, the inability to promptly provide needed medical attention to the affected individuals underscores the urgency of implementing effective solutions. The devastating consequences of life and property loss on a large scale have underscored the imperative for comprehensive measures. Recognizing these shortcomings, our proposed system has been meticulously crafted to address each of these critical issues head-on. By seamlessly integrating automated processes, such as GSM communication for swift alerts and response, this system holds the potential to significantly mitigate the impact of accidents. Through proactive measures and robust technological infrastructure, lives can be safeguarded, and property losses minimized. In essence, our proposed system represents a paradigm shift towards greater safety and efficiency in the transport logistics landscape.

Upon assessing the parameters of the task at hand, the subsequent step entails a meticulous dissection of the problem and a deep dive into its surrounding environment. This preliminary phase encompasses two pivotal endeavors: a comprehensive study of the current system and a thorough grasp of the conditions and scope envisaged for the new system. While both facets hold intrinsic significance, it is the initial scrutiny of the existing system that lays the groundwork for delineating functional specifications and ensuring the efficacious design of the proposed solution.

The examination of the present system serves as a crucial linchpin in this process, furnishing invaluable insights into its operational intricacies, strengths, and limitations. However, it is imperative to approach this endeavor with discernment, as a flawed or incomplete comprehension of the existing system could inadvertently derail the design process.

Conversely, navigating the parameters and requisites of the proposed system demands a nuanced and imaginative approach. This phase necessitates innovative thinking and a keen awareness of potential challenges and opportunities. By meticulously delineating the requirements and constraints of the new system, it becomes feasible to chart a course towards its effective realization.

Watthanawisuth's research introduces a pioneering solution: a wireless black box incorporating MEMS accelerometer and GPS tracking technologies for the continuous monitoring of vehicles. This inventive system merges the capabilities of an accelerometer, The solution devised by Watthanawisuth integrates a microcontroller unit, GPS device, and GSM module to establish a comprehensive monitoring system. If an accident occurs, the device autonomously dispatches brief text messages to assigned recipients, such as family members, emergency medical services (EMS), and the closest hospital, detailing the exact vehicle location obtained from the GPS system.

What sets this system apart is its sophisticated algorithm, which analyzes the frame data and bike velocity in real-time to discern between normal riding conditions and potential accidents or drops. Moreover, its compact design allows for easy installation beneath the rider's seat, ensuring minimal intrusion while maximizing functionality. Tested in real-world scenarios with motorcycles, the system has demonstrated remarkable accuracy in detecting various types of incidents, including direct drops, non-linear drops, and regular rides. These promising results underscore the system's potential to revolutionize vehicle monitoring and enhance safety measures on the road.

In the quest for enhanced vehicle tracking capabilities, Hoang Dat Pham's study introduces a novel framework leveraging the synergy between GPS and GSM technologies. With the escalating global vehicle population, the need for efficient tracking systems has become paramount, encompassing various applications such as individual vehicle security, public transportation management, and fleet monitoring. The development of this tracking system aims to empower users with seamless access to their vehicle's location, offering convenience and ease of use. By harnessing GPS for location acquisition and GSM modem for data transmission, the system enables users to remotely track their vehicles through the

mobile network. What distinguishes this framework is its hardware model, meticulously designed to optimize functionality and affordability. Essential hardware elements comprise the u-blox NEO-6Q GPS receiver module, u-blox LEON-G100 GSM module, and Arduino Uno microcontroller. Through the integration of these components, the developed vehicle tracking system showcases the potential for close real-time tracking, coupled with advanced customization capabilities, global operability, and cost-effectiveness. This innovative solution represents a significant advancement in vehicle tracking technology, offering a robust and adaptable solution tailored to meet the evolving needs of users in diverse contexts.

In a pioneering effort to enhance traffic incident detection, Shuming Tang's study introduces an innovative approach termed the Improved Nonparametric Regression (INPR) algorithm. This algorithm, tailored specifically for analyzing traffic flow patterns, revolutionizes the automated detection of traffic incidents. Unlike traditional methods that rely solely on current traffic states for estimation, the INPR algorithm utilizes a sophisticated nearest neighbor search strategy to explore potential traffic flow trends. This unique feature enables the algorithm to anticipate future traffic conditions, thereby facilitating more proactive incident detection.

Through extensive simulation studies and performance tests using real-world traffic datasets, the efficacy and feasibility of the proposed algorithm have been rigorously evaluated. The results underscore the algorithm's robustness and effectiveness in detecting traffic incidents, showcasing its potential to significantly improve traffic management and enhance roadway safety. This groundbreaking contribution represents a paradigm shift in traffic incident detection methodologies, offering a promising avenue for advancing the capabilities of intelligent transportation systems

"In the pursuit of enhancing emergency response to traffic accidents, Fogue presents a groundbreaking framework known as e-NOTIFY. This framework revolutionizes accident location by leveraging cutting-edge communication innovations, thereby expediting assistance to injured passengers through the swift dissemination of crucial information. Central to the e-NOTIFY framework is the integration of Enabling real-time transmission of accident data, Vehicle-to-Vehicle (V2V) and Vehicle-to-Infrastructure (V2I)

communications are pivotal. At the core of this system is the installation of On-Board Units (OBUs) in vehicles, responsible for swiftly detecting accidents and communicating this data to a centralized Control Unit (CU). The Control Unit (CU) evaluates the seriousness of the accident and promptly alerts the relevant emergency services, simplifying the response procedure and potentially preserving lives. This innovative approach represents a significant departure from traditional accident notification methods reliant on eyewitness accounts, which often suffer from delays and inaccuracies. By employing a proactive communication model, the e-NOTIFY framework promises to revolutionize emergency response systems, mitigating the impact of accidents and reducing response times. Moreover, Creating an affordable model highlights the practicality of incorporating this system into current vehicles, paving the way for widespread adoption and tangible improvements in road safety.

1.4 Proposed System

At the heart of the e-NOTIFY framework lies the integration of real-time accident data transmission, with a focus on facilitating Vehicle-to-Vehicle (V2V) and Vehicle-to-Infrastructure (V2I) communications. At its core, this system entails the installation of On-Board Units (OBUs) in vehicles, tasked with swiftly detecting accidents and relaying this information to a centralized Control Unit (CU). The CU assesses the severity of the accident and promptly notifies the relevant emergency services, streamlining the response process and potentially saving lives. This innovative approach marks a departure from traditional accident notification methods reliant on eyewitness reports, which are prone to delays and inaccuracies. By adopting a proactive communication model, the e-NOTIFY framework aims to revolutionize emergency response systems, minimizing the impact of accidents and reducing response times. Additionally, the development of an affordable model underscores the feasibility of integrating this system into existing vehicles, facilitating widespread adoption and tangible enhancements in road safety.

CHAPTER -2

COMPONENTS DESCRIPTION

Components

2.1 Arduino Micro controller

Arduino is a user-friendly, open-source platform for prototyping, renowned for its accessible hardware and software. It enables users to translate various inputs, such as sensor-detected light, into tangible outputs like activating motors or illuminating LEDs. Think of it as the central processing unit of a project, allowing you to provide instructions to the microcontroller on the board.

Catering to artists, designers, and hobbyists, Arduino's adaptability makes it the preferred choice for crafting interactive objects or environments. Seeed Studio, embodying the ethos of "Grow the Difference," not only promotes open-source culture but also distinguishes itself through continuous innovation in the domain of open platforms. Seeed offers a range of Arduino boards, including familiar ones like Arduino Nano and Arduino Mega, along with unique creations like Seeeduino. The latter, a collaboration between Seeed Studio and Arduino, maintains compatibility with Arduino while offering enhanced functionality at a more budget-friendly price.

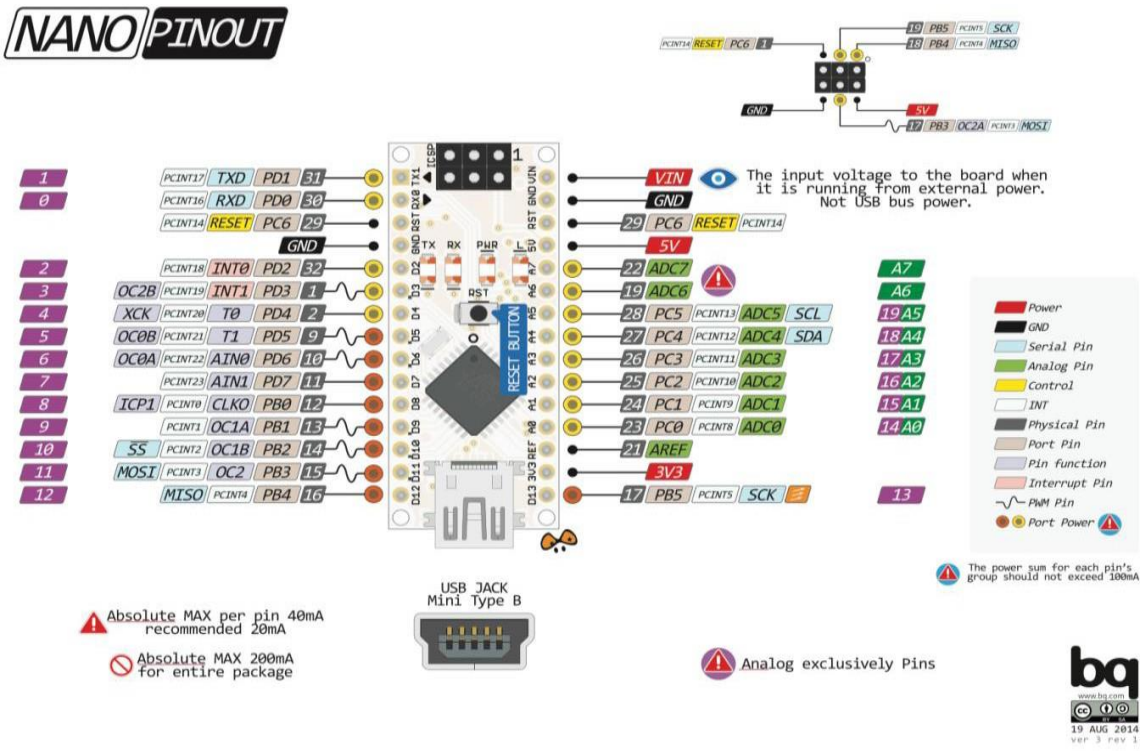


Fig 2.1 Arduino nano pinout diagram

Arduino is an accessible, open-source platform crafted for constructing electronic devices. It comprises a physical programmable circuit board, commonly referred to as a microcontroller, and an integrated development environment (IDE) software operating on the computer. The primary function of this IDE is to write code and upload it to the physical board. Unlike many other programmable circuit boards, Arduino eliminates the need for additional equipment, known as a programmer, to load new code; simply using a USB cable suffices. Furthermore, the Arduino IDE employs a simplified version of C++, simplifying programming tasks, especially for students. The iterative development process continually enhances the microcontroller's functionality, catering to all the requirements of Arduino enthusiasts within a user-friendly package.

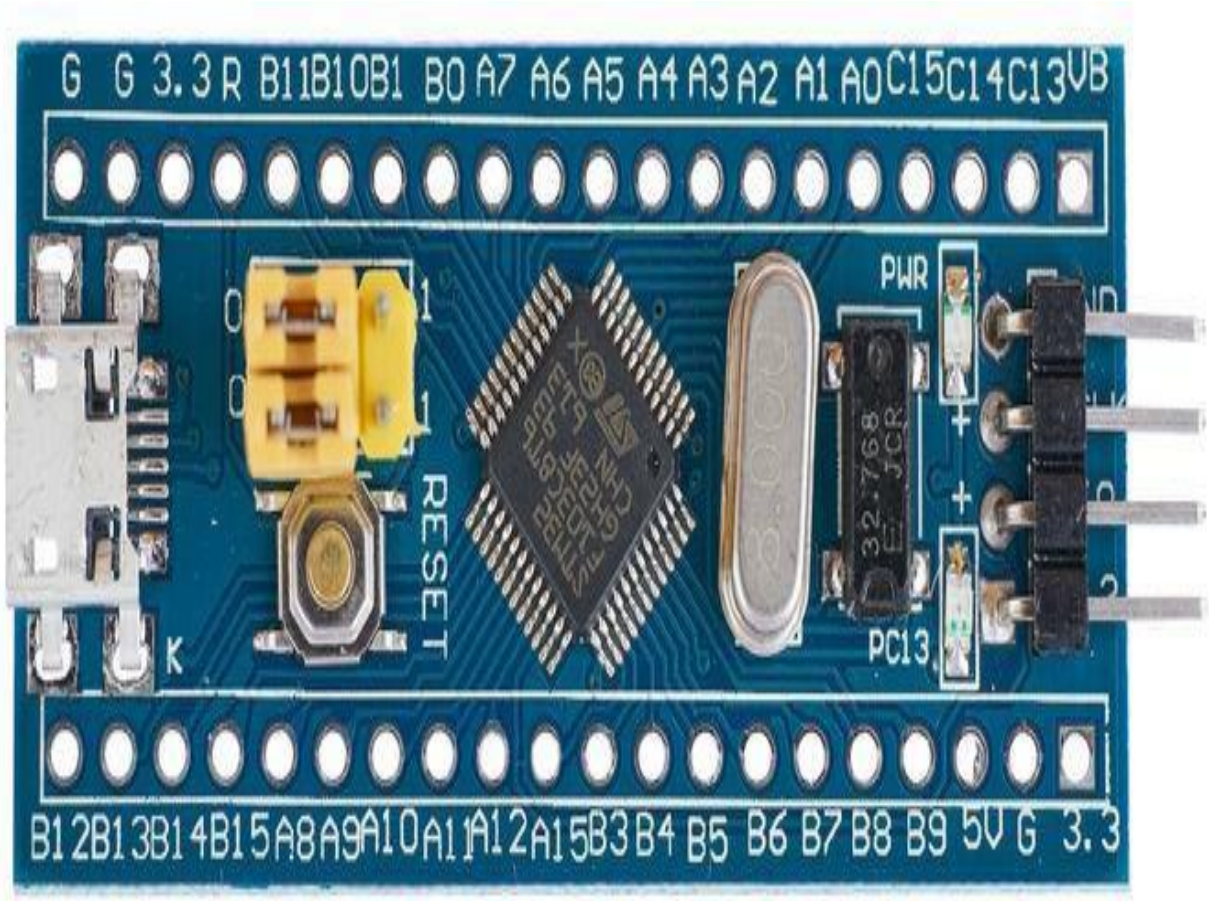


Fig 2.2 Arduino nano image

- The micro-USB connector's attachment to the board is not secure and is prone to breakage, with various versions of the board featuring different connectors. Refer to the accompanying images for visual examples. Strengthening the connector can be achieved by re-soldering it and potentially applying epoxy resin cement or hot-melt glue.
- The 3.3V voltage regulator on the Blue Pill board is small and susceptible to rapid overheating without adequate thermal protection. In case of failure, it may allow unregulated input voltage to pass through. To mitigate potential issues, it is recommended to use an alternative regulator for powering external components, ensuring that the power consumption on the Blue Pill remains below 100mA.
- Direct connection of analog power and ground to digital power and ground may introduce additional noise on the ADC input.
- Some boards have a reset button that is difficult to press.
- There is no dedicated USB reset circuitry on this board.
- The absence of a Schottky diode between USB +5V and system VIN power means that you cannot power the board directly from a 5 Volt supply and use USB simultaneously.
- Many Blue Pill boards have an incorrect pull-up resistor value, which hinders the proper functioning of native USB. The R10 resistor should have a value of 1k5 and be pulled up to 3v3. Despite this flaw, native USB may work on some PCs. Test the board on your PC before considering changing the resistor.
- Microcontroller: Most Arduino boards utilize the Atmel AVR microcontroller. The microcontroller is where all your code is stored and executed. The ATmega328p is commonly used in the Arduino UNO.
- Pins: These pins are used for connecting sensors and modules. Common pins on Arduino boards include 5V, 3.3V, GND, Digital, PWM, Analog, and AREF.
- Power supply and USB: USB is used for code uploading and powering the Arduino board. Alternatively, a barrel jack can be used for power supply. A power supply between 6-12 volts is suitable for powering the Arduino, but avoid exceeding 20 volts to prevent damage.
- Reset button: This button restarts the Arduino, allowing the code to run from the beginning.

- Power LED indicator: A LED next to 'ON' indicates that the Arduino is connected to a power supply. If the LED does not illuminate, there may be an issue with the board or the connection to the power supply.
- RX and TX LEDs: RX and TX stand for receive and transmit, respectively. These LEDs indicate data transfer during code uploading.
- Voltage controller: This component regulates the voltage entering the Arduino by filtering out excess voltage. It also has a limit to prevent damage from excessive power supply exceeding 20 volts.
- Arduino Clones: There are several clone versions of Arduino available, which are more affordable than the original boards. Clone Arduino boards serve the same purpose at a lower cost, making them suitable for beginners. Once familiar with Arduino, you can opt for original Arduino boards made in Italy.

The Arduino Nano, a compact and adaptable board, conveniently integrates with breadboards. It employs either the ATmega328 (Arduino Nano 3.0) or ATmega168 (Arduino Nano 2.x), delivering functionalities akin to the Arduino Duemilanove albeit with a distinct layout. Notably, it foregoes a DC power jack, utilizing a Mini-B USB cable instead of a conventional one. Gravitech is the innovative force behind the conception and manufacturing of the Nano.

Presently, the Nano 328 stands as an enhanced iteration. Despite its compact size, ideal for breadboarding, it utilizes either the ATmega328 (Arduino Nano 3.0) or ATmega168 (Arduino Nano 2.x). Equipped with an integrated USB interface, it shares nearly all analog and digital pins with the UNO or Duemilanove, offering comparable functionality. Combining this Nano 328 (Arduino-compatible) with the IO Shield for Arduino Nano enhances its user-friendliness, simplifying the entry into the Arduino ecosystem for enthusiasts

Nano 328, an enhanced version of the Arduino Nano, maintains full compatibility with Arduino Nano shields and IDEs. Significant improvements have been implemented to increase durability and improve user experience.

Fig 2.3 Ardunio IDE

Based on the ATmega328P, Arduino Nano3.x remains small, complete and suitable for breadboards. It has similar functionality to Arduino but in a different format. There is no DC power supply as in the previous model, a Mini-B USB cable is preferred instead.

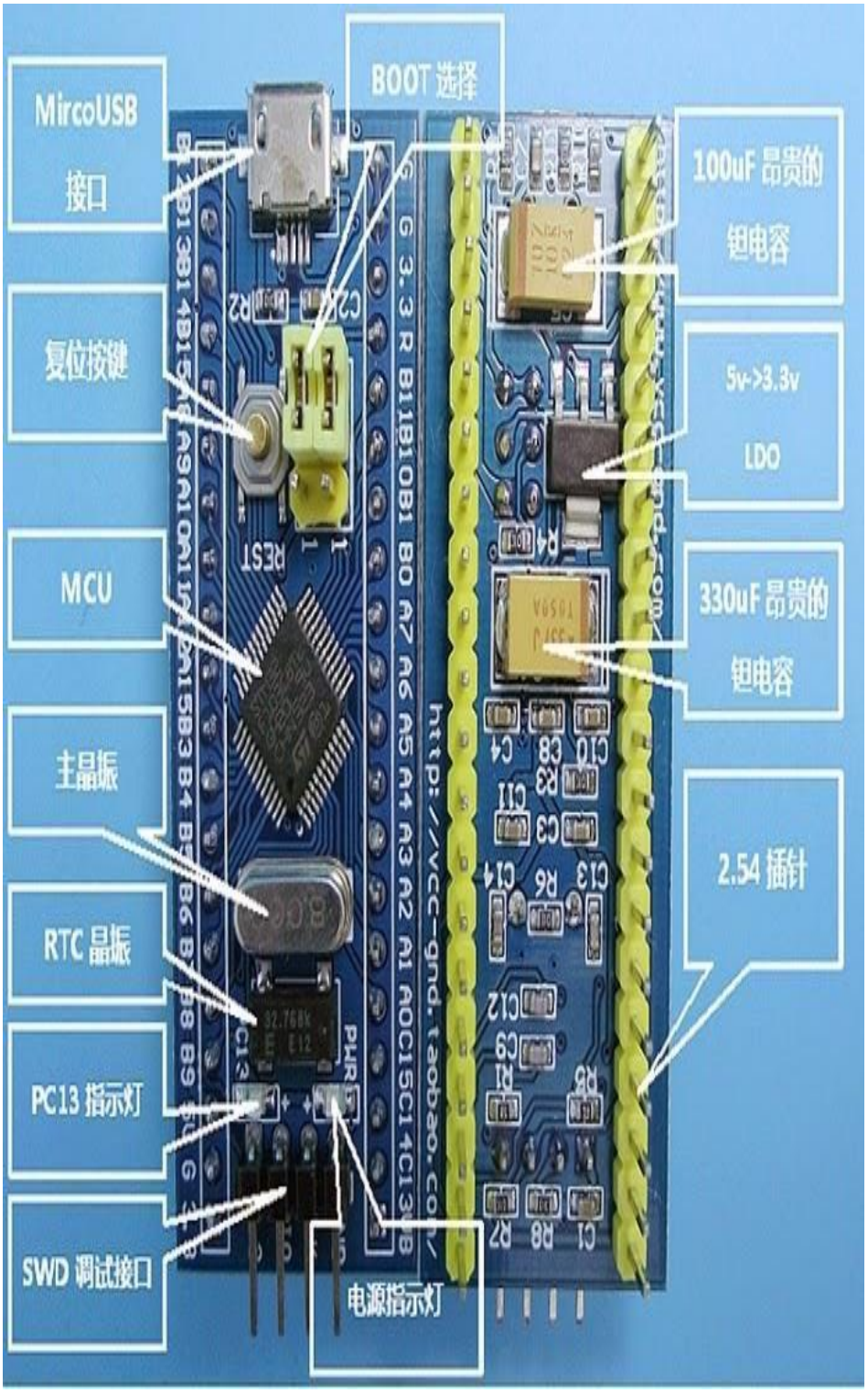


Fig 2.4 Arduino Nano Components Diagram

Various microprocessors and controllers are used to create Arduino microcontrollers. The board is equipped with a variety of digital and analog input/output (I/O) pins for use with color expansion boards or breadboards (security) and other circuits. Motherboards have made an impact over time by including Universal Serial Bus (USB), which in some models can be used to carry programs from a particular computer. Microcontrollers are usually programmed using the capabilities of C and C++ programming languages. In addition to using traditional networking tools, Arduino designs also provide an integrated development environment (IDE) based on the design language.

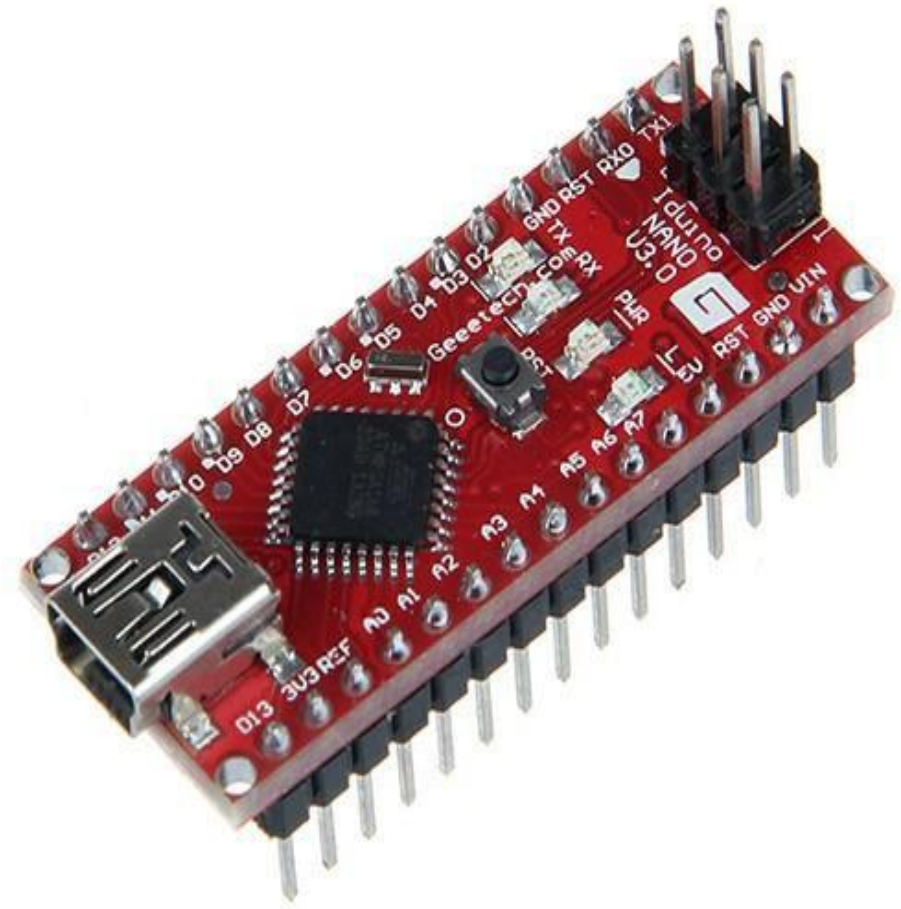


Fig 2.5 Arduino Nano mini pro

Arduino Nano 2.3 (ATmega168): This version of the Eagle file is provided as a wireless design; Eagle's free translation only supports up to 2 layers, while the Nano design is 4 layers. This allows users to open and use this in Eagle translator for free.

Arduino Nano represents a surface-mount, breadboard-compatible version of the award-winning Arduino microcontroller. Its small size, integration of USB board and design pattern make it an easy choice for users. Functionally it has almost all the analog and digital pins of UNO or Duemilanove and provides the same functionality.The smaller and more portable packaging of the Arduino Nano enhances its user-friendliness, making it convenient for individuals entering the Arduino world to bring their ideas to life.In its upgraded form, the Xduino Nano maintains 100% compatibility with Arduino Nano, including its shields and IDEs. Notably, significant changes have been implemented on the hardware front to enhance flexibility and user experience.

specifications:

- Microcontroller Atmel ATmega168 or ATmega328 Operating voltage: (logic level) 5 V input voltage: (recommended) 7-12 V input voltage: (limited) 6-20 V
- Digital I/O pins: 14 (6) Analog input pins: 8
- DC per I/O pin Current: 40 mA
- Flash memory: 16 KB (ATmega168) or 32 KB (ATmega328), of which 2 KB is used for the bootloader
- SRAM: 1 KB (ATmega168) or 2 KB (ATmega328)
- EEPROM: 512 Bytes (ATmega328))) or 1 KB (ATmega328)
- Clock Speed: 16 MHz Dimensions: 0.73" x 1.70" No

1) 1.Power Alright blue Driven, RST ruddy Driven for reset the Nano.
2) 2. Green LED for TX, red LED for RX, and orange LED for status indication (L).
3) 3. Improved 5V power supply with enhanced driving capability.
4) 4.Mini-B USB port for programming and serial display, with TX&RX breakout for

use as a USB-UART converter.

5) 5. ICSP header mounted on the surface.
6) 6. Typical 0.1-inch spacing for easy compatibility with breadboards.
7) 7. Power indicator LED, along with green LEDs for TX, RX, and status indication (L).
8) 8. Enhanced 5V voltage supply with improved driving capability.
9) 9. Mini-B USB is utilized for programming and serial display purposes, while TX&RX breakout enables its use as a USB-UART converter. Additionally, there is a Surface-Mount ICSP header.

Item	Min	Typical	Max	Unit
Microcontroller	Atmega328&Atmega168			/
Operating Voltage (logic level)	4.5	5.0	5.5	VDC
Input Voltage(Recommended)	7	9	12	V
Digital I/O Pins	14(Of which 6 provide PWM Output)			/
Analog Input Pins	8			/
DC Current per I/O Pin	40			mA
Flash Memory	32KB(Atmega328);16KB(Atmefa168)			/
SRAM	2			KB

EEPROM	1	KB
Clock Speed	16	MHz
Dimensions	7.0x 17.0	mm
Weight		g

Standard 2.54mm spacing DIP (breadboard friendly)

Usage:

1. The Atmega328 boasts increased flash and RAM memory capacity.
2. A RST LED added to show user the RST state; While all the package of LEDs upgraded.
3. Pins A0 through A7 are compatible with both the Arduino Stamp and Pro Mini.
4. Upgrade of Power supply circuit with AMS117.

Power:

The Arduino Nano can be powered via a mini-B USB connection or a 6-20V unregulated external power supply (pin 30) or a 5V regulated external power supply (pin 27). The power supply is set to maximum voltage. Xduino Nano has also updated its power supply and uses the new IC AM117. This IC can provide more current than the IC 78M05 used in the Arduino Nano. This integrated circuit can be used in many models that may need more current, such as Xduino Nano and GPRS modules. The Arduino Nano can be powered using a Mini-B USB connection, a 6-20V unregulated external power supply (pin 30), or a 5V regulated external power supply (pin 27). The power supply automatically selects the maximum voltage. The FTDI FT232RL chip in the Nano only provides power when the card is powered via USB. Therefore, when using external (non-USB) power, if pin 0 or 1 is high, the 3.3V output (driven by the FTDI chip) will not be available and the RX and TX LEDs will blink. Memory: ATmega168 has 16 KB of flash memory for code storage (2 KB for

boot program); ATmega168 has 1 KB SRAM and 512 bytes EEPROM (for reading and writing with EEPROM library); ATmega328 is 32 KB (plus 2 KB for the bootloader) and has 2 KB SRAM and 1 KB EEPROM.

2.1.2 Input and Output:

Each of the 14 digital pins on the Nano offers versatile functionality, serving as either input or output using the pinMode(), digitalWrite(), and digitalRead() functions. Operating at 5 volts, each pin can supply or draw a maximum current of 40 mA and includes an internal pull-up resistor ranging from 20-50 kOhms.

Additionally, certain pins have specific capabilities:

- Serial Communication: Pins 0 (RX) and 1 (TX) facilitate transmission and reception of TTL serial data, connected to the corresponding pins of the FTDI USB-to-TTL serial chip.
- External Interrupts: Pins 2 and 3 can be configured to detect interrupts based on low value, rising or falling edge, or change in value.
- PWM Output: Pins 3, 5, 6, 9, 10, and 11 support analog output through the analogWrite() function and enable SPI communication.
- LED Indicator: Pin 13 is linked to an LED, which illuminates when the pin is high and turns off when low, often used for status indication during the initial setup of the Xduino Nano.
- Analog Inputs: The Nano features 8 analog inputs, each providing 10-bit resolution (1024 different values). By default, they range from ground to 5 volts, with the upper end of their range adjustable using the analogReference() function.
- I2C Communication: Pins 4 (SDA) and 5 (SCL) facilitate I2C (TWI) communication using the Wire library.
- Additional Pins: AREF serves as reference voltage inputs for analog readings, used with analogReference(). The Reset pin resets the microcontroller when pulled low, featuring a physical reset button on the Xduino Nano. Users can add another reset source by wiring to their preferred source.

2.1.3 Programming:

Each of the 14 digital pins on the Nano has versatile functionality, serving as either input or output, utilizing pinMode(), digitalWrite(), and digitalRead() functions. Operating at 5 volts, each pin can source or sink a maximum current of 40 mA and includes an internal pull-up resistor ranging from 20-50 kOhms.

Additionally, specific pins offer specialized capabilities:

- Serial: Pins 0 (RX) and 1 (TX) facilitate TTL serial data transmission and reception, connected to corresponding pins of the FTDI USB-to-TTL serial chip.
- External Interrupts: Pins 2 and 3 can be configured to detect interrupts based on low value, rising or falling edge, or change in value.
- PWM Output: Pins 3, 5, 6, 9, 10, and 11 support analog output through the analogWrite() function and also enable SPI communication.
- LED Indicator: Pin 13 is associated with an LED, which illuminates when the pin is high and extinguishes when low, often used for status indication.
- Analog Inputs: The Nano features 8 analog inputs, providing 10-bit resolution (1024 different values), typically ranging from ground to 5 volts. The upper end of this range can be adjusted using the analogReference() function.
- I2C Communication: Pins 4 (SDA) and 5 (SCL) facilitate I2C (TWI) communication via the Wire library.
- Additional Pins: AREF serves as reference voltage input for analog readings, used in conjunction with analogReference(). The Reset pin resets the microcontroller when pulled low, featuring a physical reset button on the Nano.

The Arduino Nano is programmed using the Arduino IDE, typically a version higher than 1.0. To select the appropriate board, navigate to Devices > Board menu and choose "Arduino Duemilanove or Nano w/ ATmega328" based on the microcontroller model on the board. The ATmega328 microcontroller on the Nano comes preloaded with a bootloader, allowing code uploads without an external hardware programmer. Additionally, the bootloader can be bypassed for programming via the ICSP (In-Circuit Serial Programming) header.

2.1.4 TX& RX Pins other Usage:

TX& RX Pins other Usage: The Elecrom Arduino moreover burst the TX&RX pins of FTDI IC, this makes the Nano can working as a typical USB- UARTconvertor.However, for outline, you need to interface your zigbee module to PC by means of the USB connector, If you needs a USB- UART convertor in your operation. In this way, the FTDI IC on Elecrom Arduino Nano changes over the USB flag to UART flag, the zigbee can communicate with the PC. In arrange to dodge flag disarray resistors are included, The Atmega328 on Electrom Arduino Nano would not impact the UART flag when these two pins are associated to other module. Take note " TXD " on Elecrom Arduino Nano implies UART side exchanged flag and USB side concede; whereas the " RXD " implies UART side concede flag whereas USB side transferred.

2.1.5 Micro controller:

Most arduino boards use Atmel AVR. The entire code is stored and executed on the microcontroller. The most commonly used Arduino UNO microcontroller is the ATmega328p. Pins:- These pins are used to connect the sensor and module. Control power and USB:- USB is used to transfer the code to your arduino board, you can control your arduino board via USB but controlling your arduino using USB doesn't always work, in that case your barrel can be used to control the arduino. power input (Note: - Do not use more than 20 volts on control power, this may affect and destroy your arduino.)

2.1.6 Reset button:

This button is used to reset the Arduino and make it run the code from scratch.

2.1.7 Control Driven indicator:

On the Arduino board, you will see the Driver and other status as "ON", when you connect the Arduino for control power, this Driver will light up. The board is associated with power supply control.

2.1.8 RX and TX LED:

First of all, RX and TX are the abbreviations of the words "receive" and "transmit" respectively. These drives flash when data is exchanged when codes are entered.

2.1.9 Voltage regulator:

This controls the amount of voltage going to the arduino by shutting off extra power that could damage our board.

2.1.10 Communication:

The Arduino Nano recognizes itself with a horde of communication capabilities, enablingseamless interaction with assorted gadgets. The Nano uses ATmega168 and ATmega328 microcontrollers to support UART TTL communications on high-level pins 0 (RX) and 1 (TX). Integration of FTDI FT232RL chip supports USB communication to create a virtual COM port on the computer through the FTDI driver included in the Arduino computer program.Visual criticism is given by RX and TX LEDs amid USB information transmission. The Nano's adaptability amplifies to program serial communication on any advanced stick, much obliged to its Computer program Serial library. Furthermore, the microcontrollers back I2C and SPI conventions, with the Arduino computer program advertising a Wire library for disentangled I2C usage. For those digging into SPI communication, the direction coordinates clients to the ATmega168 or ATmega328 datasheet for point by point determinations. This comprehensive communication toolkit makes the Arduino Nano a flexible and effective choice for a wide cluster of implanted projects.

2.1.11 Automatic (Software) Reset:

The Arduino Nano shows a interesting include in its designthat streamlines the uploading handle. Not at all like a few sheets requiring a manual press of the reset button some time recently uploading, the Nano permits for software-triggered resets, improving client comfort. This functionality can be enhanced by connecting one of the FT232RL's control lin es, DTR (data terminal ready), to the reset line of the ATmega168 or ATmega328 (via a 100 nanofarad capacitor). When the DTR is asserted (acknowledged), it successfully resets the c hip by lowering the low-level reset line.The Arduino computer program capitalizes on this capability, empowering clients to start transfers easily by essentially clicking the transfer button.

This configuration minimizes bootloader downtime because the reboot and installation start can be synchronized. However, it's worth noting that when connected to a computer running Mac OS. While the bootloader is programmed to disregard malformed data, it temporarily

blocks the initial bytes of data transferred to the board post-connection. It's advisable for communicating software to introduce a brief delay after connection initiation to ensure proper data transfer, especially if the sketch expects one-time configuration data at startup. This distinctive reset mechanism showcases the Nano's user-friendly design, balancing efficiency and compatibility across different operating systems.

2.2.LIGHT EMITING DIODE(LED)

In the picturesque town of Ivrea, Italy, a group of visionary students at the Interaction Design Institute embarked on a groundbreaking journey in 2003. Their mission? To democratize the world of electronics by providing an accessible and affordable platform for enthusiasts and professionals alike. Thus, Arduino was born—a beacon of innovation that empowers individuals to seamlessly integrate sensors and actuators into their surroundings. From tinkering with basic robots to crafting intricate indoor regulators and motion detectors, Arduino has become the catalyst for boundless creativity, sparking a revolution in the way we interact with technology.

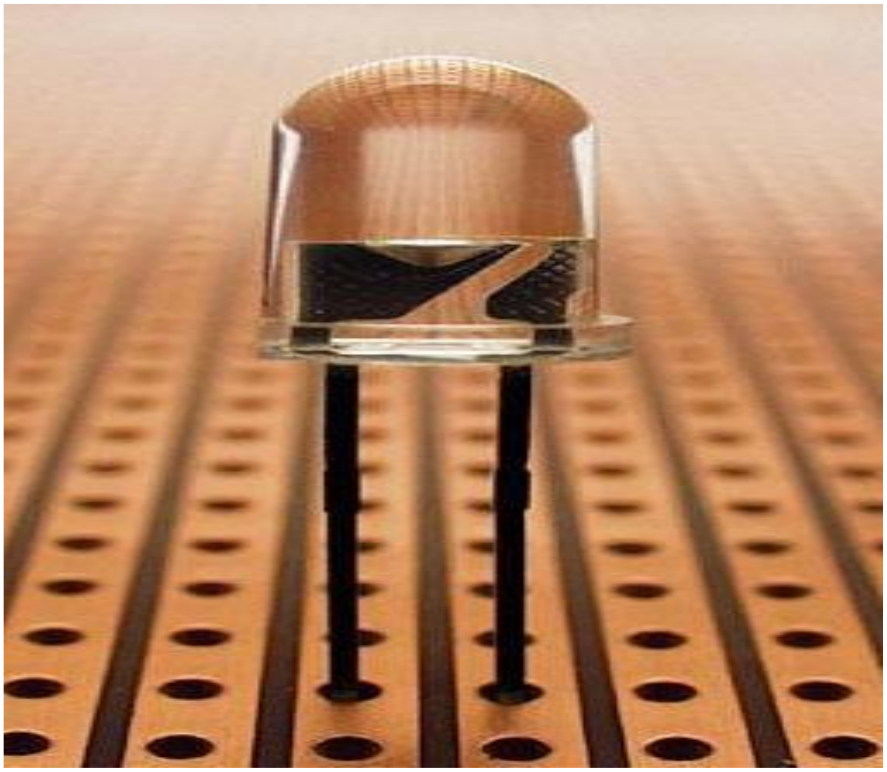


Fig 2.6: LED View

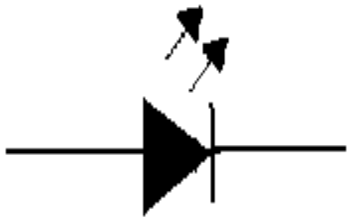


Fig 2.7: LED Symbol

Ensuring proper connection of LEDs is crucial, as they must be oriented correctly for optimal performance. Typically, diagrams designate the positive side as "A" or "+" for anode, while the negative side is indicated as "K" or "- "for cathode. Additionally, the negative lead of an LED can be discerned by its shorter length compared to the positive lead. This dual indication system helps users confidently connect LEDs, avoiding any potential mishaps and ensuring smooth operation in various electronic project.

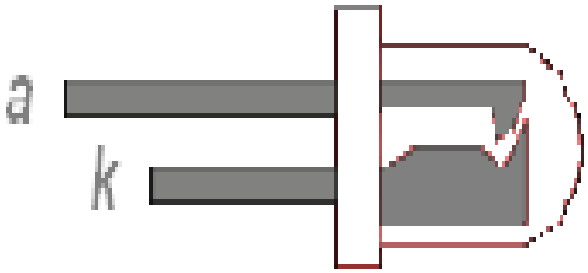


Fig 2.8: LED internal View

Seek out the flat side of the bulb, like a distinctive feature that whispers the LED's orientation. Follow the wires extending from the LED; the shorter wire often points to the cathode, hinting at its polarity. Now, for the clandestine details: if you manage to peek inside the LED, you might notice the cathode flaunting its larger electrode, though this isn't an official decoder ring. Remember, the negative lead should cozy up to the negative terminal of your battery, ensuring a harmonious electrical dance. LED's crave modest voltages, typically lounging between 1 and 4 volts, while sipping currents ranging from 10 to 40 milliamperes. Straying beyond these boundaries risks meltdown—a fate no LED desires. However, the LED's standout feature resides in its core: the semiconductor chip, situated at the bulb's center. The chip acts as a conductor, dividing its field into two parts: the positively

charged "p region" and the negatively charged "n region", separated by neutrals called nodes.

This junction isn't just any barrier; it's a formidable gatekeeper, permitting electron passage only when the right voltage knocks. Only then can electrons frolic across the junction, venturing into the p region, where luminous magic awaits.So, remember, in the absence of this mystical voltage dance, the junction stands firm, thwarting electron wanderlust, and keeping the LED's luminescent secrets locked away.

Picture the humble LED as a tiny titan in the realm of lighting—a semiconductor luminary illuminating our world. Born into the electronic scene in 1962, LED's initial glow was a modest red, serving as humble indicator lamps. But oh, how they've evolved!

Currently, LEDs illuminate a spectrum of colors spanning from visible to ultraviolet and even infrared wavelengths.. These modern marvels boast breathtaking,brightness, transforming them from mere indicator lights to the stars of our lighting landscape.Whether they're guiding our way in everyday devices or casting their brilliance in grand lighting installations, LEDs stand as beacons of innovation, proving that even the smallest of semiconductors can light up the world in spectacular fashion.

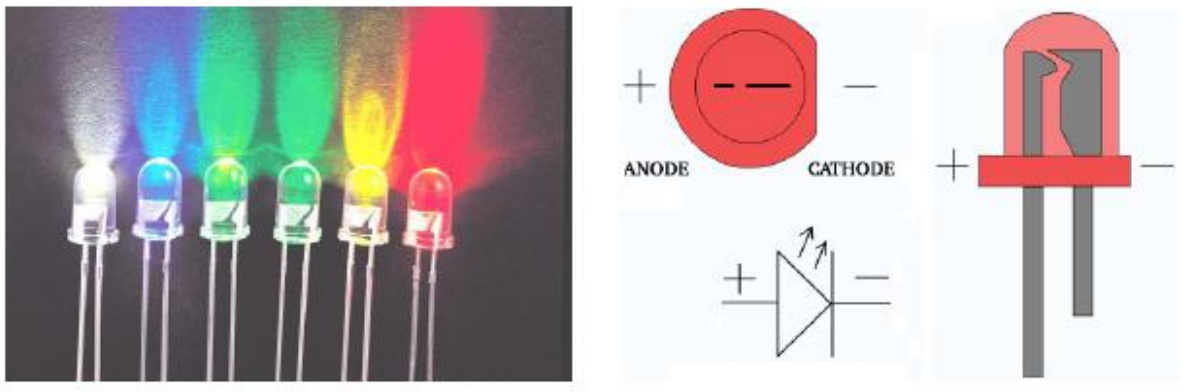


Fig 2.9. Different LED's

Consider a light-emitting diode (LED) as a compact dynamo, directing an ensemble of electrons and photons within its diminutive structure. Upon activation, these electrons gladly recombine with "holes" within the device, emitting energy as photons—a captivating phenomenon recognized as electroluminescence.

However, this is the pivotal moment: the emitted light's color, reminiscent of an artist's palette, is dictated by the semiconductor's energy band gap. From lively reds to calming blues, every shade narrates a tale of vigor and vitality.

Despite their .diminutive size (often less than 1 mm2), LEDs wield remarkable power, with integrated optical components shaping their radiant patterns. Their list of accolades is impressive: lower energy consumption, extended lifespan, rugged durability, compact stature, and lightning-fast switching speeds.

Yet, like any luminary, LEDs have their quirks. While they outshine incandescent counterparts in nearly every aspect, LEDs potent enough to illuminate rooms come at a cost—both figuratively and literally. Their price tag is steeper, and they demand meticulous current and heat management, akin to the care bestowed upon a delicate bonsai tree.In the realm of lighting, LEDs reign supreme, a testament to the marvels of modern engineering and the boundless potential of semiconductor magic.

2.3.PCB :

1. printed Circuit Board (PCB) unfolds as a mechanical maestro, harmonizing support and electrical unity. Copper tracks, pads, and intricacies etched onto layered sheets create a ballet where electrical components are soldered not just for connectivity but to elegantly waltz in mechanical embrace, transforming the PCB into a masterpiece of technological unity.
2. All but the simplest electronic devices use printed circuit boards. These are also used in some electronics such as passive switch boxes.
3. Wire wrapping and point-to-point construction are important, but have now been overshadowed as PCB replacement. The intricate dance of PCBs demands additional design finesse, yet their automation prowess, guided by electronic design software, transforms manufacturing into a synchronized symphony. While crafting PCB layouts involves a unique effort, the payoff is a cost-effective and swift mass production, where components seamlessly integrate in a singular operation. The beauty lies not just in efficiency but in adaptability large-scale PCB fabrication involves a one-time layout, yet they gracefully accommodate manual craftsmanship for smaller quantities, albeit

with diminished advantages.

4. Printed Circuit Boards (PCBs) unfolds in single-sided, double-sided, or multi-layered arrangements, akin to a dance of copper and substrate layers. Multi-layer PCBs, with their intricate choreography of outer and inner copper layers, allow for a heightened component density, strategically placing circuit traces within.

5. A simple printed circuit board (PCB) unfolds like a canvas with flat insulation sheets coordinated with layers of copper foil, intricately etched by alchemy.This enchanting process births conducting tracks, pads, vias, and even solid conductive areas,creating a masterpiece where tracks mimic wires, poised in a fixed dance. Insulated by both air and the board substrate, this intricate ballet on the PCB's surface conceals a guardian – a coating, aptly named solder resist or solder mask, shielding the copper choreography from corrosion and averting solder mishaps, adding an artisanal touch to the world of electronics.
6. The printed circuit board (PCB) unfolds like a canvas, which can accommodate many layers of copper, increasing the level of electronic concertos. Both sides of copper in two layers are elegant; Multilayer panels, on the other hand, create a light symphony by weaving additional copper layers over the insulation boards. Connecting the layers is achieved by plated copper holes that operate as electrical tunnels through the insulating substrate. Sometimes the dance includes a device that serves the dual role of the hole. In addition to the two-layer PCB duo, the crescendo often rises to a four-layer masterpiece. Here, two layers adapt according to energy and ground planes, while the other two layers act as signal connections between objects, ensuring harmony between work and design.
7. "Through-hole" components are assembled by passing their leads through the circuit board and soldering them to the outside lines. There are two types of mounting methods for circuit boards. PCBs with only through-hole mounting components are rare these days. Surface support is used for transistors, diodes, IC boards, resistors and capacitors. Can be used for some larger parts such as electrolytic capacitors and connectors through the bottom hole
8. Revealing the art in the intricate patterns etched into the sacred space of the Printed Circuit Board (PCB) called "art". This dance of creation occurs through the ballet of

photoresist placed on the PCB and exposed to light, displaying beautiful artistic patterns.Like a protective shield, the resist material preserves the board's essence amid the drawing ritual, safeguarding it from dissolution into the design's embrace. The ensuing etched board, akin to a sculpted masterpiece, undergoes a gutting process. This balletic journey allows the PCB design to be reborn, mirroring the mass reproduction akin to the duplication of photos from film negatives through the lens of a photographic printer. In this symphony of creation, the PCB becomes not just a circuitry canvas but an artistic endeavor echoing the meticulous steps of its reproduction.

i Imagine a layered dance in a circuit board, like a sandwich with copper and substrate layers taking turns. Each copper layer is etched with care, and special tunnels (vias) connect them inside. Only the outside layers get a protective coating, keeping the inner copper layers safe under the embrace of nearby substrate layers. It's like a shielded dance, ensuring the circuit board stays secure and performs its role smoothly.

9. FR-4 glass slurry is the most separated substrate. Another substrate is tissue impregnated with phenolic resin, usually brown or brown.

When the PCB has no components attached to it, it is ambiguously referred to as printed wiring board (PWB) or etched wiring board. However, the term "advertising circuit board" has been removed. The entire PCB of the electronic device is called public assembly (PCA), public board or PCB assembly (PCBA). In informal practice, the term "electrical protection" usually means "electrical protection products" (including articles). The IPC's preferred terminology for assembly boards is circuit board assembly (CCA), (4) and for assembly backplanes it is backplane assembly. . Expand card for description.

i. Picture a PCB as a canvas adorned with a "silkscreen" key, telling the story of its components, test points, or essential details. In the early days, an actual silkscreen process lent its touch, but today, refined printing methods take the stage, weaving a tale of precision. Interestingly, this screen printing is more like an artistic flourish than a vital act in the circuit's play, adding a touch of elegance without stealing the spotlight from the functional essence of the PCB assembly

10. The smallest PCB of a device used for design purposes is called the circuit board. The purpose of using a circuit board is to "remove" the conductors from the components of the individual terminals so that they can be easily connected manually. Broken plate is

especially useful for surface materials or well-spaced lead-containing materials.

11. Advanced PCBs will have components embedded in the substrate.

2.3.1 Characteristics:

The adoption of technology that constitutes the first step in the production of printed circuit board (PCB), a complex display of electronic equipment. Components drill elegant holes in carefully drilled holes on one side of the panel, performing a soldering waltz of copper lines adorning the other side. PCB is divided into two functions: single-sided panels show their charm without covering external equipment, while the equipment is more convenient, both sides are decorated with beautiful things on both sides. The choreography of objects in the hole, including resistors, capacitors, and biaxial conductors such as diodes, unfolds like a dance. The acrobatic lead is followed by a 90-degree bend, similar to synchronized performance.As the components found their stage on the board, leads from the back oftentimes engaged in an opposing ballet, enhancing the part's mechanical fortitude. The soldering crescendo and the trim of excess ends marked the grand finale, orchestrated by nimble fingers or the mechanical grace of a wave soldering machine. Yet, this ballet was not without its intricacies and costs. The elegance of through-hole manufacture came at the expense of precision-drilled holes, contributing a nuanced symphony to the board's cost. The multi-layered PCBs faced a spatial ballet, as the holes transcended layers, limiting the expansive dance floor for signal traces. However, as the narrative unfolded, a new protagonist emerged—the era of surface-mounting. In this avant-garde epoch, petite SMD components took center stage wherever possible. Through-hole mounting, reminiscent of a bygone era, was reserved for components of grandeur, unsuitable for the petite stage of surface- mounting due to power cravings or mechanical constraints. It became a safeguard against the mechanical duress that might threaten the sanctity of the PCB, a potential choreography that could lift the copper off the board surface. Thus, the saga of PCB evolution, told through the tapestry of through-hole technology, casts a unique silhouette in the annals of electronic choreography.

2.4.Buzzer

Enter the world of buzzers and beepers—a symphony of sound that transcends mere utility and ventures into the realm of auditory artistry. These audio signaling devices, whether mechanical, electromechanical, or piezoelectric (piezo for short), serve as the heralds of information, the guardians of awareness, and the messengers of time.

Picture a symphony of sounds: the insistent cry of an alarm, the steady beat of a timer, or the comforting chirp of acknowledgment, indicating the reception of user input—a click of a mouse, a tap of a key, a moment of interaction captured in sound.

But their utility extends far beyond mere function; they are the unsung heroes of our daily lives, the silent sentinels standing guard against the encroachment of forgetfulness and the passage of time.

So, whether they're nestled within the confines of a security system, perched atop a kitchen timer, or integrated seamlessly into the fabric of user interfaces, buzzers and beepers are more than mere devices—they are the voice of vigilance, the song of awareness, and the melody of interaction in the symphony of life.

Fig 2.10 .Buzzer

2.5 MQ3 SENSOR

Fig 2.11.MQ3 sensor

Behold the marvel of the semiconductor Gas sensor Module—a beacon of simplicity and affordability in the realm of gas sensing technology. Nestled within its compact frame lies the MQ3 Alcohol gas sensor, a versatile element capable of detecting alcohol vapors with precision.

But what makes this mod unique is its user-friendly design; There are no external components. Just plug in the Vcc and ground pins and you're ready to start figuring it out. For those looking for digital output, don't worry; The threshold can be easily adjusted using the built-in potentiometer, giving you full control over sensitivity.

Whether you're a seasoned microcontroller enthusiast, an Arduino aficionado, or a Raspberry Pi pioneer, this module offers seamless integration with your preferred platform, making it a versatile tool for a myriad of projects.

And let's not forget its practical applications—the breathalyser springs to mind as an obvious choice, harnessing the sensor's sensitivity to alcohol vapors for accurate detection. But the MQ3 Sensor isn't limited to alcohol alone; its keen senses also detect benzine, adding versatility to its repertoire of capabilities.

So, whether you're delving into the world of gas sensing for the first time or seeking to expand your repertoire of projects, the semiconductor Gas sensor Module stands ready to

accompany you on your journey, unlocking new possibilities with every detection.

Enter the realm of the MQ3 GAS Sensor Module—an embodiment of simplicity and sophistication, tailored to meet the needs of discerning enthusiasts and professionals alike. Behold its specifications, a testament to its prowess:

Power Supply: A humble 5 Volts, providing the lifeblood that fuels its operation and ensures consistent performance.

Interface Type: Versatility reigns supreme with both Analog and Digital interfaces, offering flexibility in integration and ease of use across a wide range of platforms.

Sensitivity: With its keen senses, the MQ3 module boasts high sensitivity to alcohol vapors, while also exhibiting a subtle inclination towards benzine, expanding its utility in various applications.

Cost: A beacon of affordability, the MQ3 GAS Sensor Module proves that sophistication need not come at a premium, offering unparalleled value without compromising on quality.

Stability & Longevity: Built to withstand the rigors of experimentation and exploration, this module stands as a beacon of reliability, promising stable performance and a long lifespan, ensuring your projects stand the test of time.

On-board Power Indication: A subtle yet essential feature, the on-board power indication provides visual feedback, reassuring users of the module's operational status and empowering them with confidence in their endeavors.

So, whether you're a hobbyist tinkering in your workshop or a seasoned professional pushing the boundaries of innovation, the MQ3 GAS Sensor Module stands ready to accompany you on your journey, offering unparalleled performance, versatility, and value.

2.6. Push Button Switch

The 6x6x4.3mm Tactile 4 Pin Push Button Switch is a common option for standard input buttons in electronic projects. While optimized for PCB mounting, these switches also offer versatility, facilitating temporary connections on solderless breadboards during prototype

stages. Featuring normally open pins, they seamlessly transition to a closed state when pressed, momentarily completing circuits. With a compact size and reliable functionality, these switches are indispensable for diverse electronic applications, ensuring seamless integration and effortless operation in your projects.

Fig 2.12.Push button

This tactile switch utilizes dome contact technology, delivering robust tactile feedback and presenting a range of operating forces for personalized use. It is utilized in telecommunications, consumer electronics, audio/visual equipment, medical devices, testing instruments, and computer peripherals, ensuring dependable performance in various industries. Its sophisticated attributes and adaptable design render it a perfect selection for electronic ventures demanding accuracy and longevity**.**

Features :

1) **Innovative Secure Mounting Design:** This switch pioneers an inventive mounting system that ensures unparalleled stability across a myriad of applications, setting new standards for secure installation.

2) **Next-Level Engineering for Automotive Excellence**: Engineered with cutting-edge technology, this switch surpasses industry norms with operating forces of 1.5N or 2.5N, meticulously calibrated to meet and exceed the most stringent automotive

standards

3) **Exceptional Endurance, Unmatched Longevity:** Despite its rugged build, this switch defies expectations with an extraordinary lifespan of 300,000 cycles, promising enduring durability that outlasts the competition

4) **Precision Redefined, Usability Perfected**: With an ultra-fine middle stroke of 1.05mm, this switch redefines tactile feedback, delivering a level of precision that enhances usability to unprecedented levels, empowering users with unparalleled control.

5) **Versatility Unleashed**: From cutting-edge electronic devices to everyday household appliances, this switch seamlessly adapts to diverse settings, revolutionizing versatility in application like never before.

6) **Innovative Environmental Resilience**: Featuring an array of groundbreaking properties including advanced waterproofing, oil resistance, anti-pollution, and anti-static interference capabilities, this switch sets new benchmarks for reliability in even the harshest environments.

7) **Mechanical Mastery, Enduring Performance**: Crafted with an intricately precise mechanism, this switch guarantees razor-sharp operation and a service life that transcends expectations, ensuring sustained performance over time.

2.7. BO Motor :

- Explore our diverse selection of BO Motors, featuring differential RPM and various shapes to meet your project requirements. Also referred to as motor bo or bo gear motors, these DC motors are tailored for battery-operated applications, offering exceptional torque and RPM performance even at lower voltages.
- Ideal for projects demanding approximately 200 RPM when powered by a single Li-Ion cell, these motors are perfect for lightweight robot applications. Our collection boasts a range of BO motors with distinct shapes and shaft styles, ensuring versatility in your

designs.

- Whether you're crafting battery-powered devices or constructing lightweight robots, our compact motors deliver reliable and efficient power. Explore our diverse selection of BO motors tailored to meet your requirements. These motors offer affordability, compactness, easy installation, and are ideal for mobile robot vehicles. Widely utilized in our 2WD platforms, they are indispensable for your Robotic projects.

Fig 2.13.BO Motor

2.8. L298N Dual H-Bridge DC/Stepper Motor Driver Controller

This motor driver uses the L298N dual H-bridge driver chip, which is praised for its excellent performance and affordable price. The L298N Dual H-Bridge DC/Stepper Motor Drive Control Module is specifically designed and manufactured to drive dual motor drives, ensuring consistency and reliability..

Fueled by the widely respected L298N Dual H-Bridge Motor Driver chip, this unit can manage motors with voltages ranging from 5 to 35 Volts, providing a maximum of 2 Amps per channel. Its adaptable digital input controls enable separate operation for each motor, granting precise command over speed, direction, and braking maneuvers.

With its unique blend of cutting-edge technology and affordability, this motor driver stands out as a top choice for enthusiasts and professionals alike. Whether for robotics, automation, or DIY projects, it provides the perfect balance of performance and cost-effectiveness, making it

an indispensable component in any motor control setup.

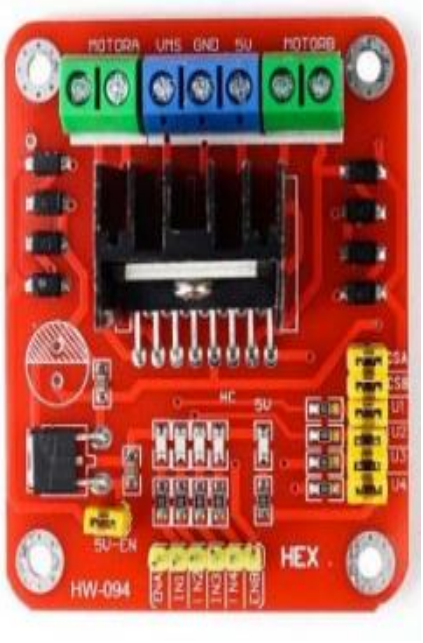


Fig 2.14.L298N Dual H-Bridge

With an onboard 5V regulator for powering additional circuitry like microcontrollers, this board offers enhanced versatility for robotic applications, seamlessly compatible with popular platforms such as the Arduino family. Employing the original L298N chip from ST, this driver module ensures superior performance and stability, featuring SMT technology and high-quality aluminum electrolytic capacitors. With the ability to seamlessly manage both the speed and direction of DC motors, along with 2-phase stepper motors, it represents a pinnacle of dependable and versatile motor control solutions.

Features :

1. Recognized for its incorporation of the widely acclaimed L298N Dual H-Bridge Motor Driver chip, this module ensures exceptional performance and dependability, establishing a benchmark in motor control solutions.

2. Engineered to effectively drive motors across a versatile voltage spectrum of 5 to 35V, delivering a formidable 2A per channel, ensuring robust operation in diverse applications.

3. Featuring 4 LEDs serving as intuitive visual indicators, this module enhances monitoring

and troubleshooting, empowering users with clear insights into the control logic state.

4. Empowering users with precise and tailored motor control, it enables independent manipulation of direction, speed, and braking for each motor, facilitating optimized functionality.

5. With user convenience in mind, the inclusion of screw terminals facilitates effortless connections to motors and power sources, simplifying installation and maintenance procedures.

6. Setting itself apart with a heavy-duty heat sink, this module ensures exceptional thermal dissipation, guaranteeing sustained performance even in the most demanding operating conditions.

7. Seamlessly integrating with a wide array of robot controllers, this module offers unparalleled versatility and compatibility, enabling effortless interfacing and control in diverse applications.

8. Equipped with current sensing capabilities, it enables accurate monitoring and management of motor currents, enhancing performance optimization and ensuring operational safety.

2.9.Digital Sensor TTP223B Module Capacitive Touch Sensor :

Fig 2.15.Touch Sensor

The TTP223B Module Capacitive Touch Sensor Switch transforms traditional push-type

buttons by utilizing a touch-sensitive IC (TTP223B) for smooth functionality. This digital capacitive touch switch module stays in a low-power mode until it detects a touch within the circular area, quickly becoming responsive. After 12 seconds of inactivity, it reverts to low power. Mountable on non-metallic surfaces like plastic or glass, it allows for discreet integration into walls and desks. With its slim profile and versatile mounting options, including beneath thin paper coverings, it enables inconspicuous button placement. The intuitive touch interface features three pins (GND, VCC, SIG) for easy control, a power indicator LED, and a touch area reminiscent of a fingerprint icon. Enhanced by positioning holes for effortless installation and inter-module combination, this touch sensor switch offers unparalleled convenience and functionality.

Efficient Power Management:

- Demonstrates minimal power consumption, ensuring energy efficiency and prolonged operation.
- Accommodates a versatile power supply range of 2 to 5.5V DC, enhancing flexibility in deployment across various setups.
- Innovative Button Replacement:
- Offers a modern alternative to conventional button interfaces, simplifying user interaction and promoting sleek design aesthetics.
- Equipped with four M2 screws positioning holes, facilitating effortless installation in diverse environments

Optimized Output Performance

Exhibits robust output capabilities with a sink current of 8 mA (@ VCC = 3V, VOL = 0.6V) and a pull-up current of 4 mA (@ VCC = 3V, VOH = 2.4V), ensuring reliable signal transmission and compatibility with downstream devices.

2.10 LCD DISPLAY:

LCD show: The LCD show appeared in the picture is a character LCD, which implies it can as it were show content and basic images. This specific LCD show has 2 columns and 16 columns, so it can show up to 16 characters per push. LCD shows are utilized in a wide assortment of applications, counting calculators, computerized clocks, and thermometers.

Microcontroller Board: A microcontroller board is a small computer that can be modified to perform many functions.The microcontroller board on the connector board is likely a exceptionally straightforward one, as its fundamental work is to control the LCD show. Microcontroller sheets are utilized in a wide assortment of electronic gadgets, counting robots, rambles, and 3D printers.

The connector board itself is a breakout board that makes it less demanding to interface an LCD show to a microcontroller board. It does this by giving a number of associations, or pins, that can be patched to the microcontroller board. The connector board too incorporates a voltage controller, which is essential to give the LCD show with the redress voltage.

The circuit board you sent incorporates an LCD1602 show module and a few extra components that empower it to communicate with an Arduino or comparative microcontroller by means of an I2C communication convention. Here are the common capacities of the circuit:

I2C Interface: This interface permits the microcontroller to communicate with the LCD show module utilizing as it were two wires (serial communication). This streamlines the association and decreases the number of pins required on the microcontroller.

Potentiometer (VR): This variable resistor is likely utilized to alter the differentiate of the LCD show by changing the voltage sent to the backlight.

Fig 2.16: LCD display

- Here are a few of the benefits of utilizing an LCD connector board:
- Makes it less demanding to interface an LCD show to a microcontroller board
- Provides voltage control for the LCD display
- Can offer assistance to decrease the sum of wiring required

2.11.12C FOR LCD

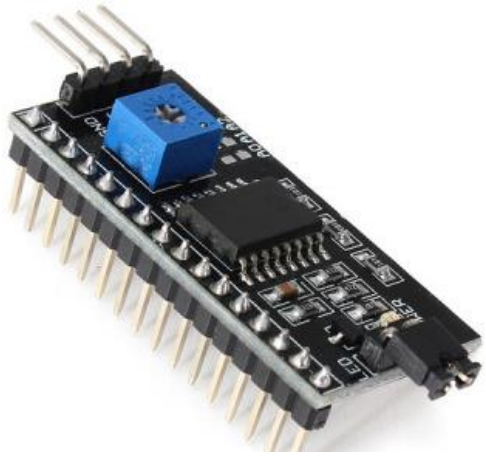


Fig 2.17: I2C LCD

Description:

Enter the realm of the I2C Module, a marvel of integration that brings the power of parallel and serial communication together in harmony. At its core lies the PCF8574 I2C chip, a master of conversion that effortlessly translates I2C serial data into parallel data for the LCD display, unlocking a world of possibilities in data transmission and display.

But what sets these modules apart is their versatility in addressing. Upon inspection of the black I2C adaptor board on the underside of the module, users are greeted with a choice: the default I2C address may be either 0x27 or 0x3F. How to discern between the two? Look no further than the arrangement of pads—three sets labelled A0, A1, & A2 signify an address of 0x3F, while the absence of pads designates an address of 0x27.

But the journey doesn't end there. Nestled beneath the display lies a contrast adjustment pot, a humble yet essential component that ensures the clarity and legibility of displayed text. With a simple twist, users can fine-tune the contrast to achieve optimal visibility, ensuring that every word and character shines brightly on the screen.

So, whether you're a seasoned tinkerer or a curious enthusiast, the I2C Module beckons, offering a gateway to seamless communication and vibrant display. With its intuitive design and thoughtful features, it stands ready to elevate your projects to new heights of functionality and elegance.

Features:

Step into the world of convenience and simplicity with the I2C Interface Module—a marvel of engineering that streamlines data display like never before. Let's explore its unique features:

- Operating Voltage: At a comfortable 5V, this module is ready to integrate seamlessly into your projects without the need for complex power configurations.
- Backlight and Contrast Control: Say goodbye to cumbersome adjustments. With a potentiometer at your fingertips, fine-tuning the backlight and contrast is as easy as a twist of the wrist, ensuring optimal visibility and readability in any environment.

- Serial I2C Control: Harnessing the power of the PCF8574, this module offers serial I2C control of the LCD display, paving the way for efficient data transmission and display management.
- Dual IIC Interface: Versatility reigns supreme with two IIC interfaces, providing flexibility in connection options. Whether you prefer Dupont Line or IIC dedicated cable, this module has you covered, offering compatibility and convenience in equal measure.
- Compatible for 16x2 LCD: With support for 16x2 LCD displays, this module caters to a wide range of applications, from basic data visualization to more complex information displays.
- Simplified Data Display: With just 2 wires, you can achieve data display with ease, thanks to the I2C interface module. Gone are the days of tangled wires and complex configurations now, you can realize your data display dreams with simplicity and efficiency.
- So, whether you're a hobbyist exploring new projects or a professional seeking streamlined solutions, the I2C Interface Module is your gateway to hassle-free data display. With its intuitive design and versatile features, it empowers you to bring your ideas to life with elegance and ease.

2.12.GPS

Embark on a voyage of navigation and discovery with the Global Positioning System (GPS), a marvel of contemporary technology that reveals the mysteries of location and position, regardless of your whereabouts.

With GPS at your fingertips, you hold the power to pinpoint your exact whereabouts, whether you're trekking through dense forests, navigating bustling city streets, or sailing across vast oceans. From the highest peaks to the deepest valleys, GPS offers a beacon of guidance, ensuring you never lose your way in the vast expanse of our world.

But GPS is more than just a tool for navigation—it's a gateway to adventure and discovery. With its ability to provide precise position information anywhere on Earth, GPS opens the

door to new experiences and opportunities, allowing you to explore remote destinations, discover hidden gems, and chart your own course through the unknown.

So, whether you're a seasoned traveler seeking new horizons or a curious explorer embarking on your first journey, GPS is your faithful companion, guiding you every step of the way and empowering you to uncover the wonders of our world with confidence and ease.

2. Fundamental Design of GPS

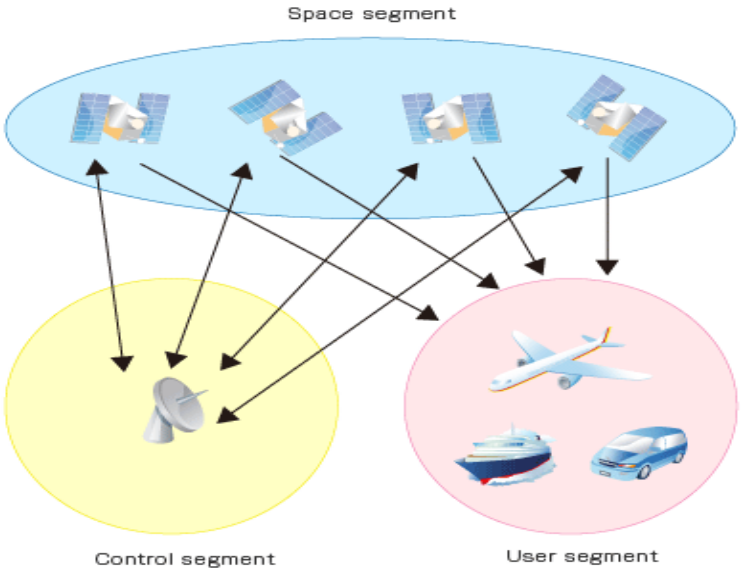


Fig. 1-2 Three elements of GPS

Fig 2.18: Three Elements of GPS

Dive into the intricate architecture of the Global Positioning System (GPS), where precision meets reliability across three essential segments:

Space Segment (GPS Satellites): Imagine a celestial ballet unfolding high above, where a constellation of GPS satellites orbits the Earth in perfect harmony. Distributed across six orbits and positioned at an altitude of about 20,000 km, these satellites four in each orbit constitute the foundation of the GPS system, guaranteeing extensive coverage and uninterrupted service globally.. With their synchronized movements and 12-hour intervals, they paint a picture of precision and reliability against the backdrop of the cosmos.

Control Segment (Ground Control Stations): Down on Earth, a network of ground control stations takes center stage, overseeing the intricate dance of satellites with unwavering vigilance. From monitoring and controlling satellite orbits to maintaining precise GPS timing, these stations serve as the guardians of accuracy, ensuring that deviations from orbit and timing remain within strict tolerance levels. With their watchful eyes and meticulous attention to detail, they uphold the integrity and reliability of the GPS system for users around the globe.

User Segment (GPS Receivers): Enter the realm of GPS receivers—the final frontier in the journey of navigation and positioning. From handheld devices to sophisticated navigation systems, GPS receivers empower users to harness the power of satellite signals and unlock their precise position anywhere on Earth. With each calculation and triangulation, they offer a window into the world of GPS positioning, guiding adventurers, travelers, and explorers on their journeys with confidence and precision.

GPS Module

Fig 2.19:GPS Module

Embark on a journey into the realm of GPS data, where the humble NMEA string serves as a because of information, guiding us through the intricacies of navigation and positioning. Nestled within the confines of a GPS receiver module, the NMEA string emerges as a treasure trove of data, waiting to be unlocked. With each transmission, it offers a glimpse into the world of longitude, latitude, altitude, time, and more, all neatly encapsulated within its digital confines. When the GPS receiver module activates, it generates the NMEA string in a standard format according to the guidelines established by the National Marine Electronics Association (NMEA).With precision and clarity, each parameter is delineated by commas, creating a symphony of data that paints a vivid picture of our surroundings.

From the sprawling landscapes of longitude and latitude to the soaring heights of altitude, the NMEA string leaves no stone unturned in its quest to convey vital information. With each string beginning with the iconic '$' symbol and concluding with the familiar carriage return/line feed sequence, it weaves a narrative of exploration and discovery.

As adventurers and technologists alike harness the power of GPS technology, the NMEA string stands as a testament to the ingenuity of human innovation. With its seamless integration into navigation systems and beyond, it serves as a guiding light in our quest for understanding the world around us.

For example:

$GPGGA,184237.000,1829.9639,N,07347.6174,E,1,05,2.1,607.1,M,-64.7,M,,0000*7D
$GPGSA,A,3,15,25,18,26, 18,26,A,3,15,25,18,26,12,,,,,,,,5.3,2.1,4.8*36
$GPGSV,3,1,11,15,47,133, 46, 25,44,226,45,18,37,238,45,26,34,087, 40*72
$GPGSV,3,2,11,12,27,184,45,24,02,164,26,29,58,349,, 05, 26,034,*7F
$GPGSV,3,3,11,21,25,303,,02,11,071,,22,01,228,*40 $GPRMC,184237.000,A,1829.9639, N,618.070,E. ,A,07347.6174,E,0.05,180.19,A.

Pin Description

Fig 2.20: GPS Receiver Module

Imagine the GPS Receiver Module as the navigator of our digital world. Just like us, it needs a source of energy (VCC) and a connection to the earth (GND) to function properly. Its TX function is akin to its voice, sharing valuable location and time data, while RX acts as its attentive ear, ready to receive instructions for customization. It's like having a digital guide, always there to lead the way through the vast landscape of technology.

Check GPS module

Get ready for a data exploration journey as we prepare to interface the GPS module with the PIC18F4550 microcontroller. Before diving into the details of the code and circuit, let's get t o kno-w the output of the GPS module. With bated breath, we await the arrival of the NMEA string, brimming with vital information that will unlock the mysteries of our location and timing. Within its digital confines lie the keys to longitude, latitude, time, and more, each parameter a beacon of knowledge in our quest for understanding.

To begin this endeavor, we need to establish a connection between the GPS module and our computer. You can opt for either the convenience of a USB to Serial converter or the traditional DB9 connector.But remember, a steadfast antenna placement is crucial, ensuring that the GPS module receives the signals it needs to navigate the vast expanse of space.

With each connection made and parameter extracted, we inch closer to our destination, armed with the knowledge needed to chart our course with precision. So, let us venture forth, for the world awaits, and with the aid of our GPS module and PIC18F4550 microcontroller, we shall conquer new frontiers of exploration and discovery.

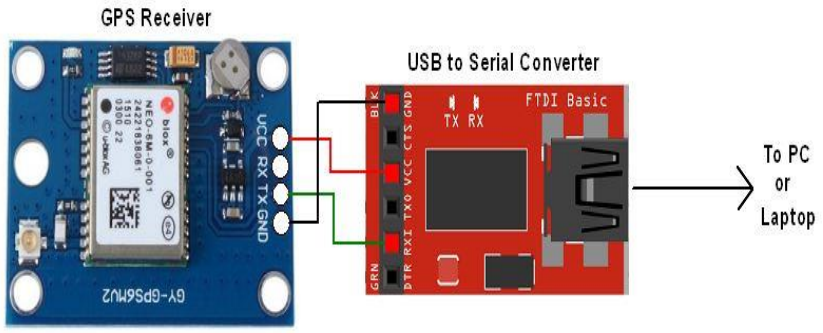


Fig 2.21:GPS receiver with USB to Serial converter

2.13. GSM MODULE SIM 900L

Fig 2.22:GSM Module

Enter the world of connectivity with the Sim800L Module, a marvel of modern technology designed to bring GSM and GPRS capabilities to the palm of your hand. Powered by Simcom's cutting-edge SIM800L chipset, this compact module packs a punch with its low cost and diminutive form factor.

Equipped with support for quad-band GSM and GPRS networks, the Sim800L Module is a versatile powerhouse, capable of operating seamlessly across the globe. Whether you're in the bustling streets of a metropolitan city or the remote corners of the wilderness, this module ensures connectivity knows no bounds. Ideal for applications where size and cost are paramount, this breakout board opens up a world of possibilities for IoT projects, allowing you to bring your innovative ideas to life without breaking the bank. With the Sim800L Module at your disposal, the only limit is your imagination. Imagine creating your own cellphone from scratch, empowered by the capabilities of the Sim800L Module. From remote monitoring systems to smart home devices, this module serves as the backbone of your IoT ecosystem, providing reliable connectivity wherever you go. So, step into the future of communication and connectivity with the Sim800L Module, and unleash the full potential of your IoT projects with ease and efficiency.

Using this module you can:-

- Send Text Messages (SMS)
- Make or receive Phone calls
- Connect to Internet via GPRS
- TCP/IP

While the Sim800L GSM and GPRS module provides exceptional connectivity, it does pose certain considerations, especially regarding its power requirements.

An important limitation to consider is voltage compatibility. This model operates between 3.7 and 4.2 volts and cannot be used directly by Arduino or Raspberry Pi, which usually operate at a lower level.

Furthermore, the Sim800L module is not your average power sipper; it demands up to 2

amperes of current to function optimally. This substantial power requirement underscores the importance of designing a robust power supply system capable of delivering adequate current without compromise.

To meet these power requirements, consider a 3.7-volt lithium polymer (LiPo) battery that provides direct, efficient power to the GSM module. Lithium polymer has great strength, making them ideal for applications where strength and weight are important.

By carefully considering and addressing the power needs of the Sim800L GSM and GPRS module, you can ensure smooth and reliable operation, unlocking its full potential for your projects. So, take charge of your power supply design, and let the Sim800L module shine bright in your IoT endeavors.

In order to interact with the SIM800L module effectively, you'll primarily utilize its UART (Universal Asynchronous Receiver-Transmitter) port. This port facilitates seamless communication between the module and external devices such as microcontrollers or computers.

The SIM800L module boasts extensive command support, including compliance with standards like 3GPP TS 27.007 and 27.005, as well as SIMCOM's enhanced AT Commands. These commands serve as the bridge between your application and the functionalities offered by the SIM800L module.

Whether you're configuring network settings, sending SMS messages, or accessing internet services, these AT commands provide the necessary interface to control and manage the module's operations.

Features of SIM800L GSM Module:

Global GSM Connectivity: With quad-band support (850/900/1800/1900MHz), the SIM800L module can connect to any 2G GSM network worldwide, allowing seamless communication with any compatible SIM card.

Voice Call: This feature allows users to make and receive voice calls using a headset or another 8Ω speaker and electret microphone, providing versatility in communication.

Vibration Motor Control: The module supports PWM/Buzzer vibration motor control, allowing for customized vibration patterns or alerts based on specific events or notifications.

AT Command Interface: It incorporates an AT command interface with automatic baud rate detection, streamlining communication and command interaction with external devices like microcontrollers or computers.

SMS Messaging: Users can send and receive SMS messages, facilitating text-based communication between devices or users.

GPRS Data Communication: The module enables sending and receiving GPRS data, including TCP/IP and HTTP protocols, providing internet connectivity for applications such as IoT devices or remote monitoring systems.

FM Radio Reception: It can scan and receive FM radio broadcasts, offering additional functionality beyond standard communication features.Buzzer and Vibration Motor Control Ports: The module includes lead-out ports for controlling external buzzer and vibration motors, allowing for customizable notification methods.

Antenna Connectivity: It features an onboard IPEX socket for connecting an external antenna, offering improved signal reception in areas with weak network coverage.

CHAPTER -3

TESTING

3.1 System Testing

Testing serves as a dynamic detective, meticulously uncovering potential flaws and weaknesses within a work product. It encompasses a multifaceted process aimed at meticulously examining every facet, from components to final assembly, to ascertain functionality and reliability. By rigorously exercising software, testing ensures alignment with defined requirements and user expectations, safeguarding against intolerable failures. Each distinct test type addresses a specific facet of validation, collectively forming a comprehensive shield against imperfection. Through this systematic approach, testing emerges as an indispensable guardian, assuring the integrity and quality of software systems.

3.2 Types of Tests:

3.2.1Unit testing

The testing unit creates detailed testing to check the internal structure of the program's logic, following the designers to carefully monitor the integrity of the software.Every decision branch and intricate code flow undergoes rigorous validation, ensuring the sanctity of inputs and outputs. Operating at the granular level of individual software units, this structural examination occurs post-unit completion but pre-integration, instilling confidence in the building blocks before they converge. A surgical precision defines this endeavor, drawing upon intimate knowledge of construction and embracing invasiveness to unearth even the most subtle imperfections. With a laser focus on specific business processes, applications, and system configurations, unit tests emerge as sentinels, diligently validating each pathway against documented specifications. Through clearly defined inputs and anticipated outcomes, they fortify the foundation of software reliability, affirming that every thread of functionality weaves seamlessly into the tapestry of user experience

Integration testing

Integration testing emerges as the conductor orchestrating a harmonious symphony of integrated software components, ensuring they seamlessly coalesce into a unified program. Driven by events, this testing regimen delves into the fundamental outcomes of screens and fields, scrutinizing the holistic performance. While unit tests validate individual components

in isolation, integration tests traverse the terrain where these components converge, verifying that their collective interaction yields correctness and consistency. This specialized endeavor seeks to unearth the nuances and intricacies that surface when components intertwine, illuminating any discrepancies or incongruities that may arise from their amalgamation. With a keen eye on the dynamic interplay between components, integration testing serves as the litmus test for software cohesion, affirming that the sum is indeed greater than its parts.

3.2.2Functional test

Functional tests epitomize the systematic choreographer of software functionality, orchestrating meticulous demonstrations to verify alignment with business and technical imperatives. Guided by the blueprint of requirements, system documentation, and user manuals, this testing regimen meticulously examines each function to ensure its availability and fidelity to specifications. With a surgical precision, functional tests navigate through the intricacies of user interactions, meticulously validating that every promised capability stands ready at the user's fingertips. By meticulously scrutinizing the software against established benchmarks, functional testing serves as the litmus test for user-centricity, affirming that every function not only exists but also performs in accordance with the envisioned user experience.

Functional testing revolves around the meticulous examination of the following facets:

Acceptance of Valid Inputs: Ensuring that delineated categories of valid input are processed accurately and without deviation.

Rejection of Invalid Inputs: Vigilantly detecting and rejecting delineated classes of invalid input to maintain the integrity of the system.

Exercise of Functions: Diligently exercising specified functions to ascertain their operational efficacy and compliance with predefined requirements.

Exploration of Output Classes: Methodically probing various classes of application outputs to validate their correctness and alignment with expected outcomes. Invocation of Systems/Procedures: Actively engaging interfacing systems or procedures to validate seamless interaction and procedural integrity.

In the intricate choreography of functional testing, meticulous organization and preparation serve as the guiding stars, navigating through the labyrinth of requirements, key functions, and specialized test cases. Every aspect is meticulously tailored to ensure a comprehensive coverage that encompasses not only the surface but delves into the depths of business process flows, data fields, and the intricate web of predefined and successive processes. Before the curtain falls on functional testing, an astute eye casts forward, identifying additional tests to fortify the testing landscape while meticulously evaluating the efficacy of current tests. This foresight ensures not only completeness but also optimization, enhancing the value proposition of each test and ultimately fortifying the software's reliability and integrity.

3.2.3 System Test

The testing system works as a monitor of software integrity to ensure that all software components meet the requirements. It ensures good performance by checking the settings to ensure that the requirements are the same through careful analysis. An example of system testing is configuration-focused system integration testing, where each component is carefully tuned to ensure that they are compatible with each other.This testing approach focuses on predefined process connections and integration points, navigating the complex network of connections accurately. Each test serves as a guide, highlighting the path to software reliability, where every integration point demonstrates the system's strength and dependability.

3.2.4 White Box Testing

White Box Testing emerges as the expert approach, wherein the tester possesses deep understanding of the internal mechanisms, structure, and language intricacies of the software. With this privileged insight, White Box Testing ventures into realms inaccessible to its Black Box counterpart, delving deep into the intricate tapestry of code, uncovering intricacies that lie beyond the surface. It serves as a beacon of precision, meticulously scrutinizing areas where the opaque veil of Black Box Testing falls short, ensuring no stone is left unturned in the pursuit of software robustness. Unique in its approach, White Box Testing stands as a testament to the symbiotic relationship between tester and technology, where mastery of the software's essence unveils a realm of possibilities for meticulous validation.

3.2.5 Black Box Testing

Black box testing represents the uncertainty of software analysis, where testers explore unknown areas without understanding the internal workings, architecture, or code of the software instance.As custodians of the unknown, they rely solely on definitive source documents, such as specifications or requirements, as their guiding stars in this nebulous landscape. Within this realm, the software assumes the persona of a black box, shrouded in mystery, impervious to prying eyes. The tester's task is to interact with this enigmatic entity, providing inputs and scrutinizing outputs without delving into its inner workings. It's a dance of exploration, where the tester's intuition and acumen guide them through uncharted waters, unraveling the software's mysteries one test at a time. In this unique realm, the focus shifts from understanding how the software functions to assessing its behavior against predefined expectations, ensuring that even in the absence of visibility, its reliability and functionality remain steadfast.

Validation of code units through unit testing is a pivotal aspect of software development, emphasizing meticulous scrutiny across distinct phases. While often integrated into a combined code and unit test phase, it may also occur independently, accentuating its significance. This methodology underscores the commitment to ensuring reliability and functionality, thereby fortifying the software development lifecycle.

Approach and Strategy for Testing

Manual testing in the field will be carried out alongside the creation of comprehensive functional test cases.

Goals of Testing:

- Ensuring the smooth operation through meticulous validation of field inputs.
- Rigorous validation of link activation to ensure proper page redirection.
- Efficient detection and elimination of delays in entry screens, messages and responses.

Features Under Testing:

- ❖ Scrutiny of entry formats to validate accuracy and adherence to standards.
- ❖ Implementation of measures to prevent duplication of entries.
- ❖ Verification of precise redirection through all designated links.

3.2.6 Integration Testing

Software integration testing is a pivotal phase in software development where different software components are gradually combined on a unified platform. Its purpose is to pinpoint any failures stemming from inconsistencies in their interfaces.Testing regimen serves as the arbiter, meticulously scrutinizing the seamless interaction of components or applications at various levels within the software ecosystem. It's a meticulous dance of validation, ensuring that the intricate web of software elements harmonizes without error, fortifying the foundation of system reliability.

Test Results :

All the above-mentioned test cases were completed successfully without any issues detected.

3.2.7 Acceptance Testing

User Acceptance Testing (UAT) stands as the pivotal bridge between project fruition and user satisfaction, demanding active engagement from end-users. This phase serves as the ultimate litmus test, meticulously gauging whether the system aligns with functional requirements while catering to user needs. With end-users at the helm, UAT embodies collaboration and validation, ensuring that the software not only meets specifications but also resonates with the end user's expectations, thus laying the groundwork for seamless adoption and success.

Test Results:

All the previously mentioned test cases were completed successfully without any defects.

Features

- Unparalleled sensitivity to Alcohol and Ethanol, exceedingconventional benchmarks.
- Intuitive user experience and flawless installation, ensuring effortless integration.
- Flexibility in configuration, allowing precise adjustment of detection parameters for unparalleled adaptability.
- Competitive pricing without sacrificing excellence in quality or functionality.
- Versatile compatibility across an extensive spectrum of alcohol detection projects, addressing a myriad of specialized requirements.

CHAPTER -4
WORKING & DESCRIPTION

4.1 Diagram Overview:

Our system is a portable alcohol detection and alert system designed around the Arduino Nano microcontroller platform. It utilizes various hardware components including the ATmega328 microcontroller, MQ3 Liquor Sensor, GSM Module, GPS Module, and several input and output peripherals. The system is developed to detect alcohol levels in the vicinity and provide real-time alerts to the user or designated authorities. It is equipped with a range of features including push buttons for user interaction, a touch sensor for additional input, an SOS button for emergency situations, and a buzzer for audio alerts. The integration of GSM and GPS modules enables the system to communicate the detected alcohol levels and the current location to predefined contacts or emergency services. The software for the system is developed using the Arduino Compiler and programmed in C language, offering flexibility and ease of development. In this document, we will delve into the hardware and software specifications, as well as the block diagram and functionality of the system to provide a comprehensive understanding of its design and operation.

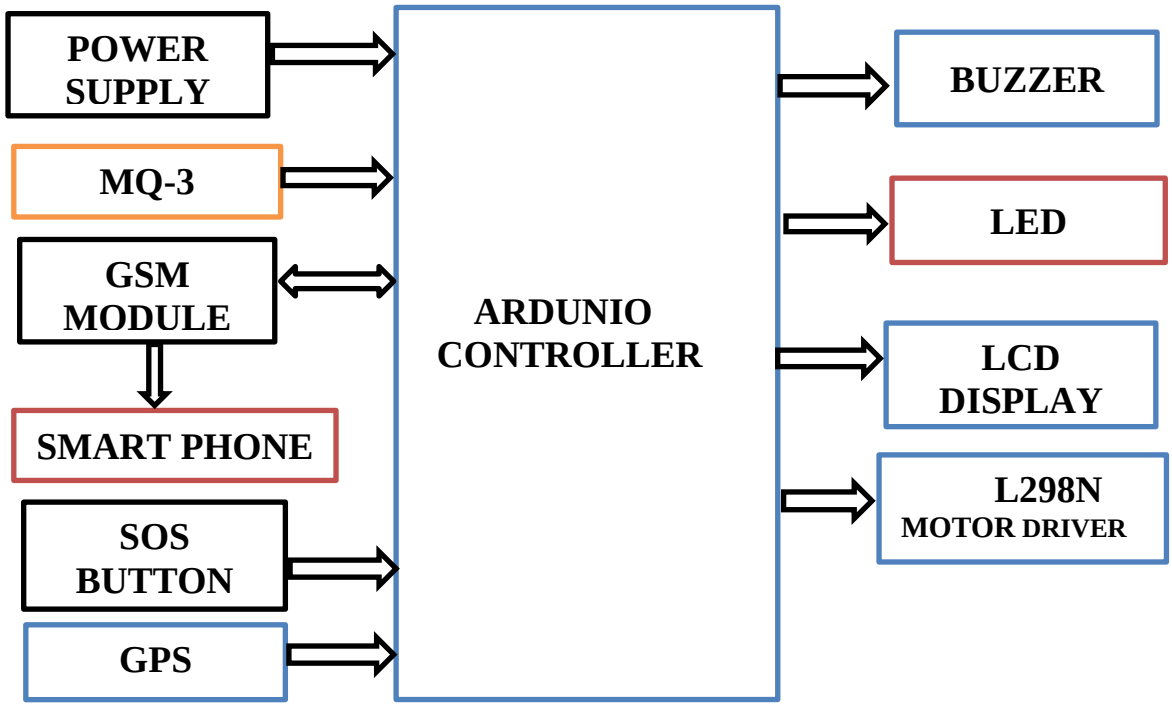


Fig 4.1:Block diagram

Specifications of the system

Hardware Specifications :

- Microcontroller (ATmega 328) Arduino nano smaller scale controller
- MQ3 Liquor Sensor
- Power supply
- Crystal
- Push Buttons
- SOS button
- Touch sensor
- Buzzer
- Bread board
- GSM
- GPS

Software Specifications

- Arduino Compiler
- MC Programming Dialect C

4.2 WORKING METHODOLOGY

To create a breathalyzer, we will need an Arduino, an LED, and an MQ-3 alcohol sensor. Although there are many MQ-X sensors available for different purposes, we chose MQ-3 because it is widely used in alcohol detection. The basic operation of MQ sensors is generally similar: They have a heater that heats the electronic material and measures its resistance. When alcohol vapor comes into contact with the sensor, the resistance changes. The status LED flashes when alcohol vapor is detected. The sensor provides digital and analog outputs. The digital output simply displays a high or low value (1 or 0) to the microcontroller, while the analog output outputs a range of values from 0 to 1023 corresponding to the nearest alcohol. An amplifier can increase the power output to a usable range. Additionally, it incorporates a power meter for accurate adjustments. The sensor's sensitivity can be modified through the potentiometer located on the module.

The overall system is illustrated by a block diagram. Initially, the piezoelectric detector identifies the commencement of the boiler operation and sends a signal to the microcontroller unit (MCU).Latitude and longitude coordinates are determined using GPS technology and transmitted to the field team via GSM communication. The recipient's phone number is pre-programmed into the EEPROM for effective communication. A key to avoid false alarms is also provided. It is often difficult for family members and emergency responders to receive timely information about these situations. Delaying this assistance could be significant for the person involved in the situation. Our design aims to help save victims by quickly alerting to this problem, enabling nature to save lives, by automatically detecting and warning accidents using GSM modems. We included a collision detection unit equipped with vehicle-mounted vibration sensors in our design. When vibration caused by the collision is detected, the sensor sends a signal to the central Arduino. Arduino immediately sends this signal to the GSM modem and starts the notification process. This button allows the driver to report minor accidents, such as hitting a wall while parking. Pressing the reset button will prompt the Arduino to stop sending SMS notifications. However, if a serious accident occurs and the driver cannot press the reset button, the system will automatically send a warning message. GSM modems are used to send messages to family members and emergency responders. Additionally, a buzzer has been placed in the system to give an audible warning in case of an accident. Thanks to these features, our goal is to save lives by providing rapid assistance to victims.

5.4 Advantages

- A robust solution to mitigate the hazards of intoxicated driving, prioritizing accident prevention.
- Streamlined and effective alcohol content testing, ensuring ease and efficiency.
- Rapid and precise outcome delivery, prioritizing prompt decision-making.
- Tailored for law enforcement assistance, equipped with automatic safety mechanisms for vehicles, bolstering road safety comprehensively.

- Utilizes advanced technology to isolate both GSM and GPM signals, ensuring uninterrupted functionality.
- Proactively alerts law enforcement and medical response units in the event of accidents, augmenting emergency response capabilities.
- Boasts a minimalist yet sophisticated design, facilitating seamless integration with various systems for enhanced functionality

CHAPTER -5

RESULTS

5.1 Alcohol Detection Concentration Levels

5.1.1 At Level 1

- When the alcohol percentage reaches 33% (level 1), drivers may feel a sense of control, but their vision may be impaired. If a driver attempts to operate the vehicle at this level, the system will detect the presence of alcohol and automatically shut down the engine.
- Moreover, a notification message will be sent to the designated mobile device, informing them of the detected alcohol level.

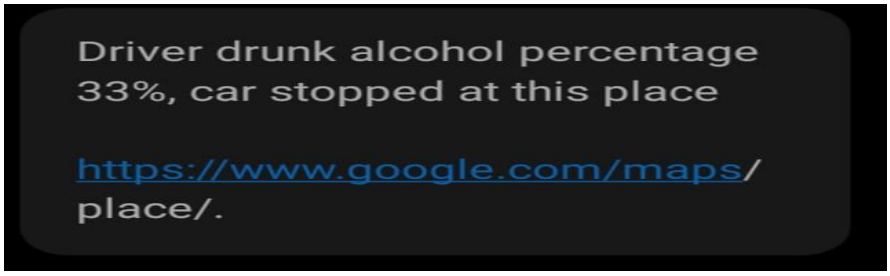


Fig 5.1: Results at Level 1

5.1.2 At Level 2

- When the alcohol percentage reaches 42% (level 2), drivers may experience a sense of relaxation and decreased self-awareness. If a driver attempts to operate the vehicle at this level, the system will detect the presence of alcohol and automatically shut down the engine.
- Furthermore, a notification message will be sent to the designated mobile device, alerting them of the detected alcohol level.

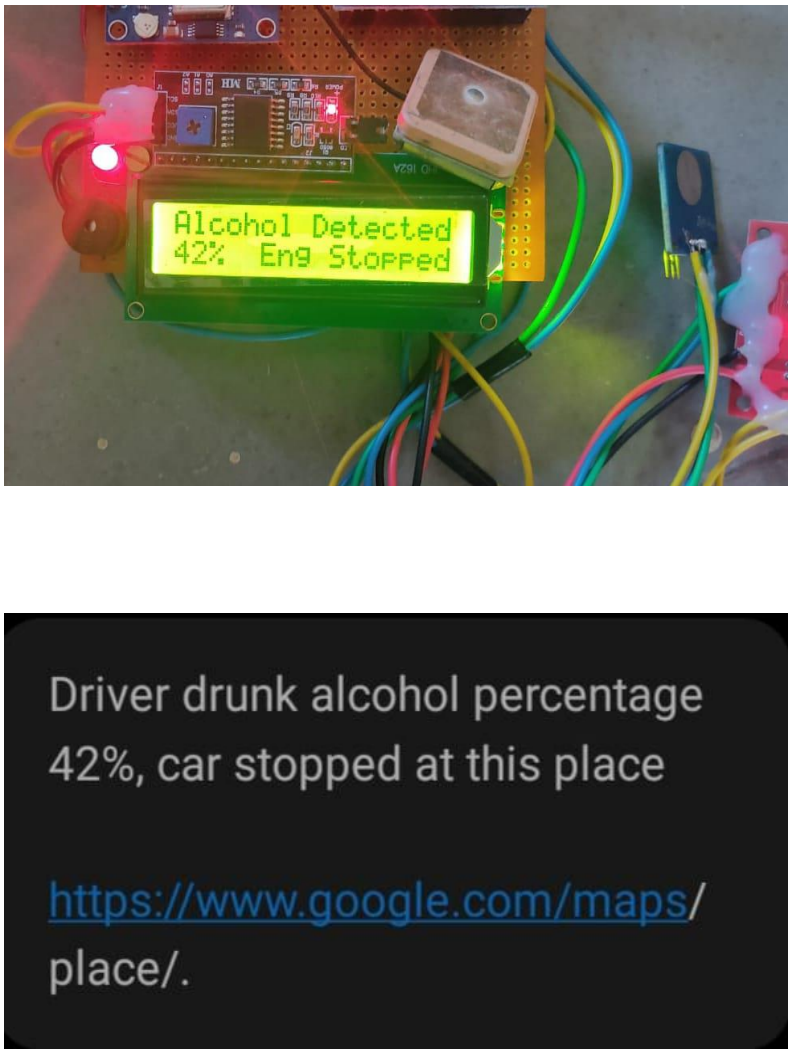


Fig 5.2.: Results at Level 2

5.1.3At Level 3

- When the alcohol percentage reaches 63% (level 3), drivers may experience difficulty with balance, coordination, and vision impairment. At this level, if a driver attempts to operate the vehicle, the system will detect the presence of alcohol and automatically shut down the engine.
- Additionally, a notification message will be sent to the designated mobile device, informing them of the detected alcohol level.

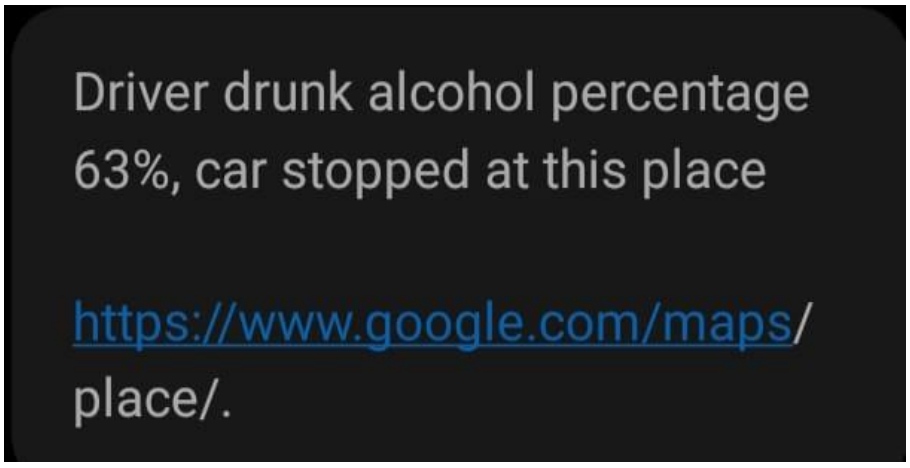
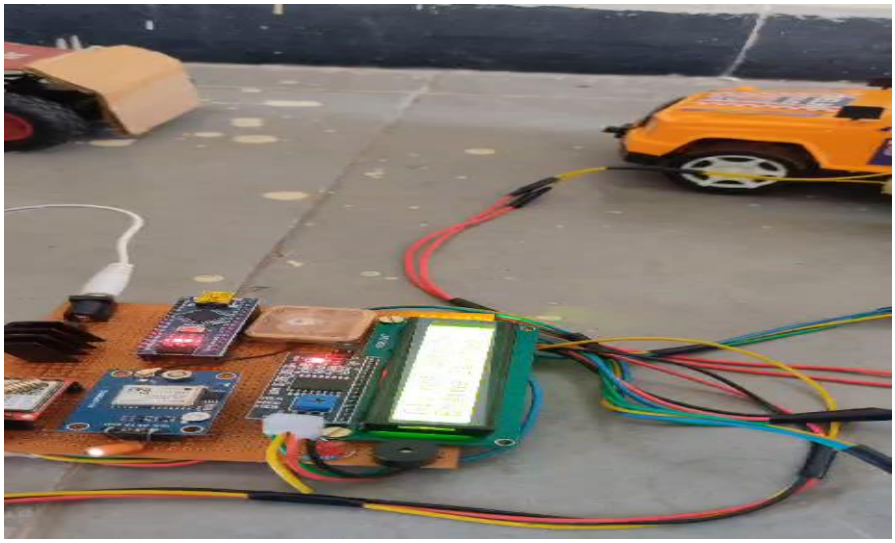


Fig 5.3: Results at Level 3

Accident Detection

- When a vehicle is involved in an accident, the SOS button is triggered, sending a signal to the Arduino microcontroller, which subsequently initiates the process to stop the car.
- The microcontroller then utilizes the GSM modem to transmit an alert message, along with the current location, to a designated mobile device..



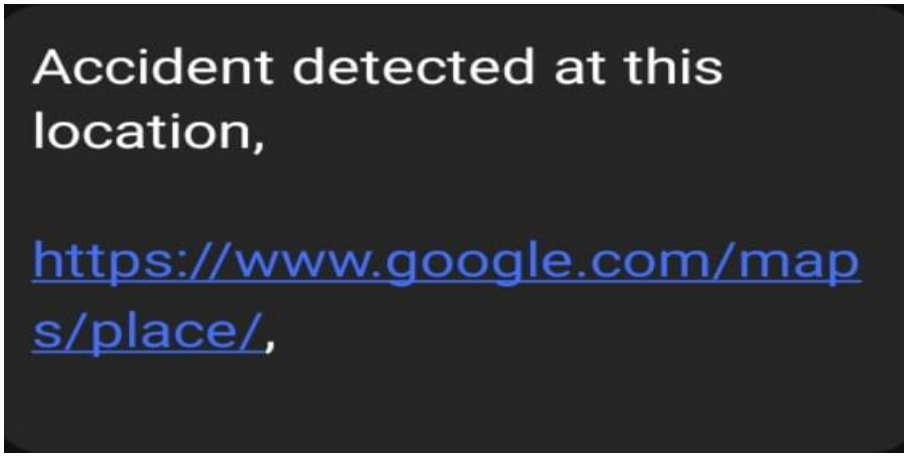


Fig 5.4:Accident detection

CHAPTER - 6
CONCLUSION AND FUTURE SCOPE

6.1 Conclusions

Our innovative solution revolves around an Arduino-based intelligent system tailored for alcohol detection in vehicles, boasting a sensor with an impressive 2-meter sensitivity range. Its compact size ensures seamless integration into any vehicle, offering discretion and reliability. As societal focus on vehicle safety intensifies, our solution heralds a new era of public acceptance towards advanced safety measures, particularly in combating alcohol-related accidents. Looking ahead, the system holds vast potential to mitigate accidents caused by alcohol consumption, representing a significant stride towards enhancing human safety. Moreover, it promises to revolutionize the automobile industry by reducing alcohol-induced accidents, thereby fostering a safer driving environment. Notably, the system's capabilities extend beyond alcohol detection, as it can also identify accidents and promptly relay distress signals via GSM modules. The integration of a Google Map module further enhances its utility by providing precise accident location details, ensuring swift emergency response. With its multifaceted functionalities and emphasis on safety, our system stands poised to reshape the automotive landscape, embodying a commitment to innovation and human well-being.

6.2 Future scope

Our system can integrate a wireless webcam to provide real-time visual assistance to drivers, enhancing situational awareness. Additionally, an automated braking system can be implemented, triggered by the vibration sensor in the event of an accident, mitigating collision impact. This proactive approach addresses driver loss of control, offering swift intervention to prevent severe accidents. Furthermore, the system's versatility extends beyond vehicular safety, finding application in diverse sectors like fleet management, food services, and traffic enforcement, showcasing its adaptability and efficacy in enhancing overall safety and efficiency.

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(12) PATENT APPLICATION PUBLICATION
(19) INDIA
(22) Date of filing of Application :10/04/2024

(21) Application No.202441029066 A
(43) Publication Date : 19/04/2024

(54) Title of the invention : GSM AND GPS BASED ALCOHOL SENSING AND ACCIDENT ALERTING USING ARDUINO

(51) International classification :B60K0028060000, G07C0005080000, G08G0001010000, E01F0015040000, G07C0005000000
(86) International Application No :NA
Filing Date :NA
(87) International Publication No : NA
(61) Patent of Addition to Application Number :NA
Filing Date :NA
(62) Divisional to Application Number :NA
Filing Date :NA

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(57) Abstract :
Road safety is a crucial concern in today's world, with accidents and incidents of drunk driving leadlilg to numerous fatalities and injures. To address these challenges, this project aims to develop and implement an integrated system that combines accident detection and alcohol locking unlocking features for vehicles. The system will utilize advanced technoldgy and sensors to enhance driver safety und promote responsible behaviour on the road, The current scenario shows that the most of the road accidents are occurring due to drunk-driving, The drivers who drink alcohol are not in an stable condition and so, rash driving occurs on highway which can be risky to the lives Of the people on road, The proposed system is a comprehensive n innovative approach to enhancing road safety by integrating alcohol detection technology with vehicle Control systems and accident detection mechanisms, This system Rims to prevent individuals under the influence of alcohol from operating vehicles, thus reducing the risk of accidents caused by impaired driving. Additionally, it incorporates advanced accident detection features enhance overall road safety. The project aims to design and implement an ignition interlock system (iis) equipped with an advanced breathalyzer that accurately measures the driver's blood alcohol concentration (BAC) before granting access to the vehicle's igntion.ln parallel, the system Includes an accident detection module that utilizes combination of sensors and algorithms to monitor the vehicle’s speed, acceleration, various other factors indicative or a collision .Therefore, loss of life and property is avoided. Alcohol sensor is installed on the steering of the car, with the end goal that when the level or liquor crosses a reasonable farthest point, where the start of vehicle will kill and the motor will stop.

No. of Pages : 8 No. of Claims : 6

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Certificate of Plagiarism Check for Thesis

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Course of Study	**IV B.Tech II Sem. (R20) – May 2024**
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Acceptable Maximum Limit	30%
Submitted By	principal.9@jntua.ac.in
Paper Title	Design & implementation of engine starting based on alcohol consumption level and accident alerting system
Similarity	5%
Paper ID	1698501
Submission Date	2024-04-25 21:16:17

Note: Less than 30% Similarity index – Permitted to Submit the Thesis

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APPENDIX

CODE FOR DESIGN AND IMPLEMENTATION OF ENGINE STARTING BASED ON ALCOHOL CONSUMPTION LEVEL AND ACCIDENT ALERTING SYSTEM

```
 #include <SoftwareSerial.h>


#include <TinyGPS++.h>          //Packages for DHT11 and Neo6m GPS module

int vibr_Pin =7;     // Connect output of Impact Sensor here
int valor_limit =600;
float valor_alcohol;


SoftwareSerial mySerial(9, 10);  // initializing pwm pins for serial communication between Arduino and GSM Module. Put tx of GSM module to pin 9 ,rx of GSM module to pin 10 of arduino
SoftwareSerial ss(5, 3);         // initializing pwm pins for serial communication between Arduino and GPS Module
TinyGPSPlus gps;
void setup() {
  mySerial.begin(9600);   // Baud rate of GSM Module
  delay(100);
  ss.begin(9600);  // Baud rate for GPS
  delay(100);
  pinMode(12,INPUT);  // Connect a Panic button/pushbutton
  pinMode(13,OUTPUT); // Led Indicator (optional)
  pinMode(8,OUTPUT);  //buzzer attached which is activated when Alcohol Level becomes more than threshold
  Serial.println("AT+CNMI=2,2,0,0,0"); // For GSM Module to receive messages
  delay(1000);
}

void loop() {
    while (ss.available() > 0){
    gps.encode(ss.read());
    if (gps.location.isUpdated()){

int pushbutton=digitalRead(12);
digitalWrite(8,LOW);
```

```
if(pushbutton==HIGH){              // Checks if panic button is pressed or
not
digitalWrite(13,LOW);
SendMessage1();
delay(15000);
}
else if(pushbutton==LOW)
{digitalWrite(13,HIGH);

    if (mySerial.available()>0){
    char text=mySerial.read();
    if (text=='!'){digitalWrite(13,LOW);SendMessage3();delay(15000);}}
// For Cabin Monitoring, Define a message to be sent to the GSM in car,
for eg. "Hello!"

    int val;
    val=digitalRead(vibr_Pin);
    if(val==1)
    {
     digitalWrite(13,LOW);
     SendMessage2();
     delay(15000);
    }

    valor_alcohol=analogRead(A5);
    if(valor_alcohol > valor_limit){
    digitalWrite(8,HIGH);
    digitalWrite(13,LOW);
    SendMessage4();delay(15000);
    }

    }


}
   }
}

 void SendMessage1()                          // Panic Button Message Loop
{

  mySerial.println("AT+CMGF=1");
  delay(1000);
  mySerial.println("AT+CMGS=\"+9193925 80061\"\r");     // insert the
number where the alert should be sent
  delay(1000);
```

```
  mySerial.println("Passenger Safety Alert , Panic Button is Pressed");
  mySerial.println("Latitude and Longitude :
");delay(50);Serial.print(gps.location.lat(), 6);
  delay(100);Serial.print(",");delay(50);
  mySerial.println(gps.location.lng(), 6);
  delay(100);

mySerial.println("https://www.google.co.in/maps?source=tldsi&hl=en");
  mySerial.println((char)26);
  delay(1000);
}
 void SendMessage2()                          // Accident Alert Loop
{

  mySerial.println("AT+CMGF=1");
  delay(1000);
  mySerial.println("AT+CMGS=\"+9193925 80061\"\r");
  delay(1000);
  mySerial.println("Car Accident Detected");
  mySerial.println("Engine off");
  delay(100);
  mySerial.println((char)26);
  delay(1000);
 }
 void SendMessage3()                           // Cabin Environment
Reading and      Sending
{

  mySerial.println("AT+CMGF=1");
  delay(1000);
  mySerial.println("AT+CMGS=\"+9193925 80061\"\r");
  delay(1000);
  DHT.read11(A0);
  delay(1000);
  mySerial.println("Hi ");delay(50);
  mySerial.println("Alcohol level in air
:");delay(50);Serial.println(analogRead(A5));delay(50);
  mySerial.println((char)26);
  delay(1000);
}
```

```
 void SendMessage4()                          // Drunk Driver Alert
{

  mySerial.println("AT+CMGF=1");
  delay(1000);
  mySerial.println("AT+CMGS=\"+9193925 80061\"\r");
  delay(1000);
  mySerial.println("Drunk Driver Alert");
  delay(100);
  mySerial.println((char)26);
  delay(1000);
}
```