VISVESVARAYA TECHNOLOGICAL UNIVERSITY

JNANA SANGAMA, BELAGAVI, KARNATAKA-590018

INTERNSHIP REPORT

on

"EMBEDDED ELECTRONIC CIRCUITS"

Submitted by

MOHAMMED MUSAIB **4DM21EC023**

Under the guidance of

Mr. HARSH C J B.E., M.Tech

Assistant Professor, Dept. of ECE

In the partial fulfilment of the requirements for the award of the degree of

BACHELOR OF ENGINEERING

In

ELECTRONICS AND COMMUNICATION ENGINEERING

Carried out at: Yenepoya institute of technology, Moodbidri

Carried from: 11-10-2022 to 29-10-2022

Interact Innovate Inspire

YENEPOYA INSTITUTE OF TECHNOLOGY

N.H. 13, THODAR, MOODBIDRI-574225, MANGALORE, D.K

2022-2023

YENEPOYA INSTITUTE OF TECHNOLOGY

THODAR, MIJAR POST, MOODBIDRI-574225

(Affiliated to Visvesvaraya Technological University, Belagavi)

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

YENEPOYA
INSTITUTE OF TECHNOLOGY

CERTIFICATE

This is to certify that the Internship/Professional Practice Report entitled **"EMBEDDED ELECTRONIC CIRCUITS"** is an authentic record of the work carried out by **MOHAMMED MUSAIB(4DM21EC023)** student of 4th semester in partial fulfilment of requirements for the award of Bachelor's Degree in **Electronics and Communication Engineering** prescribed by **Visvesvaraya Technological University, Belagavi** during the year**2022-23.** It is certified that all corrections/suggestions indicated for assessment have been incorporated in the report. The internship report has been approved as it satisfies the academic requirements in respect ofinternship work prescribed by the University.

Mr. Harsha C J	**Ms. Pavithra S. G**	**Dr Prasanna Kumar C**
(Internal Guide)	(Internship Coordinator)	(Head of the Department)

INVIHUB TECHNOSOLUTIONS PVT. LTD.

2nd November 2022

TO WHOM IT MAY CONCERN

This is to certify that ***MOHAMMED MUSAIB (4DM21EC023)***, a student of **Electronics and Communication Engineering, Yenepoya Institute of Technology, Moodbidri** has Successfully completed **Internship** (From 11th October 2022 to 29th October 2022) on **"Embedded Electronic Circuits"** at **Invihub Technosolutions Pvt. Ltd., Bengaluru.**

During his Internship period **MOHAMMED MUSAIB** displayed Professional traits and managed to complete all assigned tasks and was found to be punctual, hardworking and inquisitive.

For, Invihub Technosolutions Pvt. Ltd.

INVIHUB TECHNOSOLUTIONS PVT. LTD.

Mr. Shashank M Gowda
(Director)

+91 70221 49521, +91 90365 24934
invihub@gmail.com

#03, Sy No. 2/4, Remco BHEL Layout, Pattanagere
Rajarajeshwari Nagar, Bengaluru, Karnataka- 560098

DECLARATION

I, **MOHAMMED MUSAIB (4DM21EC023)** student of 4th semester Bachelor of Engineering in **Electronics and Communication Engineering, Yenepoya Institute of Technology Moodbidri,** hereby declared that the internship work entitled **“EMBEDDED ELECTRONIC CIRCUITS”** submitted to **Visvesvaraya Technological University, Belagavi** during the academic year 2022-23 is record of work done by me during my internship under the Guidance of **Mr.Harsha C J**, Assistant Professor, Dep. of ECE, YIT.This work is submitted in partial fulfillment of requirements for the award of degree of Bachelor of Engineering.

MOHAMMED MUSAIB
(4DM21EC023)

ACKNOWLEDGEMENT

The successful completion of any work would be incomplete without mentioning the people who made it possible. I extend my gratitude to all the people who supported me duringmy internship.

I thank the Invihub Technosolutions Private Limited Bangalore for providing internshipand to **Dr. Shashank M Gowda**, Director, Invihub Technosolutions Private Limited, for the guidance during internship.

It is my great fortune that I have got an opportunity to carry out this Internship work under the guidance of **Mr. Harsha C J,** Assistant Professor**,** Department of Electronics and Communication Engineering, I express my sincere thanks for his Constant Support, unparalleled guidance and limitless encouragement.

I am also thankful to our Internship Coordinator, **Ms. Pavithra S.G,** Assistant Professor, Department of Electronics and Communication Engineering for her support and concern.

I wish to convey my gratitude to **Dr. Prasanna Kumar C,** Head of the Department of Electronics and Communication Engineering for his support and encouragement.

I am indebted to the Principal, **Dr. R. G. D'Souza** and the Management of Yenepoya Institute of Technology, Moodbidri for providing an environment with all facilities that helpedme to complete the internship.

I take this opportunity to convey my gratitude to all the teaching and non-teaching staffof the Department of Electronics and Communication Engineering for their help.

MOHAMMED MUSAIB
(4DM21EC023)

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CHAPTER 1

COMPANY PROFILE

Name	Invihub Technosolutions Private Limited
Address	#125 ward no. 01,by rapatana,1st Cross ChekkereGate,Malur post, Chanapattana,Bengalure Karnataka -562160,India
Contact Number	7022149521
Website	https://invihub.com
Type of company	Private
Company logo	
Vision	Applying advanced technology in development of the products and providing service mainly in the field of3D printing, automation and IOT.
Mission	To achieve the vision, we are on a mission to provide customized solutions offer in unique alternatives to matchthe application requirements ensuring the total satisfactionof our clients. We believe in providing services optimizedwith true value to our clients which has enabled us to growrapidly in the industry.

ABOUT THE COMPANY

INVIHUB TECHNOSOLUTIONS PRIVATE LIMITED is a technology start- up recognized by Government of India and Ministry of Micro, Small and Medium Enterprises (MSME), which focus on the most trending technologies. The company is located at L-06, Yenepoya Institute of Technology, Moodbidri,Mangalore.

HISTORY

Invihub Technosolutions Private Limited is a private incorporated on 28 September 2018. It is classified as non- govt company and is registered at Registrar ofCompanies, Bengaluru. The company has authorized share capital of Rs. 10,00,000 and its paid up capital is Rs. 1,00,000. Invihub Technosolutions Private Limited's Corporate Identification Number is (CIN) U74999KA201 8PTC117017 and its registration number is 117017. The company's registered address is #125 Ward No. 01, by rapatana, 1st Cross Chekkere Gate, Malur Post, Channapatana, Bengaluru, Bengaluru Karnataka-562160, India.The company is working on projects of IOT based automation, PCB Design, Product development, and also it is providing 3D printing services, 3D designing services, prototyping services, reverse engineering, 3D printers manufacturing, personalized gift stop, 3D modelling, customized 3D printed objects fordecoration, educational prototypes, architectural models, 3D printing filaments and medical prototypes. The company also focuses on providing technology workshops andcertification courses.

CHAPTER 2

TASK PERFORMED

SIMULATION USING TINKERCAD

INTRODUCTION

Tinker CAD is a free online service for creating basic 3D shapes and developing digital prototypes of electronic components. These prototypes include basic circuits with LED lights, buzzers, switches, and even light sensors.

TINKERCAD TOOLFLOW

• CREATING THE ACCOUNT

Go over to https://tinkercad.com and create a free account. Tinker cad integrates with Social Media services like Facebook. It also Integrates with services like Microsoft and Google. Students can use their district accounts to log into Tinker cad if your district uses active directory accounts with Googleor Microsoft.

Fig 2.1 Basic Components

A circuit project is created and opened. A circuit project includes a variety of electronic components. As shown in fig 2.1

Electronic components include LED's, buttons, resistors, and a power source. The componentswe can use are displayed in a panel at the bottom of the page.

PROJECTS:

PROJECT 1 : SIMPLE SERIES CIRCUIT

In a simple series circuit simulated in Tinkercad, components are connected in a single path, one after the other. The same current flows through each component. When the circuit is powered on, the current starts at the positive terminal of the power source, flows through each component, and returns to the negative terminal. This creates a loop, allowing current to flow through all components in sequence. If any component fails or is disconnected, the circuit becomes open, and the flow of current is interrupted. As shown in fig 2.2.

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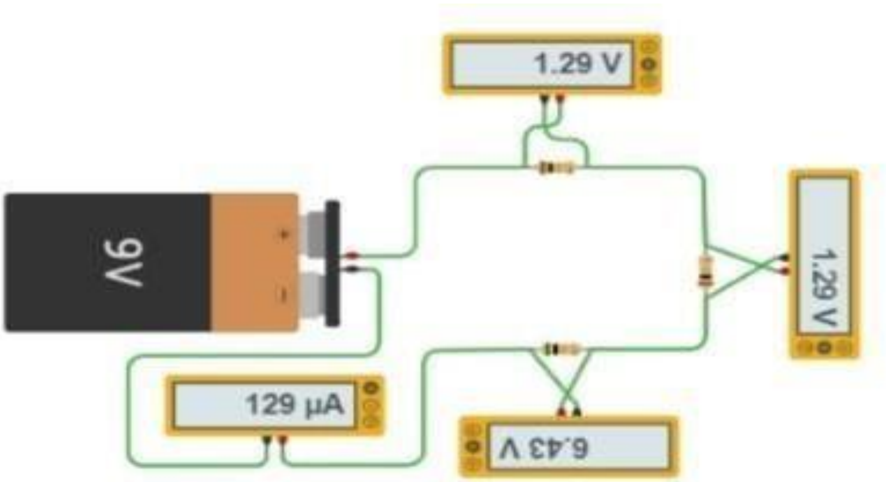

Fig 2.2 Simple Series Circuit

PROJECT 2 : SIMPLE PARALLEL CIRCUIT

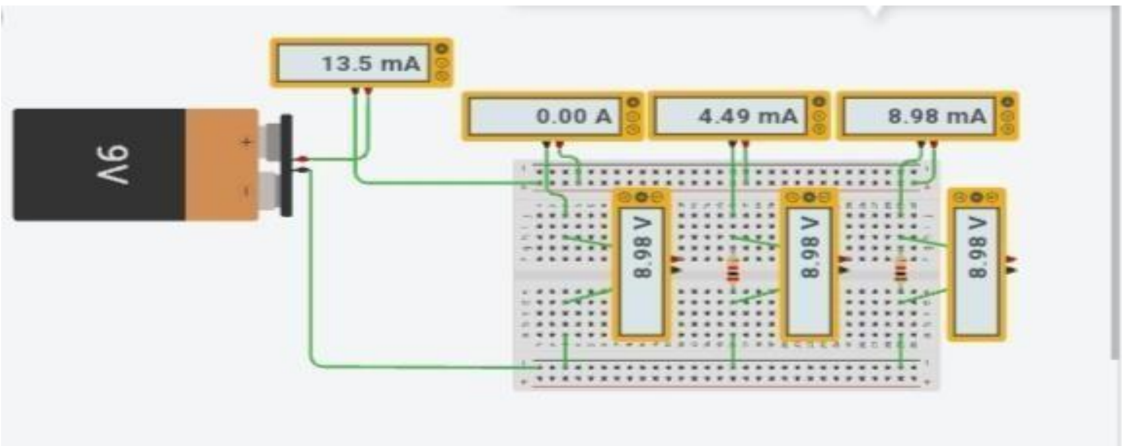

Fig 2.3 Simple Parallel Circuits

In a simple parallel circuit As shown in fig 2.3 in Tinkercad, components are connected in such a way that each component has its own separate path to the power source. This allows them to operate independently of each other. Here's how it works:

Voltage: All components in a parallel circuit share the same voltage across their terminals. This means that the voltage across each component is equal to the voltage of the power source.

Current: The total current entering the parallel circuit equals the sum of the currents through each component. Each component "draws" the current it needs based on its resistance (Ohm's law: I = V/R). Components with lower resistance draw more current.

Independence: Components connected in parallel are independent of each other. If onecomponent fails or is removed, it doesn't affect the operation of the others.

Brightness: If you're dealing with light bulbs, LEDs, or other luminous components, they'll shine with approximately the same brightness because they're receiving the same voltage.

PROJECT 3 : OR GATE USING BJT

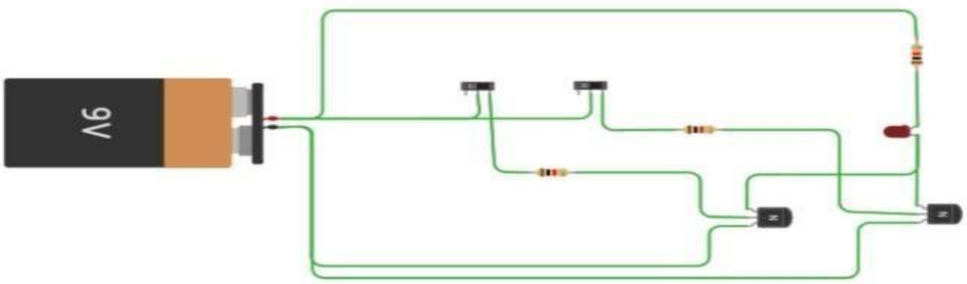

Fig 2.4 OR Gate using BJT

When either input A or input B is high (logic level 1), the respective BJT's base-emitter junction becomes forward-biased.This allows current to flow from the collector to the emitter, effectively turning ON the transistor.The output of the OR gate can be taken from the junction of the collectors of the two BJTs. If either transistor is ON, the output will be pulled down to a logic low (0). Only when both input A and input B are low, both transistors will be OFF, and the output will be pulled up to logic high (1).Remember to use appropriate resistor values to set the biasing and ensure proper transistor operation.

ARDUINO IDE

INTRODUCTION

The Arduino IDE (Integrated Development Environment) is a software used for programming and uploading code to Arduino boards. You can download the official Arduino IDE from the Arduino website or explore alternative IDEs like PlatformIO, which offer additional features and compatibility with various microcontrollers.

OPERATION

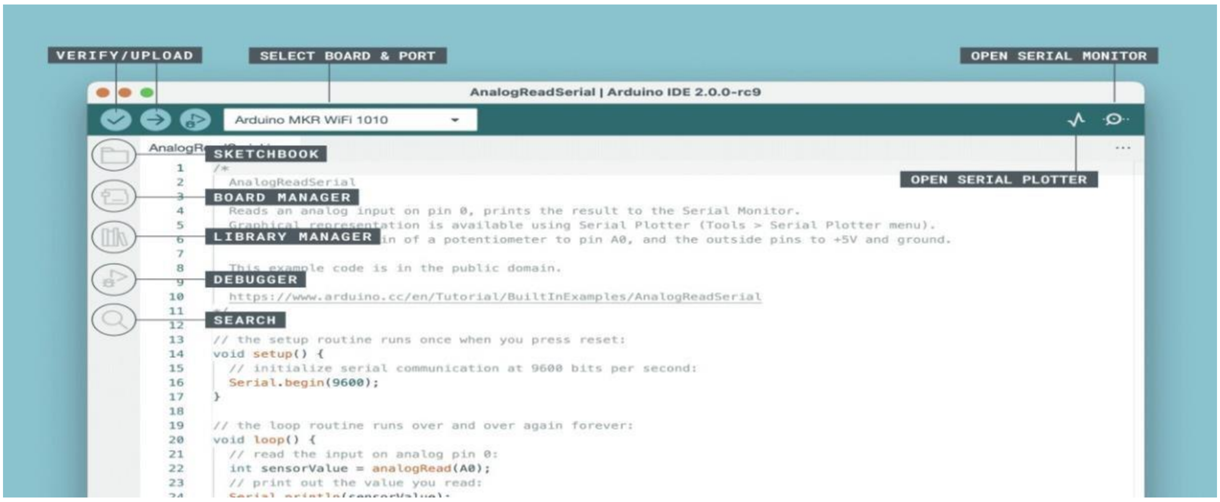

Fig: 2.5 Parts of the Arduino IDE

It provides a user-friendly interface for writing, compiling, and uploading code to Arduino microcontrollers. You write your code in the Arduino IDE using a simplified version of the C++ programming language. The IDE provides features such as syntax highlighting, code completion, and error checking to assist in coding.Once we written your code, you can compile it within the IDE to ensure it's free of syntax errors. If thereare no issues, the code is converted into machine code that the Arduino can understand.The compiled code is stored as a binary file (with a .hex extension).The next step is to upload the compiled code to the Arduino board. You select the appropriate board type and serial port from the IDE's menus. The IDE uses a bootloader pre-installed on the Arduino to communicate with the board and upload the binary code.The Arduino IDE also comes with a built-in serial monitor that allows you to communicate with your

Arduino board in real-time, sending and receiving data through the USB connection. Overall, the Arduino IDE simplifies the process of programming Arduino boards, making it accessible even to those with limited coding experience. As shown in fig 2.5.

TASK PERFORMED

All the task performed during the internship program were based on embedded electronic systemsmain containing Arduino UNO, sensors other electronic drive modules

ARDUINO UNO BOARD

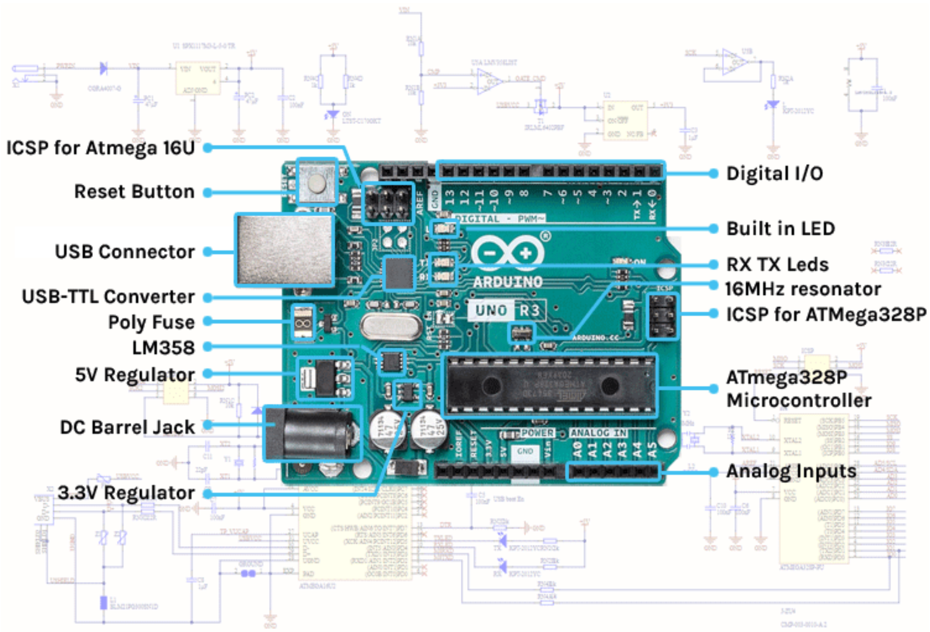

Fig 2.6 Arduino UNO board

The Arduino Uno is a popular microcontroller board that serves as the foundation for countless electronic projects. At its core, the Arduino Uno is built around the ATmega328P microcontroller chip, which is responsible for executing the instructions provided by the code written by the user.The Uno is designed to be user-friendly, makingit suitable for beginners and experienced enthusiasts alike. It features a variety of input and output pins, each serving a specific purpose. These pins can be used to connect sensors, actuators, displays, and other electronic components. The digital pins (14 in total) can be set as either input or output, allowing you to read digital signals or control devices like LEDs. The analog pins (6 in total) can read analog voltage levels from sensors, enabling the Uno to interact with the physical world in a more nuanced

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manner.Communication is a crucial aspect of the Arduino Uno's functionality. It has a built-in USB interface that enables it to connect to a computer. This connection serves two primary purposes: uploading code to the microcontroller and facilitating serial communication for debugging and data exchange. The Arduino IDE (Integrated Development Environment) is a user-friendly software that allows you to write, compile,and upload code to the Uno.Programming the Arduino Uno involves writing code in C/C++, using the Arduino-specific functions and libraries. These libraries simplify tasks like reading sensors, controlling motors, and communicating with external devices. Whenyou upload your code, the Arduino IDE compiles it into machine code that the ATmega328P chip can execute. The Uno's microcontroller operates based on a clock signal, which determines the speed at which instructions are processed. The clock speedis typically 16 MHz, allowing for relatively fast execution of tasks. As shown in fig 2.6.

Features of the Arduino Uno

Microcontroller: ATmega328P

Operating Voltage: 5V

Input Voltage: 7-12V (recommended) via power jack or 5V USB

Digital I/O Pins: 14 (of which 6 provide PWM output)

Analog Input Pins: 6

DC Current per I/O Pin: 20 mA

DC Current for 3.3V Pin: 50 mA

Flash Memory: 32 KB (0.5 KB used by bootloader)

SRAM: 2 KB

EEPROM: 1 KB

Clock Speed: 16 MHz

USB Connection: Type

SENSORS:

Ultrasonic sensor:

Fig 2.7 Ultrasonic Sensor

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An ultrasonic sensor is a device that uses high-frequency sound waves (ultrasound) to detect the distance or presence of an object.Ultrasonic sensors typically have two main pins: one forsending an ultrasonic pulse (trigger) and another for receiving the reflected pulse (echo).

The trigger pin is used to initiate the pulse, and the echo pin measures the time it takes for thepulse to bounce back. It emits a sound wave and measures the time it takes for the wave to bounce back after h It typically consists of a transmitter and a receiver. The transmitter emits short bursts of ultrasonic waves, which bounce off objects and return to the receiver. Ultrasonicsensors are widely used in various applications, such as object detection, distance measurement,obstacle avoidance in robotics, parking assistance in cars, and even medical imaging. They areeffective in environments where other sensors like infrared might be less reliable due to factorslike ambient light or surface reflectivity. As shown in fig 2.7.

features and specification

1. Operating Voltage: 5V
2. Detection Range: 2cm to 400cm
3. Operating Frequency: 40 kHz
4. Output Signal: Digital (High/Low)
5. Trigger Pulse Width: 10 microseconds
6. Trigger Signal: 10 microseconds TTL pulse
7. Minimum Object Size Detectable: ~2cm
8. Beam Angle: 15 degrees
9. Accuracy: ±1% of the measured distance
10. Operating Temperature: -10°C to +70°C
11. Power Consumption: 15mA
12. Dimensions: Typically small and compact

IR Sensor:

Fig 2.8 IR Sensor

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As shown in fig 2.8 An IR (Infrared) sensor is a module that detects infrared radiation andcan be used to sense objects, obstacles, temperature changes, or motion. The basic principlebehind how an IR sensor works with Arduino involves emitting infrared light and thendetecting the reflected or emitted light to gather information about the surroundingenvironment. Here's a general explanation of how an IR sensor works with Arduino:

Emitter and Receiver: An IR sensor module typically consists of an infrared emitter(usually an infrared LED) and an infrared receiver (such as a photodiode or a phototransistor)placed side by side. The emitter emits infrared light, which is not visible to the human eye.

Emission of Infrared Light: The emitter continuously emits bursts of infrared light.This emitted light is of a specific wavelength and intensity.

Interaction with Objects: When an object comes into the sensor's field of view, someof the emitted infrared light may be reflected by the object back toward the sensor. The amountof reflected light depends on the object's surface properties and distance from the sensor.

Detection of Reflected Light: The infrared receiver detects the intensity of the reflectedinfrared light. If there is an object in front of the sensor, the receiver's sensitivity to infrared radiation will change due to the modulation caused by the reflected light.

Analog or Digital Output: Depending on the type of IR sensor module, the output canbe either analog or digital. Analog Output: Some IR sensors provide an analog voltage output that changes proportionally with the intensity of the detected infrared light. This analog signal can be read by an analog input pin on the Arduino, and the Arduino can then convert it to a value that represents the distance or level of detection. Digital Output: Other IR sensors offer a digital output that switches from a low (0) to a high (1) state when a threshold of reflected infrared light is detected. This can be directly read by a digital input pin on the Arduino.

Arduino Interaction: In your Arduino code, you'll read the sensor's output using the appropriate input pin (analog or digital). You can then apply conditional statements to determine the presence of an object, calculate distances, or respond to changes in temperatureor motion, depending on the specific application.IR sensors in Arduino projects can be used forvarious purposes, such as obstacle avoidance for robots, proximity detection, temperature measurement, motion-activated lighting.

features and specification

1. Operating Voltage: 3.3V - 5V
2. Detection Range: Varies based on the model (e.g., short-range, medium-range)
3. Detection Angle: Typically around 90-120 degrees
4. Output Signal: Digital (High/Low) or Analog Voltage
5. Sensing Method: Reflective or Obstacle Detection
6. Response Time: Typically in the range of a few milliseconds
7. Operating Wavelength: Around 850nm - 940nm (Infrared spectrum)
8. Material: Encased in a plastic housing with an IR-transparent cover
9. Dimensions: Varies based on the model; can be compact
10. Operating Temperature: Varies, usually around -20°C to +70°C
11. Current Consumption: Depends on the model, usually around a few mA
12. Mounting: Often provided with screw holes for easy installation
13. Output Type: Can be NPN (Normally Open) or PNP (Normally Closed) for digital models
14. Sensitivity Adjustment: Some models come with adjustable sensitivity
15. Applications: Proximity sensing, object detection, line following, etc.

LDR Sensor:

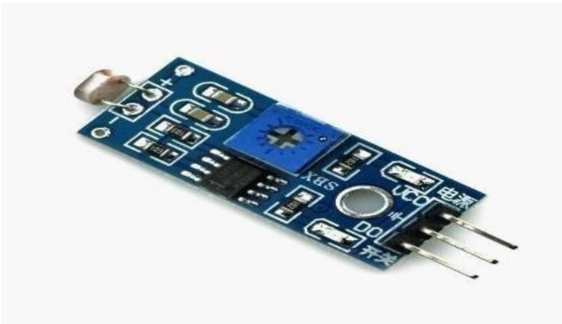

Fig 2.9 LDR Sensor

As shown in fig 2.9.An LDR (Light Dependent Resistor) sensor is a type of electronic component that changes its resistance based on the intensity of light falling on it. It's also knownas a photoresistor. When exposed to light, the LDR's resistance decreases, and when in darkness, its resistance increases. The sensor works by utilizing the photoconductive propertiesof certain materials. When photons (particles of light) strike the surface of the LDR, they provide energy to the semiconductor material, allowing more charge carriers to flow and lowering the resistance. This change in resistance can then be measured and used to detect thepresence or absence of light. LDR sensors are commonly used in applications such as automaticlighting systems, outdoor light control, and light meters. They provide a simple and cost- effective way to sense changes in light levels. LDR (Light Dependent Resistor) sensors are widely used in various applications to detect ambient light levels. They are employed in automatic lighting systems, outdoor lighting control, photography equipment, and smart devices to adjust screen brightness. LDR sensors offer cost-effective and energy-efficient solutions for light sensing needs.

Features:

1. **Light Sensitivity:** Responds to changes in ambient light levels by altering its resistance.
2. **Passive Component:** Does not require an external power source to operate.
3. **Analog Output:** Produces an analog voltage that varies with the amount of light.
4. **Slow Response Time:** LDRs generally have a slower response time compared to other light sensors.
5. **Non-Directiona:** Sensitive to light from all directions.
6. **Compact Size:** Typically small and easy to integrate into various applications.
7. **Cost-Effective:** LDRs are often more affordable compared to other light sensing technologies.
8. **Simple Structure:** Consists of a semiconductor material sensitive to light

PIR Sensor:

Fig 2.10 PIR Sensor

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As shown in fig 2.10 A Passive Infrared (PIR) sensor is a type of electronic device used todetect motion by sensing changes in infrared radiation emitted by objects within its field of view. When choosing and installing a PIR sensor, consider factors like detection range,coverage angle, sensitivity adjustments, and the environment it will be placed in. Properplacement and angle adjustment are crucial for optimal performance. It's important to note thatPIR sensors are sensitive to temperature changes and work best in detecting relatively largeand quick movements. They are not suitable for detecting slow or small movements, such asthose of a crawling insect. It's commonly used in security systems, lighting controls, Home automation, Occupancy sensing, Automatic doors, Wildlife monitoring, Camera triggering,Health care and other applications to trigger actions based on detected movement.

Features

1. **Motion Detection:** Detects human and large animal movements based on changes in infrared radiation.
2. **Passive Operation:** Only senses existing infrared radiation; doesn't emit radiationitself.
3. **Digital Output:** Provides a digital signal (high or low) to indicate motion detection.
4. **Adjustable Sensitivity:** Allows fine-tuning the sensor's responsiveness to motion.
5. **Wide Field of View:** Covers a broad area within its detection angle.
6. **Fast Response Time**: Reacts quickly to changes in the infrared environment.
7. **Low Power Consumption:** Designed for energy-efficient use.
8. **Tamper-Proof**: Suitable for security applications due to its passive nature.
9. **Pet Immunity:** Some models can ignore small pets to prevent false alarms.
10. **Multiple Detection Zones:** Enhanced accuracy through segmentation of the sensor's fieldof view.

Gas Sensor :

Fig 2.11 GAS Sensor

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As shown in fig 2.11.A gas sensor is a device designed to detect the presence of specific gasesin the environment. It measures the concentration of a particular gas and converts this information into an electrical signal that can be interpreted and used for various purposes. Gassensors operate using various principles such as chemical reaction, ca talytic combustion, optical absorption, electrochemical reaction, and piezoelectric effect. The interaction between the target gas and the sensing material generates a measurable signal. Gas sensors are essentialin a wide range of industries and applications to ensure safety, monitor air quality, and controlprocesses. They can be used to detect gases that are harmful, flammable, toxic, or even those that are necessary for specific processes.

Features and specification

1. **Gas Detection Type**: Specifies the type of gas the sensor is designed to detect, such as carbon monoxide (CO), methane (CH4), hydrogen sulfide (H2S), etc.
2. **Sensitivity:** Indicates the sensor's ability to detect low concentrations of the target gas. Accurately.
3. **Measurement Range:** Defines the minimum and maximum gas concentrations the sensorcan accurately measure.
4. **Response Time:** The time it takes for the sensor to detect and respond to changes in gas concentration.
5. **Accuracy:** The level of precision in the sensor's measurements compared to actual gas concentrations.
6. **Resolution:** The smallest change in gas concentration that the sensor can detect. **7.Operating Temperature Range:** The range of temperatures within which the sensor can operate effectively.
8. **Operating Humidity Range:** The range of humidity levels the sensor can operate inwithout compromising accuracy.
9. **Power Requirements:** Specifies the voltage or current needed to operate the sensor. **10.Output Signal:** Describes the type of signal the sensor provides, which could be analog voltage, digital (UART, I2C), or other interfaces.
11. **Calibration:** Some sensors require periodic calibration to ensure accurate measurements.The calibration process should be outlined.

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12. **Physical Size:** The dimensions of the sensor, which can be crucial for integration into different applications.
13. **Mounting Options:** Information about how the sensor can be mounted or installed.
14. **Maintenance Needs:** Whether the sensor requires routine maintenance, like cleaning or component replacement.
15. **Longevity:** The estimated operational lifespan of the sensor before it needs replacement.
16.Environmental Resistance: Any protection against dust, water, or other environmental factors that might affect sensor performance.
17. **Alarm and Alert Mechanism:** Details about how the sensor indicates gas presence, like LED indicators, sound alarms, or digital alerts.
18. **Data Logging:** If applicable, whether the sensor can log and store gas concentration data for later analysis.

PROJECTS

PROJECT 1: TRAFFIC LIGHT

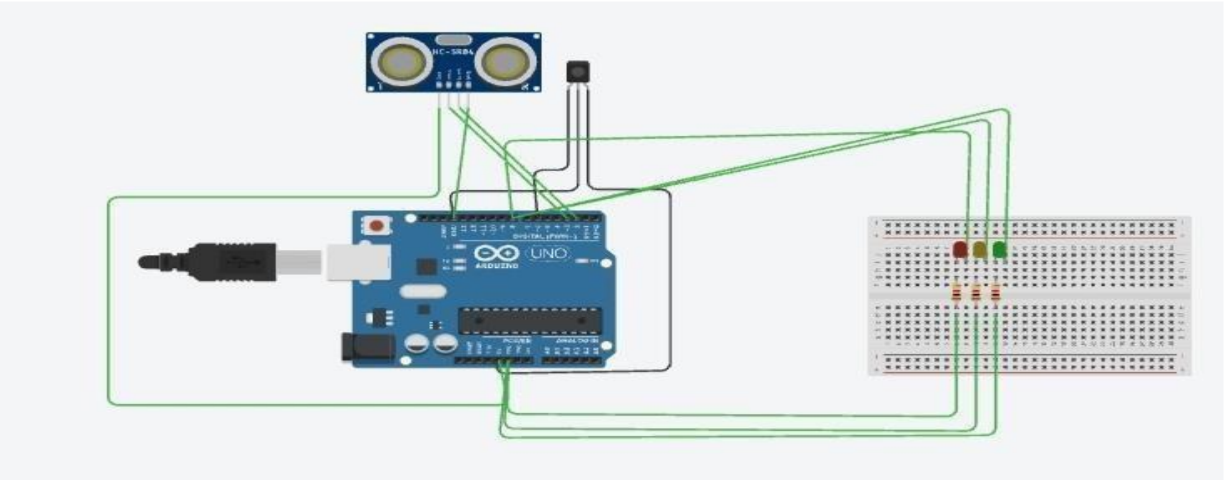

Fig 2.12 Traffic light

traffic light project using an ultrasonic sensor, piezo buzzer, and LED lights might work.The main idea behind this project is to create a simulated traffic light system that responds to the presence of vehicles using an ultrasonic sensor. As shown in fig 2.12..

Here's a basic overview of how it might work:

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Ultrasonic Sensor: The ultrasonic sensor is placed at a suitable height facing the road. It sends out ultrasonic waves and measures the time it takes for the waves to bounceback after hitting an object (vehicle). This gives the distance between the sensor and thevehicle.

Microcontroller: A microcontroller (such as Arduino) processes the data from the ultrasonic sensor. It calculates the distance between the sensor and the vehicle and determines whether a vehicle is present or not based on a predefined threshold distance.

LED Lights: The traffic light simulation consists of three LED lights: red, yellow, andgreen. The microcontroller controls the LEDs to mimic the behavior of a traffic light.

If no vehicle is detected within a certain distance, the microcontroller keeps the green light on, indicating that the road is clear.

When a vehicle is detected approaching the intersection, the microcontroller starts a countdown timer. The green light turns to yellow, indicating that the light is about to change. After the countdown, the microcontroller switches the yellow light to red and turns on the red light. This signals the vehicles to stop.

Piezo Buzzer: The piezo buzzer can be used to add an auditory element to the project.For instance:

When the light changes from green to yellow, the piezo buzzer might emit a short beep to alert drivers of the impending change.

When the light changes from red to green, the buzzer might emit a different sound, signaling the start of traffic flow.

Timing Logic: The microcontroller manages the timing of the traffic light sequence.It needs to ensure that each light stays on for the appropriate duration before switching to the next.

Cycling through Sequence: The traffic light system will then continue to cycle through the red, yellow, and green lights as vehicles are detected and the appropriate timing logic is applied.

PROJECT 2: SECURITY SYSTEM

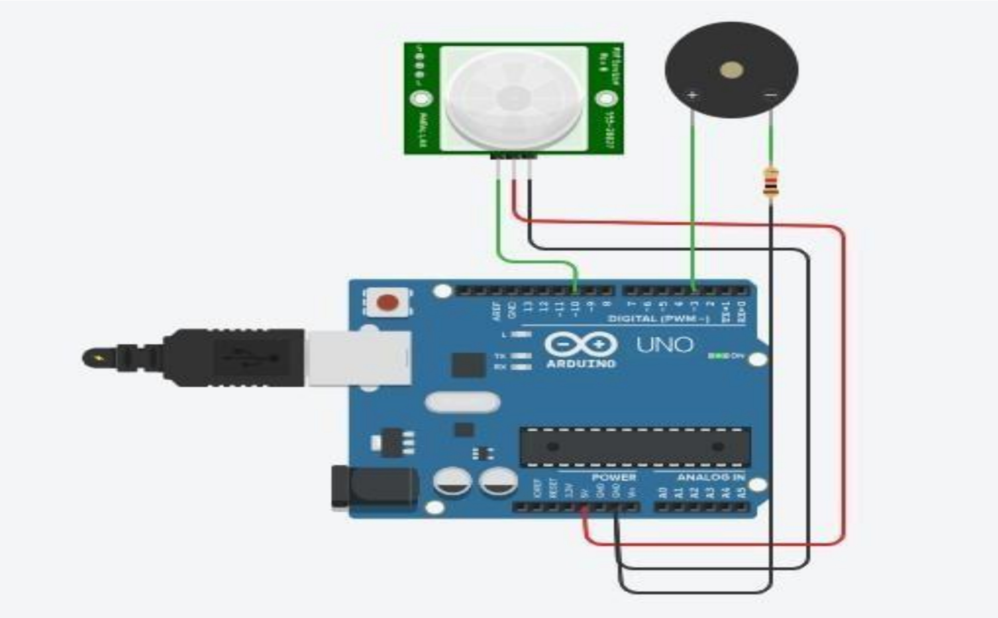

Fig 2.13 security system

As shown in fig 2.13.A security system using a PIR (Passive Infrared) sensor, buzzer, and LED typically works as follows:

Detection by PIR Sensor: The PIR sensor detects changes in infrared radiation caused by the movement of a person or object in its field of view. When there's a changein temperature, such as a person moving across the sensor's range, the sensor generates asignal.

Signal Processing: The signal from the PIR sensor is processed by a microcontroller (e.g., Arduino, Raspberry Pi). The microcontroller interprets the signal and triggers appropriate actions based on the detected movement.

LED Indication: When motion is detected, the microcontroller activates an LED to provide a visual indication that the system has detected movement. This LED could be placed at a strategic location to alert people that the security system is active and hasdetected motion.

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Buzzer Activation: Additionally, the microcontroller can activate a buzzer to produce an audible alert. This can serve as a deterrent for potential intruders and also draw the attention of people nearby to the detected motion.

User Interaction: The security system might include user interaction through a control panel, app, or physical buttons. Users could arm or disarm the system, adjust sensitivity, or configure other settings.

Alarm Delay: To prevent false alarms caused by brief movements, a system mightincorporate a delay before activating the buzzer and LED. This allows time for the microcontroller to verify sustained movement.

Reset and Deactivation: After a certain period of inactivity, the system resets and goes back to its standby state. Users can deactivate the system when they're present,preventing alerts from being triggered.

Overall, this setup combines the PIR sensor's ability to detect motion with visual (LED)and audible (buzzer) alerts to enhance security and awareness. Keep in mind that the specifics of the implementation, including code and circuitry, would depend on the chosen microcontroller, components, and programming language used.

Here are some common applications:

Home Security: Install the system at entrances, windows, or hallways to detect intruders and alert homeowners. The LED and buzzer can activate to notify residents ofany unauthorized movements.

Office Security: Use the system in offices during non-working hours to monitor for unauthorized access. The LED and buzzer can trigger alerts for security personnel.

Retail Stores: Install the system to monitor specific areas of a store, such as storagerooms or restricted zones. Any detected movement can trigger the LED and buzzer to alert staff.

Warehouses: Employ the system to secure warehouses, especially during off- hours. The LED and buzzer can help prevent theft or vandalism.

1. **Garages:** Use the system to detect intruders or unauthorized access to garages. TheLED and buzzer can provide immediate alerts to homeowners.
2. **Outdoor Security:** Set up the system in outdoor areas like yards or gardens to detect movements during nighttime. This can deter potential intruders.
3. **Automated Lighting:** Combine the system with smart lighting to automatically turn onlights when motion is detected, enhancing both security and convenience.
4. **Pet Monitoring:** Employ the system to monitor pets' movements in specific areas.The LED and buzzer can alert you if your pet enters restricted zones.
5. **Smart Home Integration:** Integrate the system with a home automation systemto receive alerts on your smartphone or smart devices when motion is detected.
6. **Hospitals or Care Facilities:** Use the system to monitor the movement of patients or residents, ensuring their safety. The LED and buzzer can alert caregivers to unexpected movements.
7. **Industrial Security:** Install the system in industrial settings to secure sensitive areas or monitor equipment. The LED and buzzer can provide instant alerts in case of unauthorized access.
8. **Event Security:** Implement the system during events to monitor restricted areas.The LED and buzzer can alert security personnel to any breaches.

The effectiveness of the security system depends on proper placement of the PIR sensor,LED, and buzzer, as well as fine-tuning the sensitivity settings to minimize false alarms. Additionally, integrating the system with other technologies can provide a comprehensive security solution tailored to specific needs.

DRIVE MODULES

The drive module in electronics refers to a circuit or device responsible for controlling and regulating the power delivered to various components like motors, LEDs, or other devices. It ensures that these components operate efficiently and safely by managing voltage, current, and other parameters. Drive modules are commonly used in a variety of applications, from consumer electronics to industrial machinery.These modules often include components like transistors, diodes, and capacitors that enable the regulation andmanipulation of electrical signals. For instance, in motor control, a drive module can adjust the motor's speed, direction, and torque by altering the input voltage and current. In LED lighting, it can manage the intensity and color of the light emitted.Drive modules contribute to energy efficiency, as they optimize power consumption by delivering the required power without excess waste. They also offer protection features, such as overcurrent and overvoltage protection, preventing damage to the connected devices.With advancements in semiconductor technology, drive modules have become more compact, efficient, and integrated, allowing for sophisticated control of various components. As technology evolves, drive modules continue to play a crucial role in enhancing the performance and functionality of electronic systems across different industries.

TYPES OF DRIVE MODULES

L293D MOTOR DRIVE MODULE :

The L293D module is a popular integrated circuit (IC) commonly used for driving DC motors and stepper motors in various applications. It's particularly useful in robotics, automation, and hobby projects. The module contains two H-bridge circuits that allow bidirectional control of two motors or a single stepper motor. Each H-bridge can drive amotor forward or backward, making it versatile for controlling motors' direction and speed. As shown in fig 2.14.

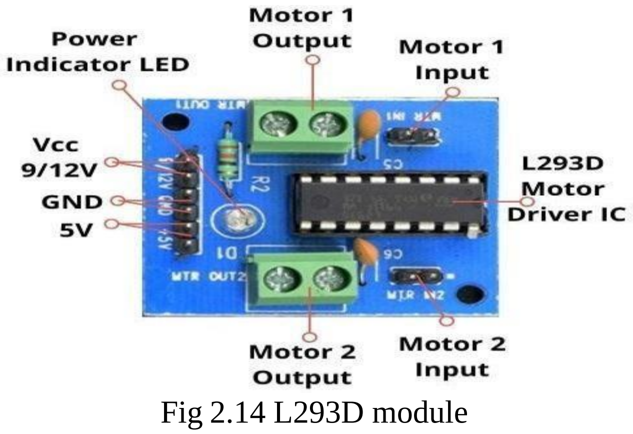

Fig 2.14 L293D module

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To use the L293D module:

Connect the control pins (Input 1, Input 2, Enable 1, Input 3, Input 4, Enable 2) to your microcontroller or a control source.

Connect the output pins (Output 1, Output 2, Output 3, Output 4) to the motorterminals.

Connect the power pins (VCC1, VCC2, GND1, GND2) to the appropriate powersupply sources.

Applications of the L293D module include:

Robotics: It's commonly used to control the movement of wheels in robots, allowingthem to move forward, backward, turn, and stop.

Remote-Controlled Vehicles: L293D helps in controlling motors of remote- controlled cars, boats, and planes.

CNC Machines: It's used for driving stepper motors in CNC machines and 3D printers, allowing precise control of their movement.

Automated Systems: L293D can be utilized in various automated systems like conveyor belts, automatic doors, and more.

Educational Projects: It's a great component for learning about motor control and electronics in educational settings.

Home Automation: L293D can be used to control blinds, curtains, and other household appliances with motors. Remember to check the datasheet of the L293D module for detailed specifications and wiring diagrams relevant to your specific use case.

RELAY MODULE

A relay module is an electromagnetic switch that operates based on the principle of an electromagnet. A set of contacts, and a mechanical system. When a low-voltage current flows through the coil, it generates a magnetic field, which in turn causes the contacts tomove, either opening or closing an electrical circuit. As shown in fig 2.15.

Fig 2.15 Relay module

Here's how it works:

Coil Activation : When a small control voltage is applied to the coil, it energizes the coil and creates a magnetic field around it.

Contact Movement : The magnetic field generated by the coil attracts a movablearmature, which is connected to one set of contacts. Depending on the design, the armature either closes or opens the contacts.

Circuit Control : The movement of contacts influences the flow of current in theconnected load circuit. If the contacts close, the load circuit is completed and current flows through it. If the contacts open, the load circuit is interrupted.

Applications:

Home Automation : Relay modules are used to control lights, fans, air conditioners, and other appliances remotely. They allow low-voltage control signals fromsmart devices to manage high-voltage devices.

Industrial Automation : In industries, relay modules control heavy machinery,conveyor belts, and manufacturing processes. They provide a safe way to control high- power equipment using control systems.

Automotive : Relay modules are used in automotive systems to control componentslike headlights, horn, power windows, and starter motors.

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Safety Systems: They are crucial in safety systems such as fire alarms and emergency shutdowns. When a fire alarm is triggered, relay modules can activate sprinkler systems or emergency notifications.

HVAC Systems: Heating, ventilation, and air conditioning systems use relay modules to control the operation of heaters, fans, and compressors.

Security Systems: Relay modules are employed in security systems to activate alarms, door locks, and surveillance cameras.

Energy Management: They play a role in managing energy consumption by controlling devices like pumps, motors, and lighting systems based on specific schedulesor conditions.

Medical Equipment: In medical devices, relay modules help control componentssuch as motors, solenoids, and pumps in equipment like infusion pumps and diagnostic instruments.

In conclusion, the relay module serves as a crucial component in electronics and automation systems. By acting as a switch, it enables the control of high-power devices using low-power signals, enhancing safety and efficiency. The relay module's ability to isolate control signals from high-voltage circuits prevents damage to delicate control components. As technology advances, the relay module continues to play a pivotal role in bridging the gap between low-power logic and high-power operations, making it an enduring and essential tool in modern electronics.

CHAPTER 3

PROJECTS

OBSTACLE DETECTING CAR

INTRODUCTION

Obstacle detection in cars typically involves using sensors like radar, lidar, and camerasto identify objects around the vehicle. These sensors provide data to the car's computer system, which then processes the information to determine potential obstacles and take appropriate actions, like applying brakes or steering to avoid collisions. The development of autonomous driving technology has significantly advanced obstacle detection capabilities in recent years.

COMPONENTS

Ultrasonic Sensor

Microcontroller

Motor Driver

DC Motors

Wheels and Chassis

Power Supply

Jumper Wires

Breadboard

LED indicators, buzzer, or servo motors for additional functionalities

SCHEMATIC DIAGRAM USING TINKERCAD

Creating a schematic diagram As shown in fig 3.1 for an obstacle-detecting car usingan ultrasonic sensor in Tinkercad involves several steps:

Components: Add components to your Tinkercad workspace, including an Arduino board, an ultrasonic sensor, motor driver module, DC motors, and wheels.

Wiring: Connect the components according to the following guidelines.Connect the VCC and GND pins of the ultrasonic sensor to the 5V and GND pins of the Arduino, respectively.

Connect the TRIG and ECHO pins of the ultrasonic sensor to digital pins on the Arduino.

Connect the motor driver module inputs to digital pins on the Arduino, controlling the direction and speed of the motors.

Connect the motor driver module outputs to the terminals of the DC motors.

Coding: Write the Arduino code to control the ultrasonic sensor and motor movements.Use the `NewPing` library to read distance from the ultrasonic sensor. Implement logic to determine whether an obstacle is within a certain distance. Dependingon the obstacle distance, control the motors to move the car forward, backward, left, or right.

Testing: Upload the code to the Arduino and test the car in the Tinkercad simulation.Make sure the ultrasonic sensor accurately detects obstacles and the motors respond correctly.

Fine-Tuning: Adjust the code parameters as needed to ensure smooth operation and proper obstacle detection.

Documentation: Create a schematic diagram using Tinkercad's built-in tools or external graphic software. Include labels for components, pins, and connections.

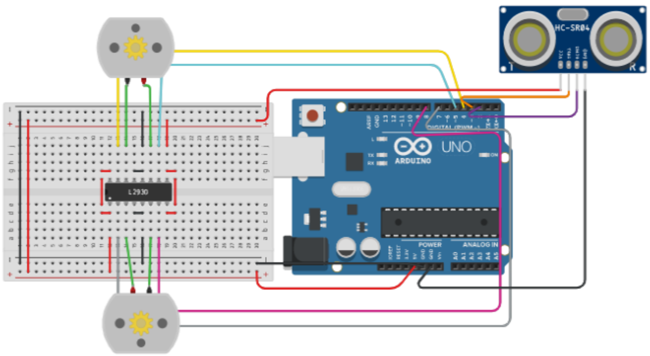

Fig 3.1 Schematic diagram of obstacle detecting car

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CIRCUIT OPERATION

Ultrasonic Sensor: The ultrasonic sensor emits high-frequency sound waves and measures the time it takes for these waves to bounce back after hitting an object. This time is used to calculate the distance to the object.

Distance Calculation: The microcontroller (such as Arduino or Raspberry Pi) connected to the ultrasonic sensor calculates the distance based on the time it takes for the sound waves to return.

Threshold Setup: A predefined threshold distance is set in the program. If the calculated distance is less than this threshold, it indicates the presence of an obstacle.

Decision Making: When an obstacle is detected (distance below the threshold), the microcontroller triggers actions. It could be activating a buzzer to produce a warning sound and turning on an LED to indicate the proximity of the obstacle.

Buzzer and LED: The buzzer produces a sound that alerts the user/driver about the obstacle. The LED might change its color or blink to provide a visual indication of the obstacle's proximity.

Feedback Loop: The system continuously checks the distance and updates the buzzerand LED status accordingly. If the obstacle gets closer, the warning sound might becomemore frequent or urgent.

User Response: The driver can then react to the warning signals by slowing down, stopping, or maneuvering to avoid the obstacle.And the output is As shown in fig 3.2.

OUTPUT

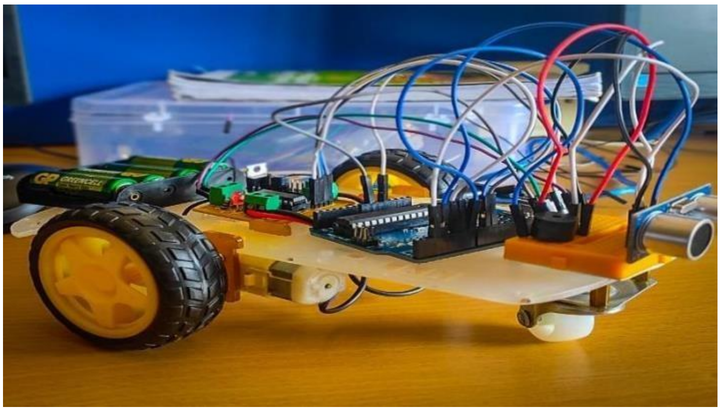

Fig 3.2 obstacle detecting car

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ADVANTAGES

Enhanced Safety

Reduced Accidents

Improved Autonomous Driving

Better Traffic Flow

Parking Assistance

Pedestrian and Cyclist Safety

Reduced Human Error

Emergency Response Improvement

Increased Accessibility

Efficient Navigation

Advanced Driver Assistance

APPLICATION

Autonomous Driving

Parking Assistance

Collision Avoidance

Pedestrian Safety

Traffic Management

Industrial Vehicles

Agricultural Automation

Robotic Vehicles

Public Transportation

Emergency Vehicle

CHAPTER 4

CONCLUSION

4.1: CONCLUSION:

During the internship, the opportunity to learn and develop skills in simulation using Tinker cad, as well as Arduino IDE, was provided. Over the course of the internship, valuable experiences were gained in these areas, which will be useful as we move forward inour careers. Through the simulation process, how to create schematics, perform circuit simulations, and analyze circuit performance using Tinker Cad. And be able to test various circuits and develop a deeper understanding of how different components and designs impact circuit performance.

In addition to get opportunity to practice code testing and troubleshooting, this helped us develop a deeper understanding of the practical implementation of micro-controllers.. And learned about how to use different tools and equipment and how to properly document and record test results. Gaining experience in using different types of sensors, drive modules, and microcontrollers. Overall, internship provided an excellent foundation in the field of embedded electronic circuits and a solid basis for pursuing careers in electronics engineering.

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