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Wireless Power Transmission Station and Automated Self Decision Making Robot

Aishwariya[1]; Dr. Sharanbasappa Madival[2]
Department of Computer Science and Engineering
Faculty of Engineering and technology (Co- ed)
Sharnbasva University,Kalaburagi,India

Abstract:- Wireless Power Transmission (WPT) is an evolving technology used in various fields to transfer power from a source to an electrical load without physical connections. WPT is beneficial when traditional wiring isn't feasible. This technology operates based on mutual inductance. An exciting application is seen in Electric Vehicles (EVs) within the automotive industry. This article discusses the development of wireless charging systems for EVs, Tesla Coils for power transmission. The main goal is to create efficient charging systems with a DC power source, transmission coil, reception coil, and battery as the electric load.

Keywords:- *Arduino Uno, Induction Coil, Ultrasonic Sensor, Relay .*

I. INTRODUCTION

The Line Following Robot is an autonomous robot that identifies a path and then follows it based on the path drawn using an IR sensor attached to the robot. The path can be a black line on a white surface or a white line on a black surface to prevent any detection errors.

This project serves as the basic stage for any automatic robot. The robot possesses enough intelligence to cover the maximum area of the given space. Equipped with an ultrasonic sensor, it can detect obstacles that come in its way and maneuver around them. Two D.C motors are utilized to provide motion to the robot.

The construction of the robot circuit is simple and compact. The electronic components used in the circuits are readily available and cost-effective. Our goal is to create a robot vehicle that responds to voice commands. Known as Speech Controlled Automation System (SCAS), our design serves as a prototype for a robot driven by voice commands.

The primary objective of creating a Voice Command Responsive Vehicle (VCRV) is to interpret human voices and execute programmed commands such as backward, forward, right, left, and stop. The vehicle can be wirelessly controlled using an android smartphone.

Wireless power transmission (WPT) is an increasingly popular technology with various applications in different fields. It enables power transfer from a source to an electrical load without physical interconnections, making it useful where wiring is not practical. Based on mutual inductance principle, WPT has potential applications in Electric Vehicles within the automotive sector.

This paper focuses on researching and developing wireless charging systems for Electric Vehicles using wireless transmission technology. The main objective is to transmit power via resonance coupling and construct efficient charging systems comprising an AC source, transmission coil, reception coil, and electric load like batteries.

II. LITERATURE SURVEY

The creation of an obstacle-avoiding robot utilizing IR motion Sensors has been accomplished without specifying a particular task for the robot platform but focusing on a general wheeled autonomous design. This versatile design allows for broad applications in education, research, or industrial settings. Students benefit from learning microcontroller programming with C++, Arduino Uno compiler, understanding IR sensor behavior, motor drive circuitry, and signal conditioning circuit design. Exploring obstacle avoidance robots at the polytechnic level enhances students' communication, technical abilities, and teamwork skills. The adaptable nature of this robot design permits various methods for different implementations. Notably, PIR sensors prove more sensitive than IR sensors in the detection of human presence.

In 1901, Nikola Tesla started the ambitious endeavor of constructing the Wardenclyffe Tower to pioneer a groundbreaking wireless energy transmission system. Unfortunately, financial limitations and Tesla's debts led to the tower's tragic demise as it was demolished for scrap metal.

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A. Components Required

- Breadboard
- Arduino UNO
- IR Sensor
- L298 Motor Driver
- Ultrasonic Sensor
- Connecting Wires
- 3.7 V lithium-ion Battery
- On off Switch
- IR receiver module
- Induction coil
- 2N2222A Transistor
- 22 to 28k register

B. Block Diagram

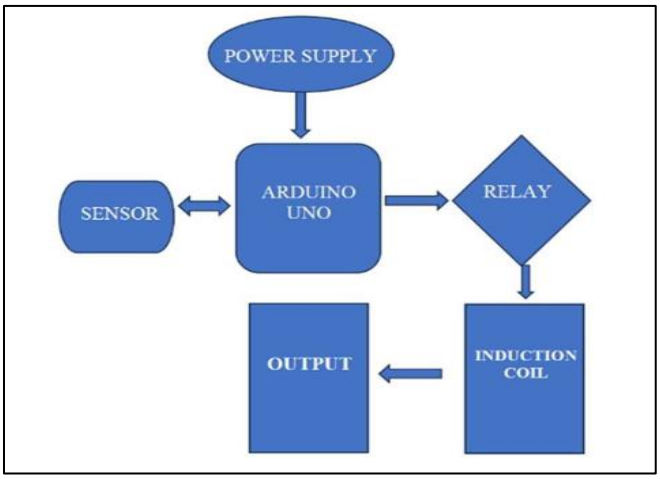

Fig 1: Block Diagram

C. Circuit Diagram

➢ *Automated Self Decision Making Robot*

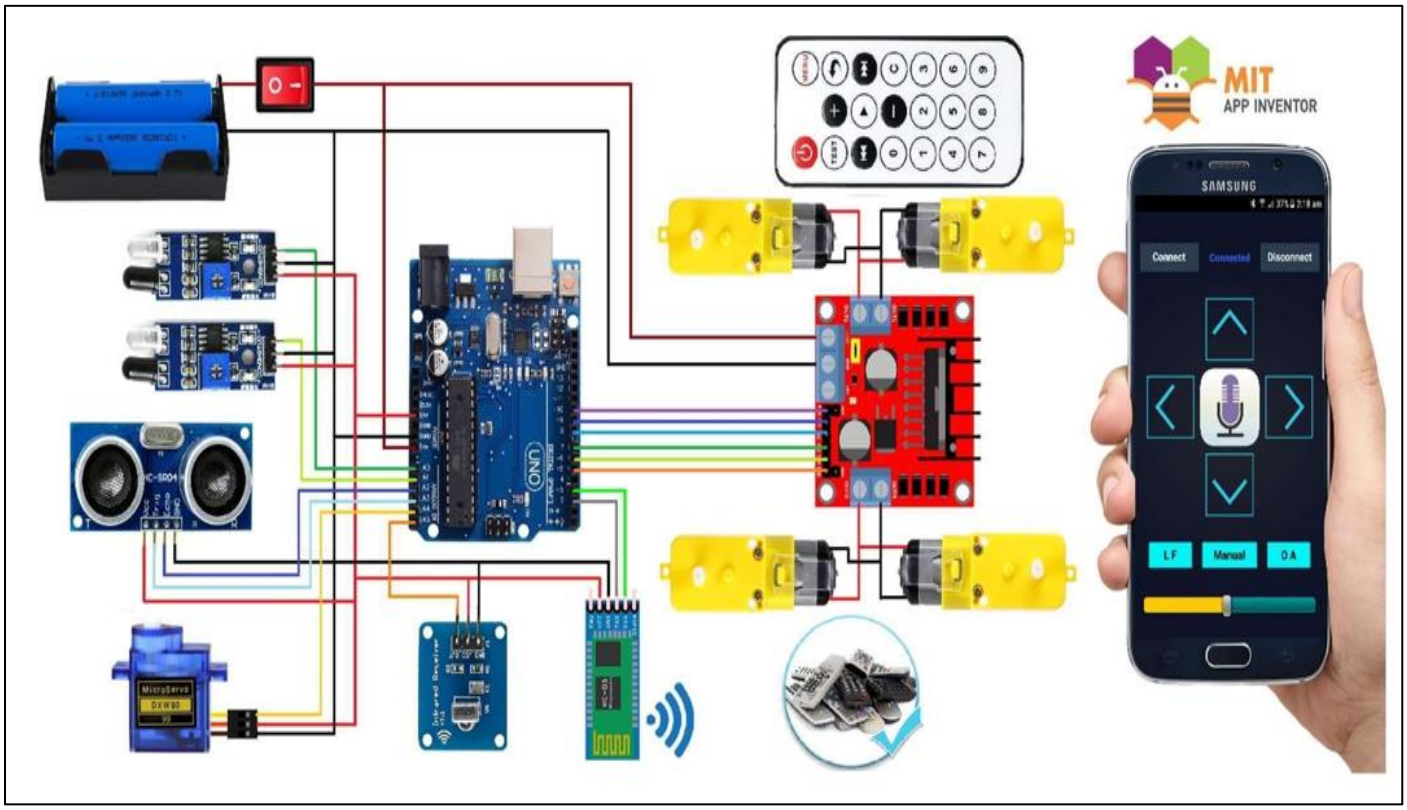

Fig 2: Automated Self Decision Making Robot

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➢ *Wireless Charging Station*

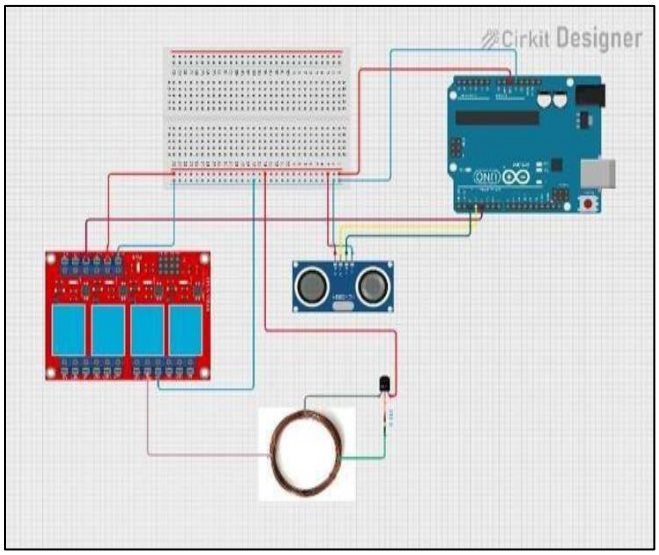

Fig 3: Wireless Charging Station

➢ *Receiver Coil*

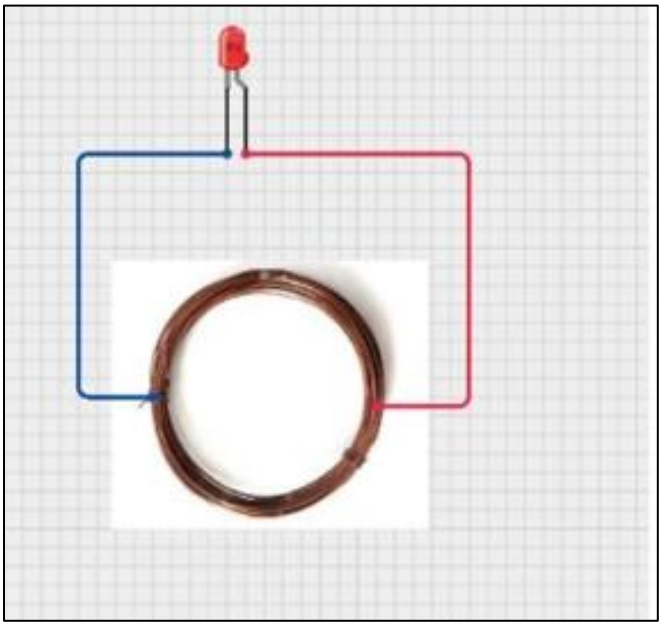

Fig 4: Receiver Coil

D. Working Principle

➢ *Line Follower Robot*

The line follower robot utilizes IR transmitters and IR receivers, also known as photo diodes, to send and receive light. IR emits infrared light that reflects off white surfaces and is detected by photodiodes, resulting in voltage changes. Conversely, when IR light hits a black surface, it is absorbed, causing no reflection back to the photo diode.

In this line follower robot, the sensor detects white surfaces as input 1 for the IC and black lines as input 0. The robot is divided into three main sections: sensor section, control section, and driver section.

The sensor section consists of 2Array IR sensors with IR diodes, potentiometer, Comparator (OpAmp), and LEDs. Potentiometer sets the reference voltage at the comparator's terminal while IR sensors detect the line and provide a voltage change at the comparator's other terminal. The comparator compares these voltages and generates digital signals.

The control section is managed by IC L298D, overseeing the entire process of the line follower robot by reading signals and sending commands to the driver circuit.

The driver section comprises a motor driver and four DC motors to drive the motors efficiently. The motor driver circuit receives commands from IC L298D and operates the motors accordingly.When both left and right sensors detect white surfaces, the robot moves forward. If either sensor identifies a black line, the robot turns in the respective direction until both sensors return to white surfaces. If both sensors detect black lines simultaneously, the robot comes to a halt.

➢ *Automated Self Decision Making Robot*

An automated robot capable of making decisions for itself is used to avoid obstacles when in motion. relies on ultrasonic sensors to guide its movements along a path. These sensors emit ultrasonic waves constantly from their sensor head as the robot travels. Should an obstacle appear in its way, the ultrasonic bounce back from the object send this information to the arduino. The arduino then adjusts the motor functions – turning them left, right, backward, or forward based on the signals received. To regulate the speed of each motor, pulse width modulation (PWM) is employed. When an obstacle is detected by the ultrasonic sensor along the path, it notifies the arduino uno. Subsequently, it instructs motors M3 & M4 to move forward and motors M1 & M2 to move backward, effectively steering the car to the left. This process repeats each time an obstacle obstructs the car's path, prompting it to veer left and avoid the hindrance.

➢ *Voice Control Robot*

Voice-controlled robots are a fascinating technology that operates through phone processing and speech-to conversion within an app using Google's speech recognition. The processed text is then sent via Bluetooth to the receiver side and transferred to an Arduino Uno board through UART serial communication. Arduino code is responsible for checking the received text and controlling the robot's movements based on matching strings such as forward, backward, turning right, turning left, and stopping. This process initiates when users speak commands into a smartphone a device with a microphone. The smartphone processes voice input, converting spoken words into text or commands using a voice recognition system.

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The converted commands are transmitted to the Arduino on the RC car via Bluetooth connection facilitated by a Bluetooth module. These DC motors set the wheels in motion according to received commands. For instance, if the command instructs to move forward, motors rotate accordingly for forward propulsion. Additionally, an optional feedback mechanism like a speaker or buzzer can offer audio confirmation of successful command execution to users.

➢ *Iot Based Wireless Charging Station*

The Arduino code provided is crafted for managing a relay via an ultrasonic sensor and password verification on the serial monitor. It sets up the pins for the ultrasonic sensor (trigger and echo) and the relay, initiating serial communication at 9600 baud rate. The password is "1234," with a Boolean flag, relay Activated. Within the setup function, the ultrasonic trigger pin becomes an output, echo pin an input, and relay pin an output. The relay starts in the off position. Serial.begin(9600) kicks off serial communication for interaction with the monitor.The loop function continually checks if the relay remains unactivated. If so, it gauges distance via the ultrasonic sensor by sending a trigger pulse and calculating return time for the echo pulse to as certain proximity to objects. Upon detection within 20 cm, "Device Detected" is displayed on the monitor along with a call to authenticate. In instances where no object is nearby, "No device detected within range" flashes before it rechecks after a 1- second pause. The authenticate function demands user input of a password through the monitor with a prompt: "Enter Password:". It reads characters until matching predefined password length is achieved. Correct entry ("1234") warrants "Access Granted" on the monitor, activates the relay by raising its pin level and toggles relay Activated to prevent further checks. For incorrect passwords, "Access Denied" pops up followed by a 2- second wait for another try.

E. Advantages

- Convenience and Ease of Use
- No Physical Plugging/Unplugging
- User-Friendly and Weather Resilience
- Clean Installation
- Reduced Material Usage
- Maintenance Savings

F. Application

- Residential Charging
- Basic Control and Monitoring System
- User Authentication and Access Contro
- Wireless Communication and IoT Integration
- Automation and Smart Features

III. CONCLUSION

The integration of Arduino Uno in wireless charging stations for electric vehicles (EVs) is a versatile solution to enhance functionality, safety, and user experience. By incorporating the Arduino Uno, users can create cost-effective solutions tailored to specific needs for personal or public infrastructure, including advanced IOT integration. Developing a basic wireless charging station control system with Arduino Uno showcases real-time monitoring, user authentication, safety protocols, and remote control features. This project demonstrates the practical application of Arduino Uno while showcasing future possibilities in EV charging technology advancements. Integrating microcontroller platforms like Arduino Uno will drive widespread adoption and refinement of wireless EV charging systems for a more sustainable future.

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