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Design and Implementation of a Wi-Fi Controlled Car Using NodeMCU, Arduino UNO, and Blynk IOT.

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Abstract - *This project proposes a Wi-Fi controlled car using NodeMCU, Arduino UNO, and Blynk IoT. NodeMCU is a microcontroller board that is based on the ESP8266 Wi-Fi chip. The Arduino UNO is a microcontroller board that is popular among hobbyists and makers. Blynk IoT is a cloud-based platform that makes it easy to create and manage IoT devices. The Wi-Fi controlled car works by using the NodeMCU board to connect to a Wi-Fi network. The NodeMCU board then receives commands from the Blynk IoT app and sends them to the Arduino UNO board. The Arduino UNO board then controls the motors of the car to move it in the desired direction. This project is relatively inexpensive to build and easy to use, making it a good option for hobbyists and makers. The Wi-Fi controlled car can be used for a variety of applications, including hobby, education, and research. In the future, we can expect to see Wi-Fi controlled cars that are equipped with additional features, such as cameras, sensors, and artificial intelligence. This will enable Wi-Fi controlled cars to perform more complex tasks, such as autonomous driving and object detection. Overall, Wi-Fi controlled cars have the potential to revolutionize the way we interact with the world around us.*

Key Words: **Wi-Fi controlled car, NodeMCU, Arduino UNO, Blynk IoT, Internet of Things (IoT), Robotics, Cloud**

1. INTRODUCTION

In an age where the Internet of Things (IoT) is revolutionizing the way we interact with and control our surroundings, the convergence of technology and innovation has given birth to remarkable projects. One such project that epitomizes the power of IoT and embedded systems is the "Design and Implementation of a Wi-Fi Controlled Car Using NodeMCU, Arduino UNO, and Blynk IoT." Today, IoT has woven a web of interconnected devices and systems, making it possible to control and monitor physical objects remotely through the internet. The application of IoT extends far beyond smart homes and wearable gadgets; it has paved the way for exciting advancements in robotics and automation. The integration of NodeMCU, Arduino UNO, and Blynk IoT platform into the design and implementation of a Wi-Fi controlled car showcases the boundless potential of this technology. This project unites the agility of Arduino-based hardware with the flexibility of NodeMCU's Wi-Fi capabilities, all harnessed by Blynk, a user-friendly IoT platform that empowers creators and innovators. The result is a remotely controlled vehicle that can be operated and monitored from virtually anywhere in the world, provided there is an internet connection. The Wi-Fi controlled car is not just a demonstration of technical prowess but a testament to the endless possibilities that the IoT era offers.

2. LITERATURE REVIEW

1.1. OBJECTIVE

The objective of this project and paper is to design and implement a Wi-Fi controlled car using NodeMCU, Arduino UNO, and Blynk IoT with the aim of demonstrating the capabilities and potential of IoT in the realm of remote control and automation. By combining the hardware capabilities of Arduino UNO and the Wi-Fi connectivity of NodeMCU, this project seeks to create a versatile and accessible platform for users to remotely control a vehiclevia the internet. Additionally, it aims to showcase the ease of integration and user-friendliness of the Blynk IoT platform, making it a powerful tool for IoT enthusiasts and developers looking to bridge the physical and digital worlds ininnovative ways. This project serves as a testament to the ever-expanding horizons of IoT applications, bringing together cutting-edge technology to deliver a practicaland educational solution in the form of a Wi-Fi controlled car. Through this project and paper, we want to increase acknowledgement and awareness of applications of IOT and the easewithwhich we can create simple and useful machines.

Title of Paper	Details of Publication with Date and Year	Literature Identified for the Project
Robotic Car Using NodeMCU ESP8266 Wi-Fi Module	2023 9th International Conference on Advanced Computing and Communication Systems (ICACCS) Year of Publication: 2023 Authors: Siddesh G K, Rakesh Kumar Patel, Sayan Maitra, Sabitabrata Bhattacharya, Shaik Moosa, Pattubala Pavan	This paper presents an insight into a Wi-Fi controlled car using NodeMCU ESP8266 module for car controlling, and ESP32 Cam Module, which collects the visual data, as well as maintains the Wi-Fi connection. This robot can be remotely controlled even if it's out of sight, but within the optimum range of the connection technology, Wi-Fi. The physical movement of this robot, is controlled using the L298N Motor Driver, which in turn is connected to the 4 DC motors, and the control from this motor driver, would be directed through these 4 motors to the respective wheels, thereby letting the user to control the movement of the robot. Along with this, the ESP32 Cam Module would collect the visual data of the nearby close areas, and relay it back to the Wi-Fi connected device, which could be a smartphone or any such device. The base hardware on which this robot unit is made, is hard plastic which gives the unit a physical durability, and thus usable for use in rough areas like industrial sites or in underground mines for surveillance purposes.
ESP32 Based Smart Surveillance System	2019 2nd International Conference on Computing, Mathematics and Engineering Technologies (iCoMET) Year of Publication: 2019 Authors: Pertab Rai, Murk Rehman	Surveillance systems have been essential part of industries, factories, organizations and homes. They actually provide additional assistance in the work of security personnel because of information storing capabilities. In addition, they also provide extreme assistance in various automation processes of chemical industries where continuous monitoring of certain chemical reactions is mandatory. The installation of such systems at the cost of meager amount is the need of hour for controlling theft and avoiding any disastrous action. In this paper we have proposed the hardware and software implementation of smart surveillance system using the Espressif's latest microcontroller ESP32. The proposed implementation acquires continuous video, transmits using integrated Wi-Fi capabilities of aforementioned microcontroller and display on SPI TFT Module connected on receiving end.
A novel remote and virtual driving system based on Wi-Fi communication	2014 4th IEEE International Conference on Information Science and Technology Year of Publication: 2014 Authors: Ling-ming Li, Guang-zhong Cao, Su-dan Huang, Ji-lin Fang, Yi Yue	Unmanned intelligent vehicles become a hot spot of the world vehicle engineering and growing innovatory motivation in the automotive industry. By the WIFI communication, a novel remote and virtual driving system is developed in this paper. AM3359 processor equipped with the Linux is used in the remote and virtual driving system. Real-time environmental information of the car is captured by in-vehicle camera. The car's environmental information is transmitted to the client by the Wi-Fi network. The steering wheel and other equipment are used to realize the remote real-time control of the car. The remote and virtual driving system consists of data collection and transmission module, system control module, system security module, power management module, remote communication and monitoring module, wireless communication module, and so on. PC terminal is established by a video display terminal, steering wheel, and other control equipment. The remote real-time operating experiments are performed. The experimental results show that users can monitor the operational status of the vehicle and the remote real-time simulation driving is achieved. The results verify that the developed remote and virtual driving system is effective, reliable, and real-time.

2.1. RESEARCH GAP IDENTIFIED

The study of the given research papers revealed that majority of the applications that have been performed in the field of IOT and the use of the equipment are too complex or primitive and lack scalability. To improve the existing systems will be a long, tedious and expensive task. Therefore, it was necessary to develop a system that will be able to counter all these problems and would have more varied applications in different domains. Our topic "Design and Implementation of a Wi-Fi Controlled Car Using NodeMCU, Arduino UNO, and Blynk IOT." and the project built around it facilitates in solving this problem.

3. Components Used

1) NodeMCU ESP8266

The NodeMCU ESP8266 integrates a Tensilica L106 32-bit microcontroller, typically operating at 80 MHz, providing 4MB of flash memory for code and data storage. It offers built-in Wi-Fi connectivity supporting 802.11 b/g/n standards. Featuring multiple GPIO and analog pins, it allows interaction with various sensors and devices. Programmable using the Arduino IDE or Lua scripting language, it operates at an input voltage of 3.3V and commonly utilizes a micro-USB port for power and programming. Its compact form factor and cost-effectiveness make it a popular choice for IoT projects and rapid prototyping.

Figure 1: NodeMCU ESP8266

2) L298N motor driver

The L298N is a popular dual H-bridge motor driver integrated circuit. It's designed to control small to medium-sized DC motors or stepper motors. The chip can handle a peak current of up to 2A per channel and an operating voltage range between 4.8V to 46V. It features built-in diodes to protect against back EMF and supports PWM (Pulse Width Modulation) for speed control. The L298N has two H-bridge outputs, enabling bidirectional control for two DC motors or one stepper motor. It is commonly used in robotics, automation, and various projects requiring motor control due to its reliability and ease of use.

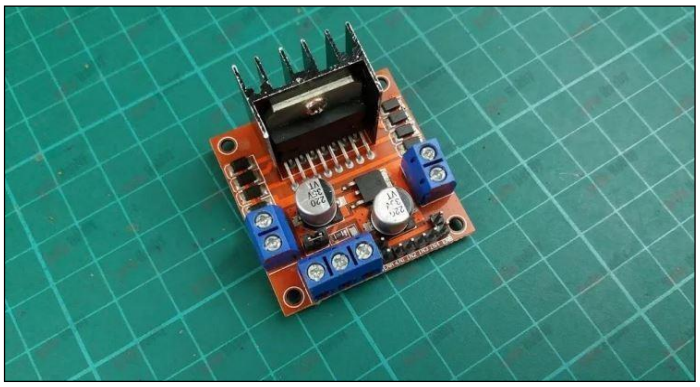

Figure 2: L289N Motor Driver

3) Gear Motors (x4) and robot wheels (x4)

Gear motors are typically DC motors combined with a gearbox to provide high torque output at lower speeds, making them ideal for driving robot wheels. These motors often have encoders to provide feedback on speed and rotation. Robot wheels for IoT-based cars come in various sizes and materials, such as rubber or plastic, offering traction and stability on different surfaces. They are often designed for easy mounting onto gear motor shafts, ensuring efficient movement and maneuverability for our wireless car. These components are crucial for mobility and precise control in IoT-based vehicles, allowing them to navigate and perform tasks in diverse environments.

Figure 3: Gear Motors

Figure 4: Robot Wheels

4) 3.7V Li Ion Battery

Lithium-ion (Li-ion) batteries are a popular type of rechargeable battery used in various devices, from smartphones and laptops to electric vehicles. They are known for their high energy density, which means they can store a large amount of energy in a relatively lightweightand compact design. In this project, we have used a 3.7V Li ion Battery having a form factor of 18650 and a capacity of 4800 mAh.

Figure 5: 3.7V Li Ion Battery

5) Jumper wires

Jumper wires are essential, pre-crimped wires used in IoT projects to quickly and temporarily connect various components like sensors, microcontrollers, and breadboards. Available in male-to-male, male-to-female, and female-to-female types, they come in various lengths and colors for easy identification and organization. These flexible wires, often made of copper or aluminum with insulation, eliminate the need for soldering during prototyping, enabling swift adjustments and connections for testing and building IoT setups.

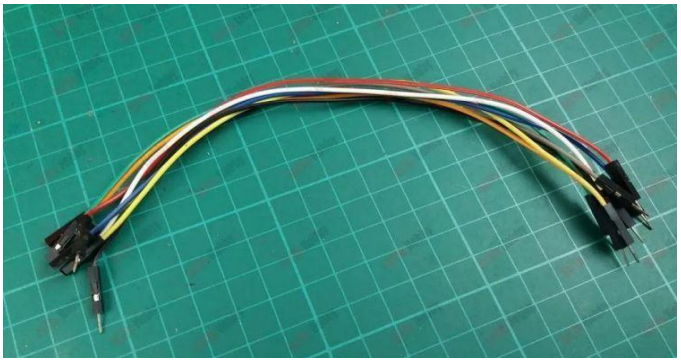

Figure 6: Jumper Wires

6) Breadboard

Breadboards are key prototyping tools used in IoT projects for creating and testing electronic circuits without soldering. They provide a platform with an array of interconnected sockets that facilitate the easy insertion and connection of electronic components, such as sensors, microcontrollers, and jumper wires.

Figure 7: Breadboard

4. Working Methodology and Algorithm

4.1 Working

In this Project, we have used NodeMCU Esp8266 microcontroller, L298N motor driver, Gear motors and wheels for hardware implementation. We will control the four gear motors via L298 Motor Driver IC. L298N is a high-power motor driver capable of running 5V to 35V DC Motor at a maximum of 25W. The main control unit is ESP8266 Board which connects and controls the entire circuit and equipment. After that we connect the battery to the L298 Motor Driver power supply input. Connect all 6 inputs of L298 to ESP8266 digital output pins. Supply 3.7V to the car through L298 Pin and connect the output pins of L298N to all four gear motors. Also, attach the motor driver board and Esp8266 to the top of the board for which we have used a foam board as a chassis for the car. The source program for WIFI Controlled car compiled in Arduino IDE is used to control the actions of the car and the blynk Iot cloud platform is used to connect the Wi-Fi of the user to the ESP8266's In-built Wi-Fi Module.

4.2 Algorithm

1. Start by setting up the ESP8266 Wi-Fi microcontroller and configuring it to connect to your local Wi-Fi network.
2. Next, install the Blynk app on your smartphone and create a new project.

3. In the Blynk app, add a virtual joystick widget to your project, which will be used to control the car.

4. Use the Blynk app to generate an authentication token for your project, which you will need in the next step.

5. In your code, use the ESP8266's Wi-Fi functions to connect to the Blynk cloud and authenticate using the token from step 4.

6. Once connected, you can use the Blynk app to control the car by sending commands over the Wi-Fi connection. For example, when the user moves the joystick on the app, your code could interpret this as a command to move the car forward or backward, turn left or right, or stop.

7. Use the ESP8266's outputs to control the motors of the car, allowing it to move in response to commands received from the Blynk app.

8. Optionally, you could also use the ESP8266's inputs, such as sensors or cameras, to provide feedback to the user through the Blynk app, such as showing the car's current location or its surroundings.

9. Of course, this is just one possible algorithm, and there are many other ways that you could implement a Wi-Fi controlled car using the ESP8266 and Blynk.

4.3 Model Implementation

Given below are the pictures of the actual model created by the team

Figure 8: Side Angle Of Model Car

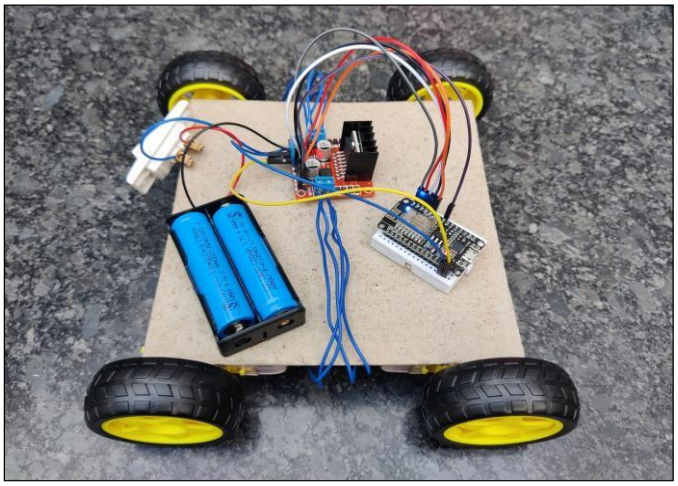

Figure 9: Top Angle Of Model Car

4.4 Circuit Diagram

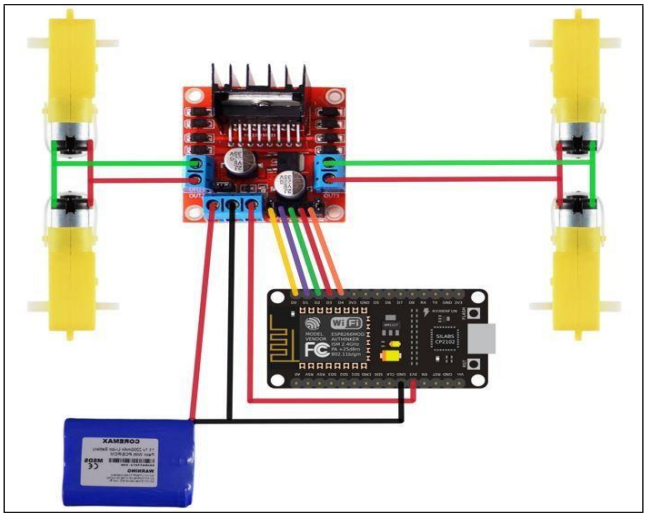

Figure 10: Visualized Diagram Of All The Components

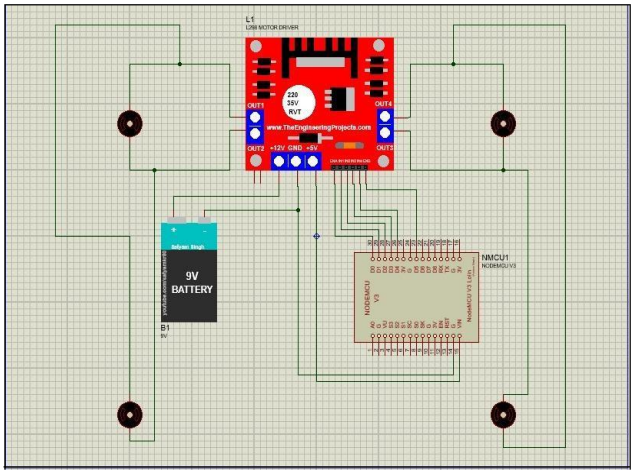

Figure 11: Circuit Diagram In Proteus

5. RESULT

The Wi-Fi Controlled Car project utilizing NodeMCU, Arduino, and the Blynk IoT App represents a cutting-edge integration of hardware and software to create a versatile and innovative remote-controlled vehicle. The NodeMCU serves as the brain of the operation, providing wireless connectivity through Wi-Fi, while the Arduino handles the intricate control mechanisms of the car. The Blynk IoT App acts as the user-friendly interface, enabling seamless interaction and control over the car's movements. This collaborative setup allows users to remotely steer the car with the convenience of a smartphone or tablet, showcasing the potential of Internet of Things (IoT) technology in the realm of robotics and automation. This project not only exemplifies the synergy between these platforms but also offers a practical and engaging application of IoT in the realm of home automation and robotics.

6. CONCLUSIONS

In conclusion, the Wi-Fi Controlled Car project, powered by the combined prowess of NodeMCU, Arduino, and the Blynk IoT App, stands at the intersection of modern connectivity and robotics. By leveraging NodeMCU's Wi-Fi capabilities, the project achieves wireless communication, freeing the car from the constraints of traditional wired controls. The Arduino, serving as the control hub, adds a layer of intelligence, enabling precise and responsive handling of the car's movements. The integration of the Blynk IoT App not only enhances user convenience but also brings a user-friendly interface to the forefront, allowing users to intuitively manipulate the car's actions through their smartphones or tablets.

This project is not merely a technical feat; it exemplifies the practical application of Internet of Things (IoT) in our daily lives. The marriage of hardware and software in this setup showcases the potential of IoT to revolutionize how we interact with and control devices. Beyond the thrill of a remotely controlled car, this endeavor highlights the broader implications of IoT in home automation, robotics, and the seamless integration of smart devices. As we witness the convergence of these technologies, the Wi-Fi Controlled Car project serves as a tangible testament to the exciting possibilities that arise when ingenuity meets connectivityin the realm of electronics and automation.

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