# Wi-Fi Controlled Smart Wheel Chair

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**Abstract – Internet has changed our daily life. For most of daily life work people depends on internet. The Wi-Fi controlled wheelchair using the NodeMCU, allows for remote control of the chair through an application. The internet connection is provided by the Wi-Fi module, and two DC motors are used for controlling the wheel chair. The project also includes an Android app to control the chair, which sends signals to the microcontroller through the ESP RC connection. The project serves as a practical application of the Internet of Things (IoT) in the field of assistive technology. This project will help some people who are especially abled, they can easily use this gadget they can easily move from one end to another end without any one's help. With the rise of the Internet of Things (IoT), it can be able to connect to other smart devices and sensors to provide more advanced functionality. Like, they could connect to smart home systems to automatically adjust the lighting or temperature in a room. In the future, we may see Wi-Fi-controlled wheelchairs with autonomous capabilities, such as self-driving or self-navigating capabilities. This would allow users greater independence and mobility.**

## INTRODUCTION

Internet has become an essential part of our lives. Most rely on the Internet to perform their various tasks, to make their lives easier. In fact, most people use a device connected to the Internet. The Internet has multiple processes from entertainment to data processing, task solver, process automation, education and others. Recently, a new technology, called the "Internet of Things" has begun to make room in people's lives to facilitate their various activities, without them getting too tired. The Internet of Things (IOT) can be classified as consumer IOT or industrial IOT is a new technology model envisioned as a global network of devices capable of communicating with each other. The IOT is generally accepted as one of the most important fields of future technology and is gaining vast attention from a wide range of industries. One of the utilities of the Internet of Things is the remote control of certain electronic devices. This proves useful in many areas, such as army, agriculture and many more. For example, if we want to send an electronic wheel chair (or robot) to a hard-to-reach place, such as under the rubble of a house devastated by an earthquake or other calamities. Or if we want to control a military device to spy on the enemy's activity. In short, the advantage of a remote-controlled wheel chair is to reach areas where the man cannot, does not want or is not recommended to arrive. The objective of the project is to make a machine that can be controlled remotely through an app. The internet connection will be provided by a Wi-Fi module, and for controlling the wheel chair two DC motors will be used. Thus, with the help of the web page, the wheel chair can be moved to the four-wheel cardinal points. In addition, on the web page you will be able to view the battery voltage level in real time, to know when they need to be changed.

This is a smart wheel chair made up of simple components. This Wi-Fi controlled chair runs with the Wi-Fi signal. This chair runs with a highly integrated System-on-a-Chip. This module is more powerful than our traditional Arduino-uno board. It has more memory and more processing power. The most important thing is that It has Built-in Wi-Fi Module. This small size element comes with microUSB port and can be operated with seven to twelve volts. You can also program it with Arduino IDE.

When we connect the whole circuit with the Power Supply, then it creates a server with the given service set identifier and the password. Now we must connect with the hotspot and must open the same IP address. we can give the signal to the browser address bar.

Suppose we want to give the wheelchair to go to the forward command. Then we must go to the browser address bar and type 192.168.4.1/F (We must have to declare F for forwarding in the code.) for the smart chair. In the same way, we must declare all the preferred directions in the Wi-Fi control code. Now, one by one typing all the IPs is not a good opinion for users.

So, instead of typing every time in the address bar, here we will use an app made by a developer and we will give the signals to the microcontroller. With the instructions, the microcontroller gives data to the motor Driver through the connection. In this way it will be easy for all the users. In this project we are making an esp8266 smart wheelchair. This Wi-Fi remote control chair runs with ESP8266 Module which is also known as NodeMCU. This module is more powerful than our traditional Arduino UNO Board. It has more memory and also more processing power. The most important thing is that it has Built-in Wi-Fi Module. We can control this wheelchair through a web page. This small sized NodeMCU comes with MicroUSB port and can be operated with 7-12V.

## BACKGROUND STUDY

Any mechanical-electrical system using a microcontroller that controls the motion of the system is a mechatronic system. Due to wireless and wired communication development any internet connected devices, no matter of the geographical position, can be controlled and the data can be extracted. One of the emerging fields is the one of internet controlled chairs. For this Wi-Fi controlled wheel chair, some hardware components like motor driver, nodeMCU, motors, wheels etc are used.

DC motors [1] are operated on direct currents; they come from small motors to huge ones. It can also be used on a robotic basis. Direct current (DC) motors convert electrical energy into mechanical energy through the interaction of two magnetic fields. One field is produced by a magnet of poles assembly, the other field is produced by an electrical current flowing in the motor windings. These two fields result in a torque which tends to rotate the rotor.

Here, an H Bridge motor drive called the L298n is utilized. This motor drive has numerous controls. A device constantly needs push to complete its task. In his approach, power plays a crucial role in how Node MCU functions. If two components have different power supplies, the output is better. L298N module [2] is a high voltage, high current dual full-bridge motor driver module for controlling DC motor and stepper motor. It can control both the speed and rotation direction of two DC motors. This module consists of an L298 dual-channel H-Bridge motor driver IC. This module uses two techniques for the control speed and rotation direction of the DC motors. A motor driver showcases itself as an interface between the motor and the microcontroller. The reason is that the microcontroller and the motor work on different ranges of voltages. The engine will use up a higher current level than the microcontroller. Two motors are parallelly connected with L298N motor driver, how to control this through an application that is studied for this project. [3]

NodeMCU [4] is an open source platform; its hardware design is open for edit/modify/build. NodeMCU Dev Kit/board consists of ESP8266 Wi-Fi enabled chip. The ESP8266 is a low-cost Wi-Fi chip developed by Espressif Systems with TCP/IP protocol [5]. For IoT start-up students, it is ideal. The devices that use Wi-Fi and tethering Hotspot are compatible. In this prototype, the nodeMCU connects to the hotspot, which has an IP address that our mobile device can use. In order for us to host or operate the prototype using the installed application. Instead of typing every time in the address bar, Here android application will be used, which must be installed in the mobile device.. The signals will be given to the microcontroller through the installed application. With the Instructions, the microcontroller gives data to the motor Driver through the RC ESP connection.

Arduino[6] is an open source microcontroller which can be easily programmed, erased and reprogrammed at any instant of time. It is also capable of receiving and sending information over the internet with the help of various Arduino shields. Arduino Uno is a microcontroller based on a board on a microchip ATmega328P. ATmega328 has 28 pins in total which has 14 digital total input / output pins, in which 6 pins are providing PWM output and 6 pins are providing analog inputs. The microcontroller operates at 5V. Arduino Uno needs crystal oscillator for 16MHz frequency. All the concepts about arduino [7], arduino uno programming [8] and all the algorithms [8] which are used for IOT based projects and training the arduino uno are studied.

The word "socket" derives from a metaphor involving electrical and telephone connections, in which sockets serve as interfaces for connecting to one another through a network. The socket interface was created by a team of Berkeley academics as part of this effort as an application programme interface (API) for TCP/IP (Transmission Control Protocol / Internet

Protocol) network communications. These sockets are the TCP (Transmission Control Protocol) and UDP (User Datagram Protocol) protocols' respective programming interfaces for stream and datagram communication of the transport layer, a component of the TCP/IP stack. Since socket programming [9] relies on connections between clients and servers, TCP offers a connection-oriented service. Connection oriented refers to the idea that a connection must be made before processes can communicate. The fact that a TCP client needs an acknowledgement from the server in order to communicate data to it makes the Transmission Control Protocol dependable. TCP automatically retransmits the data and waits for a longer amount of time if an acknowledgement is not received. Sending messages into sockets allows processes that are executing on different machines to communicate with one another. Every process can be compared to a home, and the process' socket to a door. Consumer electronics frequently use lithium batteries. They have high energy-to weight ratios, a high no load voltage, a low self- discharge rate, no memory effect, and a gradual loss of charge when not in use, making them one of the most widely used types of rechargeable batteries for portable gadgets. Battery is the source of electrical energy in stored form Lithium-ion Battery is a rechargeable battery, supply of 14V.Jumper wires are used for connection in prototype and wheels are providing motion to the prototype.

## PROPOSED METHODOLOGY

The first important thing to remember is that we will be programming the Arduino and it is responsible for configuring the ESP8266 Module through Serial Communication and also controlling the L298N Motor Driver Module. So, the Digital Pins 2 and 3 of Arduino are configured as RX and TX using the Software Serial function. These pins are connected to the TX and RX pins of the ESP8266 Module. Then, the Inputs of the L298N Motor Driver Module i.e. IN1, IN2, IN3 and IN4 are connected to Digital Pins 8, 9, 10 and 11 of Arduino UNO. Coming to the robot chassis, it has 2 wheels. So, I have connected them with the motors in parallel and connected them to OUT1 and OUT2 terminals of the Motor Driver.

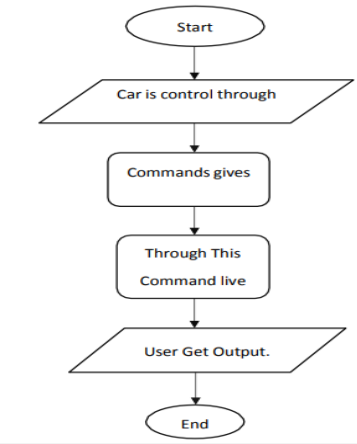


Fig. 1: System Flow

Here, Fig. 1 illustrates the working flow of the Wi-Fi wheel chair. Two 9 volt batteries are connected into this socket for power supply .Here for arduino no power supply is used; this esp8266 Wi-Fi module is using the power supply from the laptop. Then upload the code into the esp8266 and go to compile. After completely compiling one monitor page is open and also one hotspot is given “Make DIY”. Now install the android app to give the manual command .And connect the hotspot . After completing all the steps, the project is ready to run. When you click the right arrow then inside into the monitor is showing “F” it means Wi-Fi control car can go forward direction. Similarly click the down arrow go backward “B”, and click the left for go to the left “L”, and click the right one for go the right “R”. Also we can control the speed up to 1023 m/h. When this wheelchair is stopped it continuously shows “S” into the monitor.

## ALGORITHM

- Step 1: First connect two 9 v batteries into this socket.
- Step 2: open our Arduino-Uno software and connect through the usb type cable on ESP-8266 module.
- Step 3: upload the code into ESP-8266 module.
- Step 4: when uploaded is done one blue light is blinked from esp-8266 module. Then one Arduino commend page is created.
- Step 5: We need to install our app” NodeMcu Car”.
- Step 6: Then our ESP-8266 through a Wi-Fi signal name is “Make DIY" we need to connect

this open Wi-Fi into the phone where our android app is installed.

- Step 7: Now our project is ready to work when we click the up arrow on the app, then the wheel moves forward, and the back arrow moves backward. And also, we can control the wheel speed as well. and all the command are shown into this Arduino commend page.

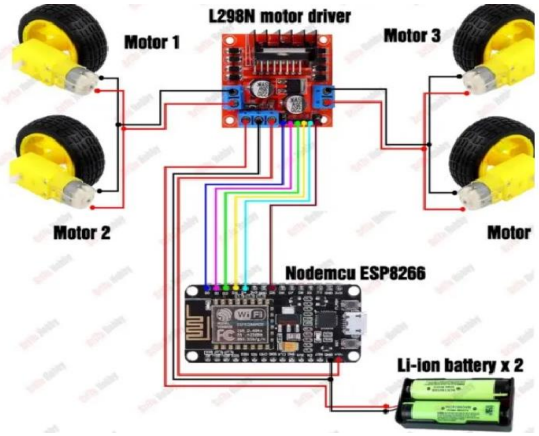


Fig. 2: Circuit Diagram

Fig. 2 illustrates that how the circuit of the prototype of Wi-Fi wheel chair is designed. Arduino is programmed and it is responsible for configuring the ESP8266 Module through Serial Communication and also controlling the Motor Driver Module. So, the Digital Pins 2 and 3 of Arduino are configured as RX and TX using the Software Serial function. These pins are connected to the TX and RX pins of the ESP8266 Module. Then, the Inputs of the Motor Driver Module are connected to Digital Pins of Arduino UNO. Coming to the robot chassis, it has geared motors. Motors are connected in parallel and connected to OUT1 and OUT2 terminals of the Motor Driver.

## RESULT & DISCUSSION

We can use this WIFI Controlled model in various Assistive devices like Trolley bags, Home automation. We can also use this mechanism in various fields like Low range Mobile Surveillance, Devices Military Applications (no human intervention). The robot is small in size so can be used for spying also. With few additions and modifications, this robot can be used in the borders for detecting and disposing of hidden land mines. The robot can be used for reconnaissance or surveillance.

In future multiple sensors can be added in this model. Size and shape of the model can be modified according to the requirement. We can also mount the web camera in the mechanism, which can be used in various fields such as spying, or for military uses. It is a rapidly growing field, as it continues to research, design and build new robots that serve various practical purposes, whether domestically, commercially, or militarily. However there's a still lot of scope for future improvement and add-ons in practicality.

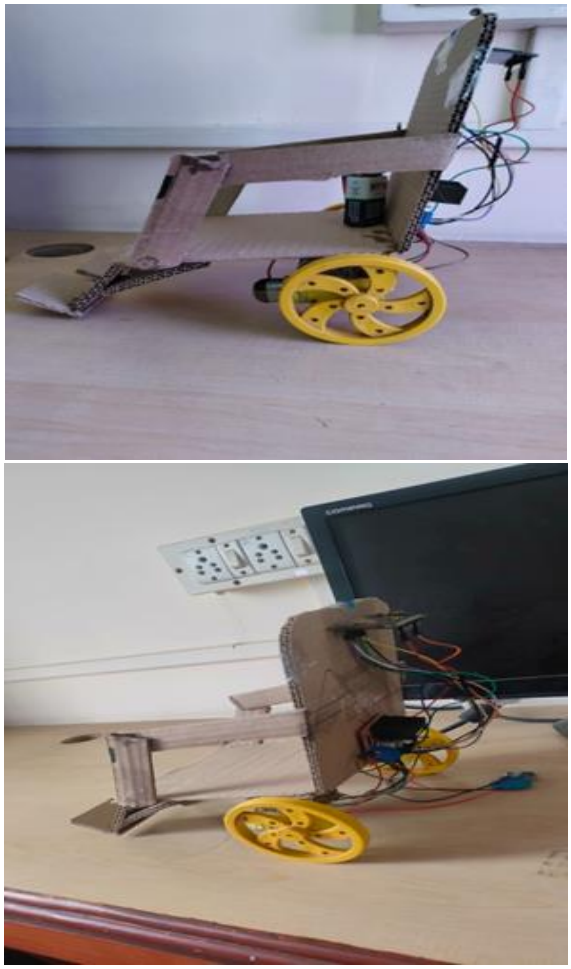

Fig. 3: Project Model

Figure 3 illustrates the prototype of the Wi-Fi wheel chair from two different angles

## CONCLUSION

This article tried to present a prototype wheelchair that can be controlled remotely by an operator using a web-page medium. The commands are sent to the chair using data packages exchanged via Wi-Fi. The dimensions and type of electronic components in the

wiring diagram (resistors, capacitors, diodes, and transistors) were chosen according to the recommendations in the catalog sheets and the working frequency. The idea of development of remote monitoring work and prototype system using a Wi-Fi controlled RC car controlled by mobile phone which work as a remote. The different hardware components and studies were done to investigate the best approaches to combine the parts in order for them to Communicate with a web interface the camera acts as the viewer, either to provide surveillance view or to When used for surveillance or other purposes, the camera serves as the viewer guide the user while remotely navigating the car. The web interface enables live streaming video, while the user is equipped with a navigation controller panel that enables control of the movement of the RC car. This project may be utilized with a completely functional prototype for monitoring purposes in building, in a hazardous location, and other such locations. Several improvements can be made to enhance the capability of the project. For example, the camera may be upgraded to a higher-quality camera to boost the quality of live streaming.

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