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Wireless Car Using WIFI – IoT - Bluetooth

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Abstract - *A working prototype has been designed to control a car Wirelessly using an Android Application. This is done with the help of Arduino, a microcontroller, interfacing it with Bluetooth module and wifi module for better connectivity. Android application is used by the User to send data wirelessly either by Bluetooth Connection or by connecting to the Arduino using Wifi. This data is an input to the microcontroller system and the microcontroller uses it as the controlling parameter to the underlying hardware. The prototype also captures the real time video using a video camera interfaced with the arduino and the user can locate the position of the device connecting to the cloud service provided for the captured real time video.*

Key Words*: *Arduino, ESP8266, Bluetooth Module, Blynk App

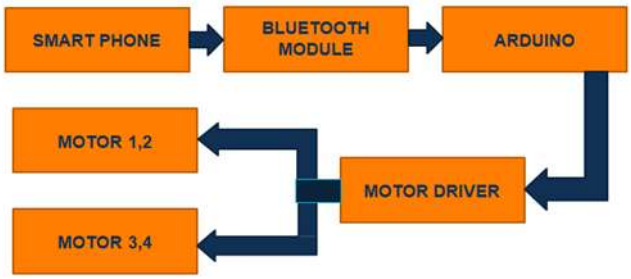
1.INTRODUCTION

Designing of a Bluetooth or Wi-Fi controlled wireless car is the main motto of this project. Bluetooth technology used has an average range of 10 m , due to which the car cannot travel a longer distance. So Bluetooth controlled automated cars have limited range issues. This limitation has been solved by using a Wi-Fi Module with a better range and wireless connectivity. Another key point behind developing a the project is the use of Android Application rather than traditional hardware controllers, that effectively reduces cost. The wireless car is controlled via smartphone which is connected to the Bluetooth module and a Wi-Fi module . This Android Application has been developed with the required software tools (Android Studio) and it works as a controller that controls the movement of the car. Arduino Uno has been used as a microcontroller to drive this project. Arduino board provides an ease in terms of hardware interfacing and the coding is done using Embedded C software. [9]

An additional feature to this working prototype is capturing real time video. This real time video can be seen on the application on which the camera is been connected and the videos recorded can be stored in the cloud that is available through the camera. This ensures security of the model in case of obstacles.

Existing technologies related to the development of the project were studied. These technologies even used arduino as a backbone of the entire prototype and leveraged the efficiency of the controlling system using the Arduino NodeMCU module. This ensured a wide range using the prototype.[1] This project differs from the studied technologies as it also captures the real time video and provides user the privilege to view it using an online cloud service that comes with the Camera module. Also the project is developed such that it initiates the connection between three technologies: Wifi, Bluetooth and IOT

1.1 Block Diagram



The rudimentary task is to enable switching between different ways of communication whenever required. This is achieved with the help of a potentiometer. The entire range of potentiometer is divided into three different ways of communication namely; Bluetooth, WIFI, and the internet. The range of Bluetooth is around 10m. The range of WIFI is 100m and the range of internet is unlimited as long there is internet connection. The security level is moderate in Bluetooth, low in WIFI and very high in internet. Hence IOT is considered as the most reliable and efficient way to control the car. Once potentiometer is set low enough, the HC-05 starts reading information from the Bluetooth app. Based on those commands the car responds. If the potentiometer is set on a higher level the WIFI is selected. In this first the mobile has to connect itself with the WIFI created by NODEMCU. Once connected the app sends the data over to NODEMCU. The car works seamlessly. Now before going into the IOT we have to reset the car and pull the potentiometer to the highest level. Once the NODEMCU is connected to the internet the BLYNK app helps you send

command over the internet from anywhere. Hence all the three ways of communication are interfaced using single processor with just the help of potentiometer. [9]

2. HARDWARE DESCRIPTION

Following are the hardware components used to develop the project. Arduino works as the main hardware component. All the components are interfaced and coded using Arduino. Interfacing of hardware is done with the help of connecting wires and the coding is done using C programming that provides functionality to the interfaced hardware.

2.1 Bluetooth Module:

Bluetooth Technology is an IEEE 802.15 standard named in honour of the King of Denmark, Harald Bluetooth. It is used in short range communication between cell phones, laptops, PCs. It uses a standard 2.4 GHz frequency so that all Bluetooth enabled devices are compatible with each other. It uses a technology called Frequency Hopping Spread Spectrum. There are various classes of Bluetooth technology that differentiates each other from Maximum Permitted Power and its operated range. Class 1 provides maximum permitted power of 100mW and operated range of 100m. Whereas Class 2 is used in applications requiring maximum permitted power of 2.5mW and operated range of 10m.

The Bluetooth module used will act as a one to one communication medium between the android application and the Arduino board. Bluetooth Module HC-05 has been used for this project. HC-05 Bluetooth Module is an easy to use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup. Its communication is via serial communication which makes an easy way to interface with controller or PC. HC-05 Bluetooth module provides switching mode between master and slave mode which means it cannot be used for receiving or transmitting data. [1]

2.2 NodeMCU ESP8266

The ESP8266 is a low-cost WiFi microchip with full TCP/IP stack and microcontroller capability produced by manufacturer Espressif Systems in Shanghai, China.

The ESP8266 is the name of a micro controller designed by Espressif Systems. The ESP8266 itself is a self-contained WiFi networking solution offering as a bridge from existing microcontroller to WiFi and is also capable of running self-contained applications. This module comes with a built in USB connector and a rich assortment of pin-outs. With a micro USB cable, you can connect NodeMCU devkit to your laptop and flash it without any trouble, just like Arduino. It is also immediately breadboard friendly.

The Wi-Fi module will act as an interface between Smartphone and bluetooth module . We will be using NodeMCU ESP8266 module for the system, which can be used as either receiver or transmitter. Generally our transmitter will be smart-phone and receiver will be Bluetooth module.

2.3 L298N-Motor Control Driver Board:

L298N Motor Driver is a motor controller breakout board which is typically used for controlling speed and direction of motors. This motor driver is used to drive our motors so that the car can be used for surveillance. The motor A and B are connected together and the positive and negative terminal is connected to the OUTPUT A that is provided on the motor driver , so that the motors can run softly. Similarly motor C and D are connected together and the positive and negative terminal is connected to the OUTPUT B so that the desired output is obtained. A 12V/1.3 Accuplus R Battery (8507) is been used to diver the motors and all the system components connected. This battery is connected to a 12V supply provided on the motor driver.

The Enable pins A and B and the logic inputs all are connected to the NodeMCU ESP8266 module so that the data sent from that module helps us to drive the motors properly.

2.4 12V DC Geared Motors- 200 RPM:

200 RPM Side Shaft 37mm Diameter Compact DC Gear Motor is suitable for small robots / automation systems. It has sturdy construction with gear box built to handle stall torque produced by the motor. Drive shaft is supported from both sides with metal bushes. Motor runs smoothly from 4V to 12V and gives 200 RPM at 12V. Motor has 6mm diameter, 22mm length drive shaft with D shape for excellent coupling.

Note: This motor will be bit noisy while running. For long life, this motor is not recommended for application requiring dynamic torque of more than 3 kg-cm.

2.5 Camera Module:

i) CLOUD RECORDING: Keep recordings safe on FTP server even if camera is stolen / broken.
ii) 360 DEGREE MOBILE CONTROL: Rotate camera horizontally or vertically from anywhere in the world using mobile application.
iii) IR NIGHT VISION: HD night vision with inbuilt IR lens. iv) MOTION DETECTION: Will send alerts whenever any motion is detected.
v) WAY AUDIO & SD CARD SLOT: Video chat with inbuilt microphone & speaker. No need of computer. SD card slot to record images & videos. No need of separate DVR.

3. SOFTWARE DESCRIPTION

Arduino software is used to put the instruction of whole functions of this system to the microcontroller. Here we use programming language 'C' for coding. The program for executing this project has been written in C language. The program is burnt in the microcontroller using burner software. The program is stored in the EEPROM of the microcontroller, which is present in the NodeMCU ESP8266. By this software we put the data and instruction for forward, backward, left, right operation of this system. In android application when we press a button, a corresponding signal is sent through the Bluetooth to Bluetooth module (HC-05) which is connected with the NodeMCU ESP8266 . Similarly a android application is been built for Wi-Fi module and when the buttons been pressed through the application the corresponding signal is been sent through the NodeMCU ESP8266 and the motor driver drives the wireless car. When signal data arrives the NodeMCU ESP8266 the pin which corresponds to the particular input is set to high. Now that pin gives the output to the motor driver section. Motor driver switches accordingly the data bit, if the data bit is low then the corresponding pin of the motor driver doesn't work else high bit then the corresponding pin of the motor driver is on. We have used Arduino IDE version 1.8.1 for writing program. There are two steps of the programming. First set up section where we define all the variables. Second loop part where the program runs continuously.

FIGURE A

3.1 APPLICATION DEVELOPMENT

Application Development was one of the important part of our project. We had to develop controller applications for both Bluetooth and WiFi so that by connecting them we could drive our wireless car easily. We used the MIT App Inventor 2 for the application development process , and inserted desired things that we needed in our applications to run our wireless car . We added buttons for driving i.e. Front , Back , Right ,Left for driving the wireless car , and also added the connectivity i.e. Bluetooth or WiFi so that we need connect the car either to Bluetooth or WiFi and drive the car easily and smoothly.[5]

FIGURE B

4. CONCLUSION

The implementation and testing of the wireless car using BLUETOOTH + WI-FI + IOT was done and the desired results were obtained. We successfully drove the car and the car can be used for surveillance purpose. We also tested the applications used to drive the car. Due to the new concept of Wireless Controlled Car using Bluetooth, Wifi and IOT, we were able to come up with various possibilities that can take place.We were successful in making an android application that can be used for driving and giving commands to the car.

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