

CS5041 – Practical 4 – Special Project Practical

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ABSTRACT

The report is about the final assignment of the CS5041. The paper mainly describes the program's design and the implementation. There will be three main parts of this paper. The first part is an introduction which is a brief description of the program. Then, the next part is the implementation, which involves the details of the program's implementation. In this section, there will be some subsections, because there are two divided parts of the system. To show the information more clearly, there will be some original codes shown in the report. Moreover, some pictures of the functions' demonstration will also stick in this report. The last part is the conclusion and evaluation of the assignment, both the advantage and flaws are involved in this section.

INTRODUCTION

This system implemented the wireless remote-control car. The controller is the tablet that based on Android system. The user can control the remote-control car by using the application installed in the tablet, which is the software of the system. On the other hand, the aspect of the remote-car, it mainly implemented by the Arduino R3, which is the hardware of the system. The system is the combination of the software and the hardware. The software is responsible for sending control command, and the hardware can receive the command from the software, and execute different movement corresponding the command, like make the car move forward or make a turn.

IMPLEMENTATION

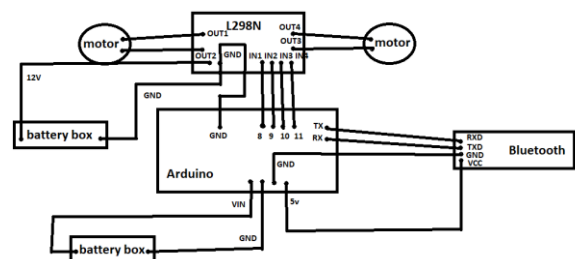
Hardware

Except for the Arduino R3, the remote-control car still needs other components. The car has three wheels, one of them is the universal wheel, and other wheels are connected to motors. Moreover, the car needs the motor controller drive module, which is L298N in this system. Besides, there are two battery boxes, that support power to Arduino and the L298N. To receive the command from the software without wire, the system uses the Bluetooth which is HC-06 to achieve this goal.

The operation mechanism of the hardware aspect is not too complicated. The Arduino receives the operation command from the user by the Bluetooth. Then, the Arduino will execute the corresponding action based on the command and the program that stored in it advanced. Moreover, the action will influence the motor controller drive module to enable the wheels to turn. For example, the user presses the move forward button, then the Arduino received the message, then allocating different digital signals to every port. The digital

signal will support the battery to motors and make them turn through the motor controller drive module.

The following picture shows the connection of the hardware. The Arduino and L298N have the individual battery box to support power because one 6v battery is hard to support power to Arduino and the L298N at the same time. The motor will not have enough power to turn, so they use the individual battery. The input of the motor drive module connects the digital port of the Arduino. Moreover, the output of the L298N connects to the motor. The critical point is that the L298N and the Arduino have to use the same ground. Besides, the Bluetooth's power is supported by the Arduino, in other words, they use the same battery box. Moreover, the TX port and the RX port of the Bluetooth is respectively connected to the RX port and the TX port of the Arduino.



1-1

After connecting these components, the Arduino needs to store the program that computes the received message and control the output. Next, there are some example codes for every step.

At first, stating the variable for received message and the port connected with motor controller drive module.

```
char getstr;
```

```
int Left_motor_go=8;
```

Then, initializing the pin mode of the port.

```
pinMode(Left_motor_go,OUTPUT);
```

Next, based on the diverse command, the program executes different function.

```
if(getstr=='A')
```

```
{
```

```

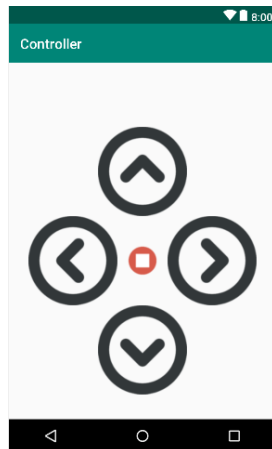
Serial.println("go forward!");
run();
}
void run()
{
digitalWrite(Right_motor_go,HIGH);
digitalWrite(Right_motor_back,LOW);
digitalWrite(Left_motor_go,LOW);
digitalWrite(Left_motor_back,HIGH);
}

```

Software

This software program developed based on the Android platform, which aimed to create an application that can run on the Nexus 7 with the API in version 23. The primary function of the program is controlling the remote-car.

The application is very simple with one activity. Four buttons are using to control car's running directions. The car will run straightly when the user presses the up button, and the car will stop when the user releases the button. The other buttons' function is similar but with different running direction. The following picture is the application's activity.



1-2

The application will connect the Bluetooth automatically when the application is running. It will be based on the MAC address of the Bluetooth, connecting the Bluetooth on the remote-car. If the connection is successful, the sign light of the Bluetooth will keep the light on rather than twinkling. The code for implementing the Bluetooth is referred on the internet. The next step is compiling the press event and the release event. Both events will execute the function that sends a message through the Bluetooth, but the content of the message is different. For example, when the user presses the button, the program will send the message that will make the car move straight. Then the user releases the button; the program sends the stop command to the remote-car.

```

if(event.getAction() ==
MotionEvent.ACTION_UP){//release event
    bluesend(bytestop);//send message
}
if(event.getAction() ==
MotionEvent.ACTION_DOWN){//push event
    bluesend(byteup);//send message
}

```

COMMENTARY

The remote-car system is very interesting, and it is not very difficult to develop. However, during the development, there were also many confusing problems like the correct way connecting the L298N with the Arduino, and make the application match the Bluetooth. There are many ways can make the system better, like the increasing remote distance. The Bluetooth limited the remote distance. As for the application, it can only match the specified Bluetooth because the Bluetooth MAC address has been set in the program.