Automated Advanced Remote-Control Car System

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Abstract: 21st century, the era of digitalization. It is expected that in this era, robot will take the role of human in every sector and will make the human's work easier. Everyone is working at their best for technology to push it to a new level. Our work is a sample of it. In this paper, we are going to discourse about our project named Automated Advanced Remote Control Car. Our car is not like just other ordinary cars because of the specialty that it has. First of all, we are going to make our own app to control our car. All the input situations will be given from our own application. First we want to run our car by an application through a server. Secondly, whenever obstacles are found, our car will detect those obstacles and will choose an alternative way to bypass the obstacle.

Keywords: Automation, IOT RC car, Bluetooth, Arduino, Google Firebase, Realtime database.

1 Introduction

"Besides black art, there is only automation and mechanization"-Federico Garcia Lorca. Automation is one of the most advanced technology in this era that can lead the next century. It is a technology which can be performed without human assistance. Our project is also related with automation. The project that we are proposing in this paper is Automated Advanced Remote control Car System. Like Automation, our car is not controlled by human. It is Automatic and it can choose its own way whenever it finds any obstacle. It also has a camera by which it can take pictures of night vision, can do zoom in and out, autofocus, both video and voice record, swap camera, LED flash, camera and color adjustment. Our car has variety of features that gives great efficiency of its work.

1 Proposed model

Our model includes a robotic vehicle which adds Arduino Uno board and a Bluetooth chip on it. This chip is added to the Arduino and it communicates with an android application for the serial communication with Arduino. By an web application, our car

can get predetermined routes. Apart from this, the main feature of our car is that anyone can control it by being connected to any Wi-Fi or Internet. Our car has an auto pilot mode this mode will automatically avoid obstacle and go ahead. For this, we use Google firebase real time database to save our route and control our car.

The web application will save the routes that one just played. It is because if anyone forget the route, it can automatically drive it towards the destination.

Fig.1. Working process of our model

2 Components

We use Arduino UNO, Bluetooth Module, Sonar sensor, Four led light Power Supply(12.5V), Four DC motor, Four Wheels and an Android phone.

Arduino

Arduino is an open source prototyping platform based on easy-to-use hardware and software. Arduino contains an ATmega328P microcontroller. Arduino circuits are programable with Arduino IDE(Integrated Development Environment) apart form this There are Arduino libraries for JAVA, C++ so it's easy to code without Arduino IDE.

L298N Motor Driver

In our project we use L298N motor driver because of it's feature those are

1: It can handle 5V to 35V DC.
2: It can control 4 motor at a same time.
3: It has an speed control feature.
4: Screw terminals for easy Connection
5: It supports current sensing.

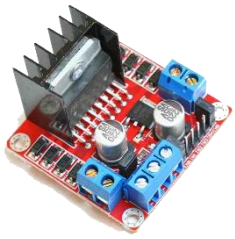

Fig.2. Motor Driver

Android Device

Android is an operating system fully based on Linux and created by google. In our project we are using a Samsung Galaxy S4 device to broadcast the live camera from our car and also we are using serial communication with Arduino to control the car and the commands are coming live from firebase database. We can control the camera from internet and there are so many modes available in our web application like night vision, zoom etc.

HC-SR04 Sonar Sensor

In our project we are using Sonar Sensor for automation and to avoid obstacle it creates a 40,000Hz sound to detect obstacle in front of it. In sonar sensor we transmit sound from trig pin and receive sound from echo pin and calculate the distance.

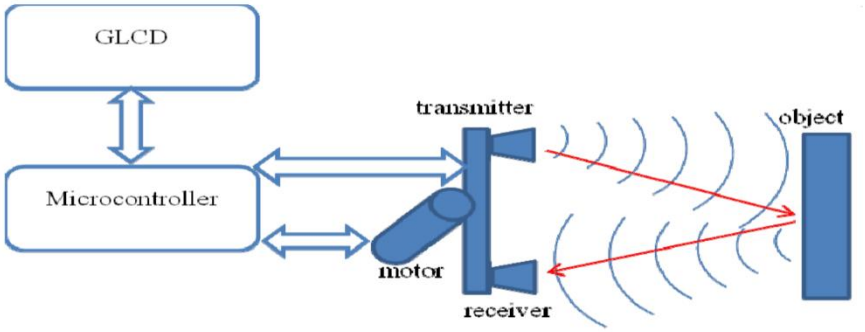

Fig.3. Data Transmission of Sonar Sensor

Bluetooth HC-05

Bluetooth is a technology by which we can transmit data from once place to another without using any kind of a cables or wire. In our project we use Bluetooth HC-05 module which can connect once device at a time and in this place the device is our android phone. There are three power modes available for a Bluetooth module. They are sniff mode, hold mode and park mode. These modes are selected depending upon the requirement for a Bluetooth device [3]. It uses CSR Blue core 04-External single chip Bluetooth system with CMOS technology and with AFH (Adaptive Frequency Hopping Feature [4].

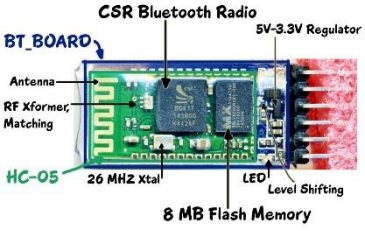

Fig.4. Bluetooth Module

3 Experimentation

We used Bluetooth module, car casing, motors and motor driver, servo etc. for making up our project. We wrote our code on Arduino IDE to run. We made an application through the server that could control the speed and left right combination of our car. This was interesting in every way because we were using our own application to run our own car.

1 Route Setup

We set up our route on server. We defined the forward move, backward move, left move, right move by tapping that button till reached to our wish value. By doing this, we had a value in every move of it. So, our car knew how much it was needed to go forward, backward, left and right.

2 Application

We made our mobile application on JAVA. We used Android Studio 3.0.1 IDE instead of Eclipse IDE as Google now recommends Android Studio. In our app, we retrieved data from firebase database and push the data to the Arduino Module through Bluetooth

3 Camera Set Up

This is one of the specialty that our car has. Our car can take different sort of image from different type. For set the camera, we had to put our device above of the car so that our camera could have a better view to capture everything. After settled everything, our car was able to take night vision image, we were able to zoom in and out for any object autofocus to any object, both video and voice record, swap camera front and back, LED flash at night, camera and color adjustment.

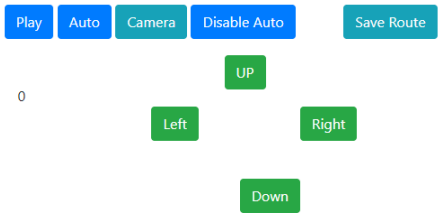

Fig.5. Car Controls (Web application)

Fig.6. Car connections

4 Performance Analysis

We divided our experiment into part by part where we did experiment on our chassis of the car, interaction with hardware and software, advanced sonar detection and last but not the least automatic movement. In our experimental case we run the motor and chassis of the car over 10 time and it gave the success result at 8 times which is 80%. Then we install our microprocessor (Arduino UNO) with the motor driver and motors. Here we

basically test the interaction with the software and hardware. We found that the whole system interaction was successful 11 times out of 15 times which is 73.3% success. After these we moved on the advancement part where we tested the sensors and automation technology. In this part at first we tested the sonar sensor and we got 60% success rate and the automation technology gave us 55% success rate which increased in our post experimental test. After the experimental test we moved on post experimental test. Here we examine the performance and higher development. It gives us the boosted performance than the experimental test. Here we got some problems in speed control and turning. We are working on these to resolve the problems. We got almost 83% success rate here and still we are developing. We are assuming by analyzing the previous results that the success rate would be in 90%.

5 Results

In total we test our product over 45 times and we got our expected result almost 32 time. Which is bearing almost 74.1% success rate.

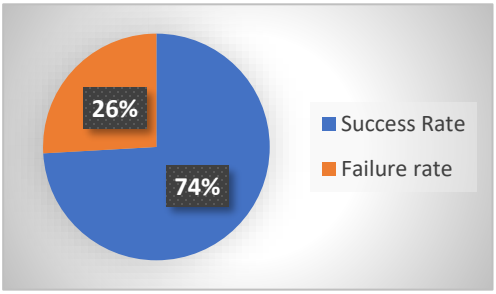

Fig.7. Success failure rate pie chart

6 Evaluation

We tried our best to resolving some real life problems through our project. Now we are going to analyze our project that is how we are different from others and some improvement areas also.

6.1 Advantages

We choose Bluetooth technology for our project's communication. We choose this because of its cheap price and availability. Though we can find similar on some projects but still we

are carrying some features which make our project unique. We also used a ATmega328P microcontroller here.

Table 1. ATmega328P vs At89S52

ATmega328P	AT89S52
Has 8 KB self-programmable Flash memory	Has 8 KB in-system programmable Flash memory
Uses RISC instruction set, which is faster	Uses CISC instruction set, which is faster
Has higher code memory and RAM	Has higher code memory and RAM
The IDE and the compiler of Arduino is free. and this microcontroller comes installed onto the board with a number of additional packages	The board needs to be bought (costs around USD 35.00) or constructed at home
Is simple to program, and supporting hardware's are easy to learn to work with	Comparably harder to work with
Has 1 KB of internal SRAM	Has 128 bytes of internal RAM
Can maintain an operating voltage of at least 7.2V	Can maintain an operating voltage of 2.7-6V
Has 23 I/O lines	Has 15 I/O lines
Has programmable serial USART (Universal Synchronous and Asynchronous Receiver and Transmitter)	Has programmable serial UART (Universal Asynchronous Receiver and Transmitter)

From the two comparison we can see that we used best microcontroller in this project in our range.

6.2 Disadvantage

As we know we are using the Bluetooth technology for cheaper price and availability but this can be performed in short range. For long range or remote operation we have to replace the communication modules into some long range communication module like or GPS. We can also use Arduino MEGA. The performance and pins are advanced in MEGA than UNO. Here we can see the difference,

Table 1. Arduino UNO vs Arduino Mega

Arduino Uno	Arduino Mega
It has 1 KB EPROM	It has 4 KB EPROM
Has an SRAM of 2 KB	Has an SRAM of 8 KB
Has an Flash memory of 32 KB	Has an Flash memory of 256 KB

Has 1 UART (Universal Asynchronous Receiver and Transmitter)	Has 4 UART (Universal Asynchronous Receiver and Transmitter)

7 Conclusion

Our project in reality is a productive venture because of the usefulness that it has. In this paper, we proposed a car project that has a sense to choose his own ways whenever it found any obstacles and it will be controlled by an Android application All in all, in our project we tried to represent the automation technology in a very simple car. We firmly believe that if our project is used in a mining system, it can have tremendous result.

8 References