Wi-Fi Remote Control Car Via Mobile Device

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ABSTRACT

The goal of this project was to design and build a Wi-Fi Remote Controlled Car via Mobile device. The idea was to first design the interface of the application, settings, camera live view and their overall purposes. Using our own previous knowledge of programming in general combined with X-code programming language. I plan to come out an idea of an automobile controlled, using accelerometers. In order to do this, we need a remote control that using wirelessly transmits that used RF technology, and data to the vehicle to move in any way. Moreover, it is also contain an automatic mode, which the car moves in the direction that control by the user. Mobile device screen is located on the remote control to displays the direction, mode and distance to plan on the distance, direction and mode by a button. By doing this project, I found that there are several problem need to overcome as currently remote control car is not using accelerometer. Finally, all of us all like to play with remote controlled vehicles.

ABSTRAK

Matlamat projek ini adalah untuk mereka bentuk dan membina Wi-Fi yang Jauh Kereta Kawalan melalui Peranti Mudah Alih. Idea ini adalah untuk pertama reka bentuk antara muka permohonan, tetapan, live view kamera dan tujuan mereka secara keseluruhan. Menggunakan pengetahuan sebelumnya kita sendiri pengaturcaraan umum digabungkan dengan X-kod bahasa pengaturcaraan. Saya bercadang untuk keluar idea kereta dikawal, dengan menggunakan pecutan. Dalam usaha untuk melakukan ini, kita memerlukan kawalan jauh yang menggunakan tanpa wayar menghantar bahawa teknologi RF digunakan, dan data kepada kenderaan untuk bergerak dalam apa-apa cara. Selain itu, ia juga mengandungi mod automatik, kereta yang bergerak ke arah kawalan oleh pengguna. Skrin peranti mudah alih yang terletak pada alat kawalan jauh untuk memaparkan arahan itu, mod dan jarak untuk merancang pada jarak, arah dan cara dengan butang. Dengan melakukan projek ini, saya mendapati bahawa terdapat beberapa masalah yang perlu untuk mengatasi sebagai kereta kawalan jauh kini tidak menggunakan pecutan. Akhirnya, kita semua tidak suka bermain dengan kenderaan kawalan jauh.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

RC : Remote Control

PWM : Pulse Width Modulation

GHz : Giga-Hertz

Kbps: Kilobits per second

Mbps: Megabits per second

Ms: milisecond

1.1 Introduction

In my final year design project for WIRC, I plan to come out an idea of an automobile controlled, using accelerometers. In order to do this, we need a remote control car that are using wirelessly transmits by RF technology, and data to the vehicle to move in any way. Moreover, it is also contain an automatic mode, which the car moves in the direction that control by the user. Mobile device screen is located on the remote control to displays the direction, mode and distance to plan on the distance, direction and mode by a button. By doing this project, I found that there are several problem need to overcome as currently remote control car is not using accelerometer. Finally, all of us all like to play with remote controlled vehicles.

1.1.1 Objective

- To enable the connectivity of the Remote Car transmit Using Wi-Fi-signal via Ipad
- To enable the Remote Car to be controlled by using Accelerometer
- To enable life view to the Remote Car to be view and controlled on the Ipad Screen
- To enable sound input from the Remote Car and transmit through Wi-Fi-signal to Mobile device

1.1.2 Project Scope

- Children above than 5years old
- Primary School- student, teacher, parents,
- Secondary School-student, teacher, parents
- University – student, lecturer, Researcher and social society.

1.1.3 Problem Statement

- Remote car currently is using on the radio- frequency and will give range limitation
- Remote car is not using Accelerometer concept and just using left and right button.
- There are no life view in Mobile device to view what happen surround to your remote car
- Remote car have no voice input to record voice

1.2.1 Review of Previous Work (TRCC)

This research uses a client computer to control an RC car, which is connected with a server computer via the Internet movement by the MPEG-4 video and the G723 audio via the Internet network using WLAN.

1.3.1 Description of the System (TRCC)

A remote user can used client computer and remote live video to control the robot via the Internet network. They exported to remote a robot arm via the Internet for a real-world execution. They used tele-robot-arm to draw a picture, which looks like four petals flower. Presented system architecture of the Internet based tele-laboratory, which allows users to remote control and program online robot. Based on the researches, this research objective is to purpose the controlling RC car via the Internet network.

1.4.1 Terminology (TRCC)

The research is separated into two parts. The first part is the client part for a user to send the remote commands to operate the RC car. The second part is the server part for receiving remote command and operating the RC car based on the received operation. Both server and client system are installed in the Internet network for a remote controlling purpose as shown in Figure 1.

Figure 1: The conceptual diagram of the TRCC system.

1.5.1 Method approach (TRCC)

Both client and server computer use the Windows-XP for an operating system. The application software develops based on the Visual Basic 2005 as shown in Figure 2 below.

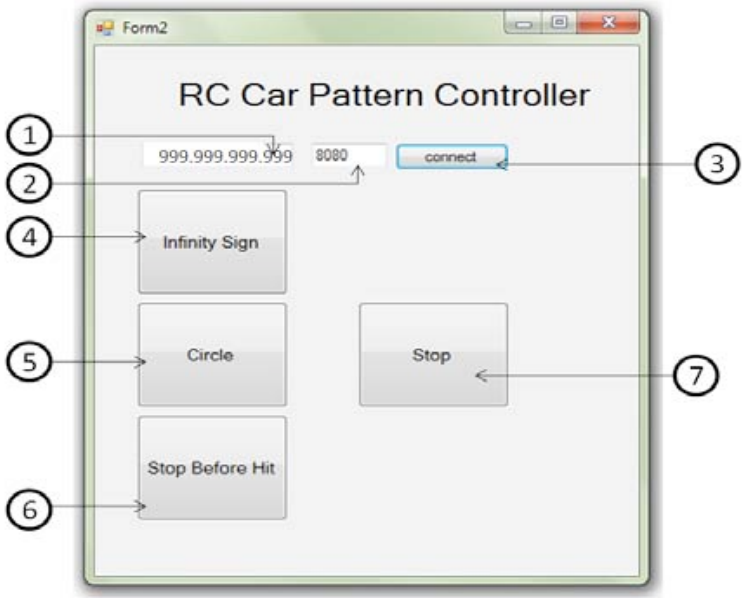

Figure 2: The pattern commands user interface screen.

1.6.1 Limitation of the system (TRCC)

RC car has some limitations as the following:

- The RC car is a cheap car with some hardware performance limitation. It uses a simple motor (not stepper motor) to drive a car. Therefore it will have inertia force after commands were sent. The limit distance of radio signal to control an RC car, which connects to the server site. So, the car cannot operate far from the server site.
- The RC car use 1.2Volts rechargeable battery and need to set to a high level of voltage before perform all testing.

1.7.1 Future plan of report (TRCC)

RC can apply to many applications include: 1) military to detonate a buried bomb, 2) industrial to perform the remote controlling tasks and 3) security guard to monitor the restriction area.

(Chomtip Pornpanomchai, Nutdanai Trakarnsirinont,. Dec 2011)

1.2.2 Review of previous work (Wifi Robot)

Figure 3: Wifi Robot System

"A few month ago, author of the system discovered that the Linksys WRT54GL router. It's very user-friendly in that can runs in Linux and some of the hardware has been reverse engineered. A huge of alternative firmware versions have been created for this router. Wifi-Robot idea was created by them.

The mainly purpose of this article is to give a high-level overview of the project and give more deeper details of the software and electronics all about. It doesn't mean to be a step-by-step on how to use, but you should have enough information with motivation and some background knowledge in electronics and software in order to make your own wifi robot system." (Bennet John, August 2008).

1.3.2 Advantages and Disadvantages of the project (Wifi Robot)

Microcontroller	PIC16F628A	Arduino (ATmega168) Freeduino MaxSerial	AVR Butterfly (ATmega169)
Advantages	level of software control	Much more simple to code in Programing laguange C because many built-in libraries.	Simple to code a application than the PIC (C) with serial little soldering involved
Disadvantages	Difficult to code a program (assembly). It have to screw up the circuit by hand with excessive serial hardware required (MAX232A) extra programmer required	Price expensive	bootloader error integrated peripherals cause weird output voltages price expensive

1.4.2 Method Approach (Wifi Robot)

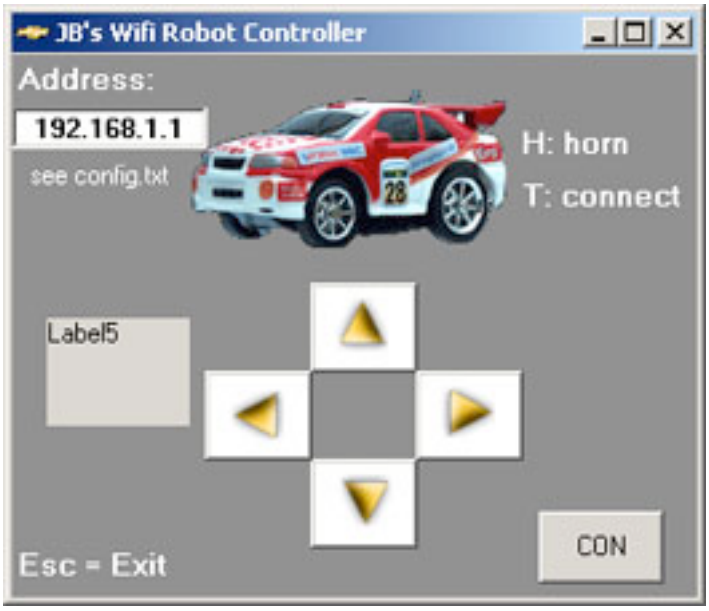

Figure 4: WiFi Robot Controller

In order to create this project to function well, you need three type of software program. The Visual Basic 6 Wifi_Robot client application will be runs on Windows), we use C to write the Car Server in order to built on the router process Open WRT White Russian version 0.9 (Linux), and the microcontroller firmware program. Verified 'firmware for PIC16F628A microcontroller and Arduino (Freeduino Max Serial)' are provided. GNU GPL v2 licensing all the software.

1.5.2 Limitation of Scope and limitation of Study (Wifi Robot System)

In order to avoid using router, I would like to suggest using a Raspberry Pi and an Arduino for the IO functionality. After this you can also use a USB webcam instead of the expensive network camera. This means Linux configuration instead of modifying a router. Using an Ethernet shield and a Wi-Fi shield would be turning the Arduino into a router. It would be difficult (at best) to do this. Wi-Fi shields are also quite expensive, so I would suggest avoiding them.

1.6.2 Outline of material presented in rest of report (Wifi Robot)

It is a fully process link system Router by 2 serial ports and car server software installed. They have tested the router & Micro controller is fully functional and compatible with this project.

(Bennet John, August 2008).

1.2.3 Review of previous work (Android RC Car)

They modify an inexpensive Remote Control car to batch with an Android smartphone using Bluetooth.

1.3.3 Bluetooth module Remote control using Android

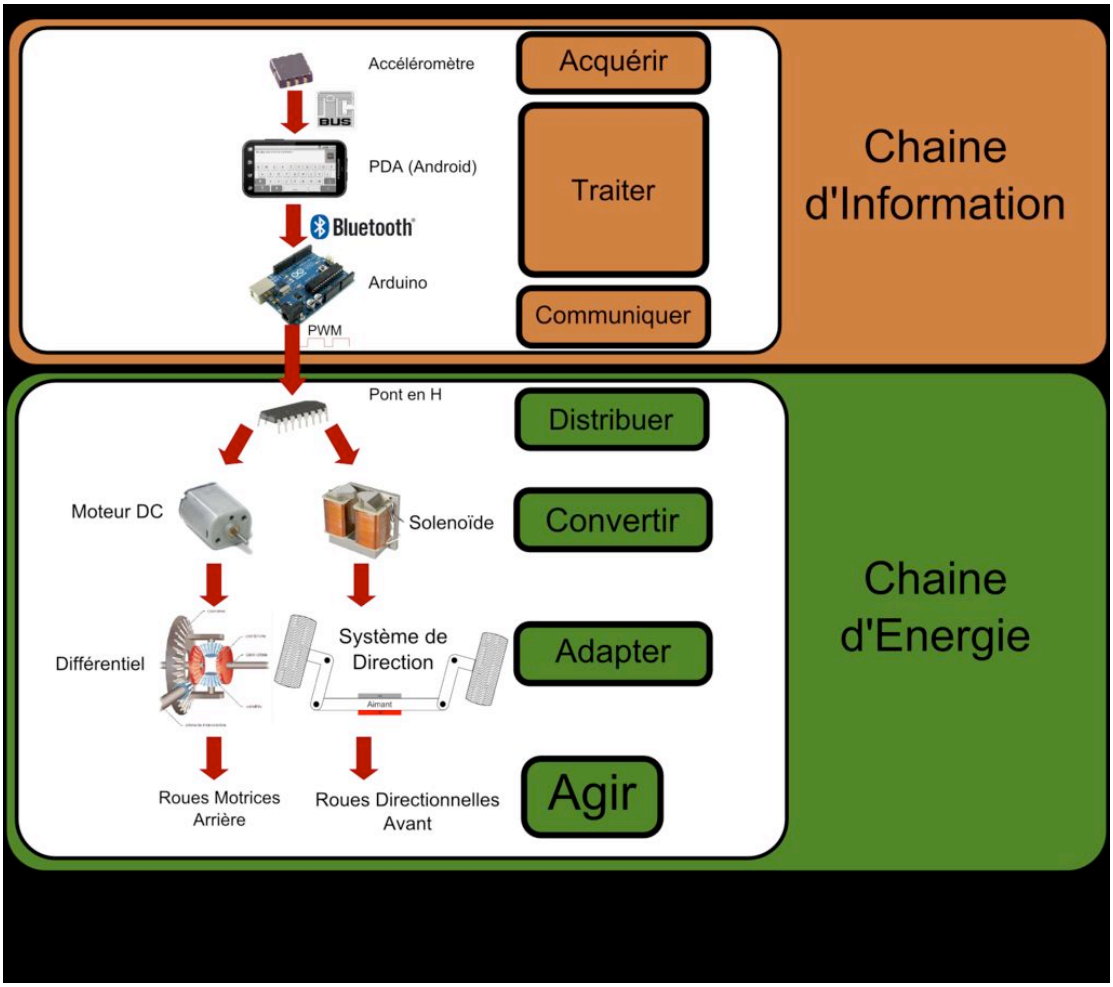

Figure 5: Bluetooth Module Remote Control Car via Android

The cost of this instruct table is about 30~40$ but condition is you must have the remote control car first. The Remote Control Car will be created using accelerometer sensor over Bluetooth. By using this, you can use an android application & Arduino library named Amarino 2.0.

1.4.3 Terminology (Android RC car)

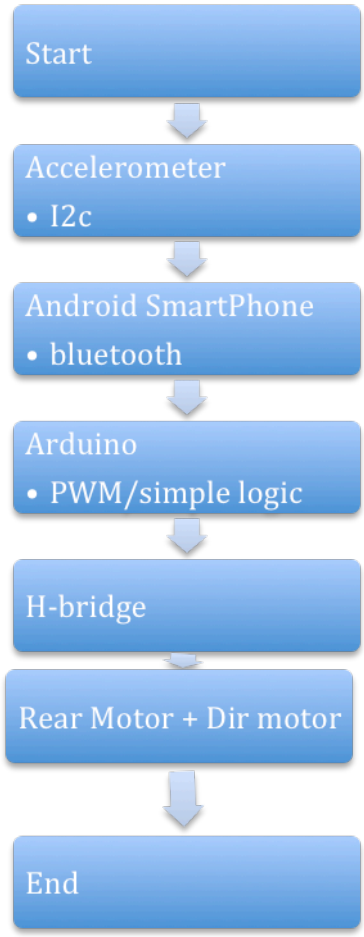

Figure 6: Process of Bluetooth Module Remote control using Android

1.5.3 Method approach (Android RC car)

This is a process of a Bluetooth module remote control using Android system in Figure 1.3. It is a system that used on Accelerometer algorithm on android smartphone by Bluetooth connection and its is a electric power motor. Software needed are Arduino IDE and Eagle CAD freeware edition.

1.6.3 Indications scope and limitations of the study (Android RC Car)

The disadvantages of this module is using dangerous chemicals (Acetone and Ferric Chloride) and dangerous tools (drill, saw, soldering iron,etc...) cause dangerous when used on. Bluethooth also have a problem because the limit range of availability is 5m-100m.

1.7.3 Outline material presented in rest of report. (Android RC Car)

It might be better to create a footprint for this module on the board that we etched in earlier steps. Then we could place the module on our etched board and just drop solder on the terminals that are needed. It's obvious why the author didn't choose this approach. Doing so would make this Intractable less-usable, because the Eagle file would have this board's footprint on it, and that would mean users would have to purchase the exact same module (which might be difficult to acquire, or out of production).

(Rico Jonathan, 2011)

1.2.4 Review of previous work (Radio Remote Control Car as a Vehicle of Dynamics Test Bed)

Figure 7: Radio Remote Control Car as a Vehicle Dynamics Test Bed

In this article have described few kind of features car, document functional procedures, and show how to work it on several research applications.

1.3.4 The current system and its limitation (Test Bed RC)

Few benefits of a reduced-scale model than a full-scale car for research:

- Prohibitive in terms of beginner purchace and replacement of parts cost a bit only.
- Modification to reduces-scale model is simple to create.

1.4.4 Method Approach (Test Bed RC)

They have created a embedded program for their RC car test bed using 'MATLAB's Simulink modeling environment'. 'MATLAB's Real-Time Workshop' generates C code comes from the 'Simulink model'. They create C code from a Simulink model used by Real-Time Workshop.

1.5.4 Indication Scope and limitation (Test Bed RC)

This system is good and no limitation. It can be used a reduced-scale model instead of a full-scale car for research of vehicle dynamics:

1.6.4 Overview of the system (Test Bed RC)

"The Dynamic Design Lab has created a vehicle dynamics test bed using a one quarter- scale radio frequency remote controlled car. An onboard computer and various sensors are used on the car. The main purpose of this report is to analysis few major features of the car, document operational procedures, and demonstrate several research applications."(Rico Jonathan, 2011)

1.2.5 Review of previous work （iPhone-Controlled RC Car）

In this research project, they show you how to use various technologies and combine them together to create a cheap Remote Control Car, power with an iPhone. With the NerdKit serve as the field between the computer device and the Remote Control Car, it show an example of how powerful microcontrollers would be when they act as the glue that creates complex systems work with each other.

1.3.5 The Current System and its limitation (‘iPhone-Controlled RC Car’)

‘I-phone-Controlled RC Car’ is used in major technologies and combined them together to create a cheap Remote Control Car with an iPhone. They use a web browser on an iPhone and link to a computer that work as a web server.

1.4.5 Explanations of terminology if necessary (‘iPhone-Controlled RC Car’)

The circuit that you create is very easy, as it just needs the four 2N7000 transistors as switches between the remote control wires and ground:

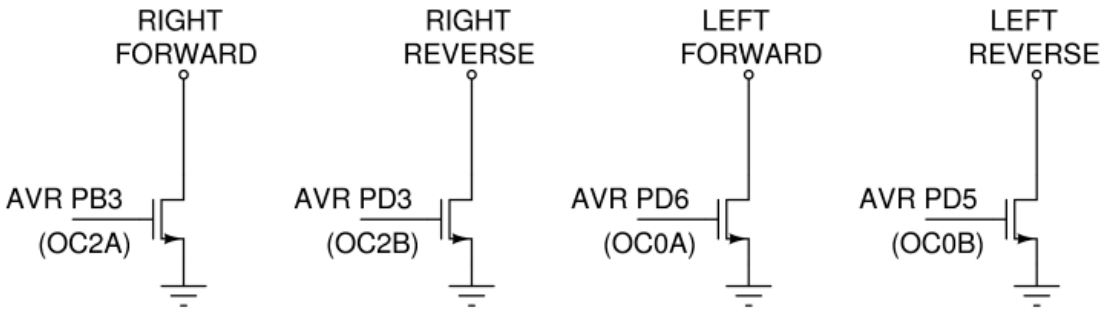

Figure 8: Circuit 2N7000 transistors as switches

In the picture below show that they easily wired up all the things at the top of their NerdKits breadboard:

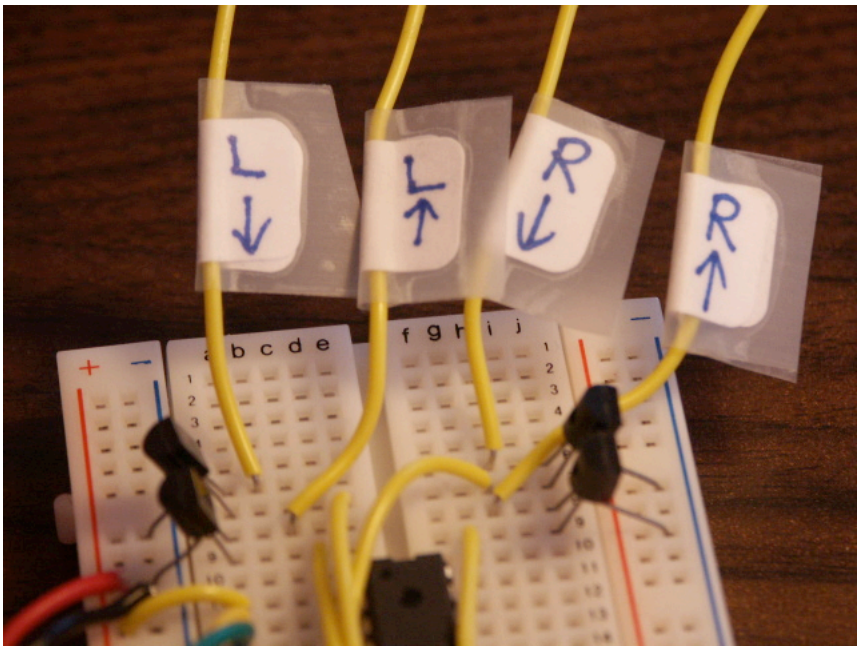

Figure 9 : NerdKits Breadboard

1.5.5 Method approach ('iPhone-Controlled RC Car')

Web server on the computer desktop or laptop is needed for the iPhone to link with the system. Apache Webserver is needed to Download and install in your own computer. After finish installation, you also need to download the Web Code for this system. Compatibility of this system that web browser must go to http://{your_ip_address}/car.php. Then you can start playing and move around with your finger on screen and control the car.

1.6.5 Indication Scope and limitation (iPhone-Controlled Remote Control Car)

IPhone that need a computer to work together to control a remote car. This will makes a problem; every time you want to play your RC car, you need to bring a long with your computer. Its is not practical, why not just make a application that use iPhone and no need computer to control the remote control car and much more user friendly and practical.(NerdKit, Nov 2011)

1.3.6 Comparison between Wi-Fi and Bluetooth RC Car

	Bluetooth RC Car	Wifi RC Car
Frequency Used:	2.4 GHz	2.4, 3.6 and 5 GHz
Standard Code:	IEEE 802.15	IEEE 802.11
Cost:	Low cost	High cost
Specifications authority:	Bluetooth SIG	IEEE, WECA
Year of Create:	Year of 1994	Year of 1991
Hardware requirement:	Bluetooth adaptor	Wireless adaptors need on which the devices you are using on network and wireless router and access point.
Bandwidth:	Quite Low (800 Kbps)	Quite High (11 Mbps)
Way of Use:	Fairly simple to use. 7 devices can be connected at the same time. It is easy to switch between devices or find and connect to any device.	More massive, difficult to set up because requires setting configuration hardware and software.
Primary Devices:	Mobile phones, mouse, keyboards, office and industrial automation devices	Notebook computers, desktop computers, servers, TV, Latest mobiles.
Power Consumption:	Low Power used	High Power used
Distance Far:	10 meters distance	100 meters distance
Bit-rate:	2.1Mbps	600Mbps
Latency:	200ms	150ms
Security:	Less secure in term of security policies.	More secure than the Bluetooth device.

(Cuervo Aron, 31 Dec 2011).