

A dark blue vertical bar on the left side of the page. A blue arrow points to the right from the bar, containing the text 'Log Inc.'

Log Inc.

Wii Car

Analysis Report

Several thin, curved lines in shades of blue and grey originate from the bottom left and curve upwards and to the right.

Project Supervisor:

Dr. Tauqir Ahmad

Co-Supervisor:

Mr. Muhammad Sami Ullah

Team Members:

Ahmar Sultan (2012-CE-08)

Asad Azam (2012-CE-11)

Hassan Imam (2012-CE-26)

Abdullah Baig (2012-CE-27)

Project Overview

The project aims to control a GPS and Wi-Fi enabled car using an Android based smart-phone. The car would also upload the GPS tracking data to a web-server that is available for viewing by logging on to the server. The web server would allow viewing of the tracking data on a map using Google Maps.

Wireless remote controlled cars are already present but we are attempting to control the car using an Android based smart-phone using its accelerometer hardware feature. An ARM Cortex-M based microcontroller would control the car. The challenges posed to us by this project include:

- Designing an Android app.
- Establishing a web-server (XAMPP stack).
- Constructing a website.
- Using an API (Google Maps).
- Employing Bluetooth.
- Embedded systems based motor control.

Motivation and Objectives

The idea is inspired from the fact that today the smartphone market is blooming and the open source Android project has greatly simplified development for mobile phones. Advancements in technology have made mobile phones much powerful and capable computing machines. This has inspired us to utilize the features in these hand-held devices to control different hardware remotely. The aim of our project is to drive an RC car remotely using an Android phone by utilizing its accelerometer.

Problem Statement

“Design a remotely controlled wireless car that is to be controlled by an Android based smart-phone using its accelerometer. The car should have a GPS and should upload its position regularly to a web-server which can be accessed by an authorized person to view the tracking data on a map.”

Description

Android Phones

The project utilizes two android smart phones. One phone is in the hand of the user and the other is in the car. These two phones communicate over a Wi-Fi network using TCP/IP sockets.

Android Applications

Two android applications are present on the two phones. The application on the user's phone contains the functions to control the car's movement. The application on the car's phone receives data from the user's phone over the Wi-Fi network and transmits it to a Bluetooth module that is part of the car's embedded hardware.

Car

The car is a toy truck. It has two dc motors: one for drive and the second for turning. It also has headlights. The car contains its phone and a custom-made PCB to control the motors and the lights. The PCB contains headers to attach the microcontroller board STM32F4-Discovery. A Bluetooth module is also attached to the PCB. An ARM Cortex-M based microcontroller STM32F407 from ST Microelectronics controls the car. The ARM microcontroller communicate with the car's phone through the Bluetooth module.

GPS

The car's android phone will use its GPS feature to upload the coordinates to the server.

Web Server

A web-server will be running on a computer connected to the Wi-Fi network. The car will regularly report its position to the web-server, which will record the input in the database. Apache will be used as the HTTP web-server together with MySQL database and PHP programming language.

Tracking Information

The web-server will host a website to view the tracking data of the car. The tracking data will be shown on a map by employing Google Maps API.

System Dependencies

- The android application, car and the hosting computer all need to be connected to the same Wi-Fi network to be able to communicate.
- Wireless communication efficiency between the phone and the car depend on the Wi-Fi router as well as the Wi-Fi module used on the car.
- Features of the map on the website depends on the capabilities provided by the Google Maps API.

Functional Requirements

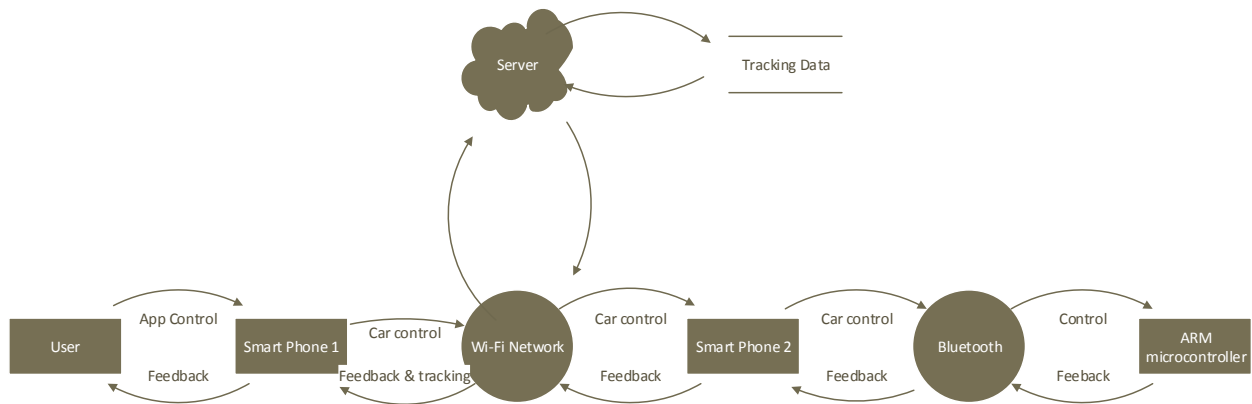
- ARM based microcontroller is required.
- Android version Gingerbread minimum.
- The devices should be on the same network so that they can communicate.
- The car's cell phone should support GPS, Bluetooth and Wi-Fi.

Non-Functional Requirements

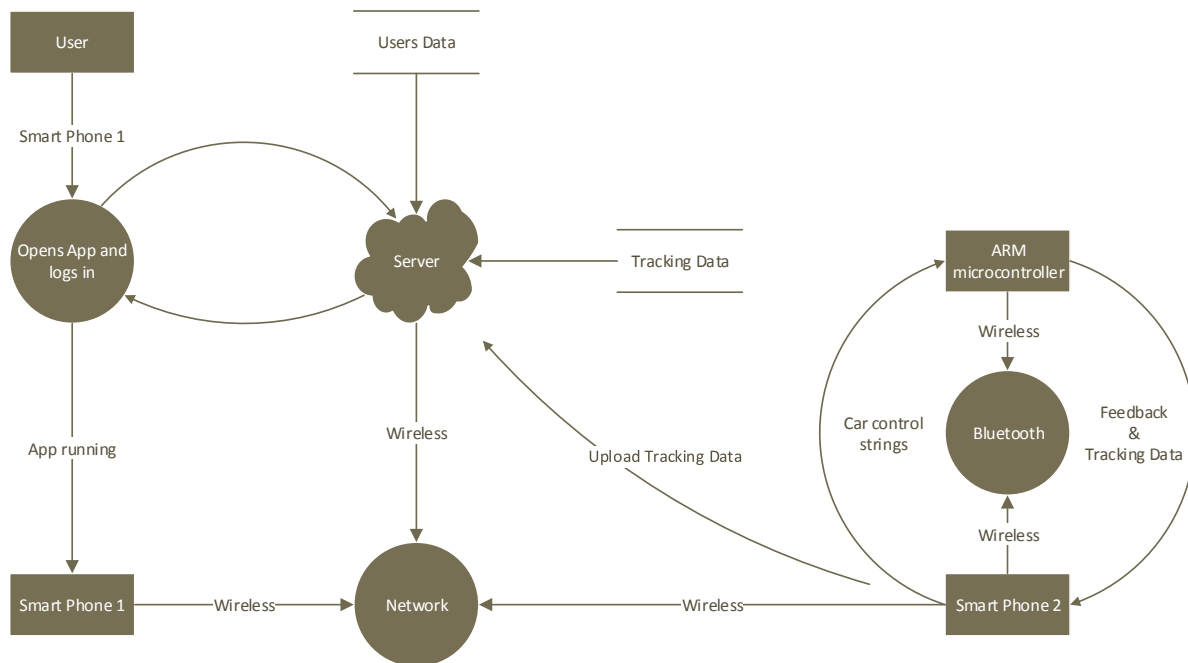
- Team should cooperate heavily because the software and hardware must be in complete harmony.
- The soldering of the PCB should be done with care to avoid the risk of shorting.

Data Flow Diagrams

Level 0



Level 1



Tasks and Responsibilities

Name	Registration No.	Responsibility
Ahmar Sultan	2012-CE-08	Android App Development and Testing
Asad Azam	2012-CE-11	Web Server Maintenance and Web Development
Hassan Imam	2012-CE-26	Wireless Communication and Circuit Design
Abdullah Baig	2012-CE-27	Embedded System Programming and Testing

Tools Utilized

Software	Utilization
Eclipse Luna	Android App Development
Dreamweaver	Web Development
XAMPP	Apache, PHP, MySQL Stack for Web Server
Google Maps API	Displaying tracking information on map
IAR Embedded Workbench	ARM Microcontroller Programming
Proteus	Circuit Simulation
Microsoft Word	Documentation and Report
Microsoft Visio	Flow charts and Diagrams
Microsoft Access	Project cost
Adobe Premier	Video Editing
Adobe Photoshop	Graphics Design
Android Studio	Android App Development

Cost Analysis

ID	Description	Unit Cost	Quantity	Total Cost
1	Project Proposal	90.00	1	90
2	Wireless Module TLN13UA06	2340.00	1	2340
4	USB to TTL Converter Module	351.00	1	351
5	TCS	210.00	1	210
7	Jumper Wire Female End	4.00	20	80
8	Soldering Wire	85.00	1	85
9	Male Connector	10.00	1	10
10	Container Box	300.00	1	300
11	Li+ Ion Cell	100.00	3	300
12	HC-05 Bluetooth Module	800.00	1	800
13	Male Connector	10.00	1	10
14	Female Connector	30.00	1	30
15	Jumper Wires	10.00	2	20
16	Resistors 1k, 2k, 10k	1.00	30	30
17	Heat Sink	15.00	1	15
18	L298	150.00	1	150
19	Diode 1N4007	3.00	12	36

20	LM1117	50.00	1	50
21	Terminal Block 3 pin	4.00	1	4
22	Capacitor 100nF	1.00	4	4
23	Capacitor 1uF	2.00	4	8
24	Capacitor 10uF	2.00	4	8
25	Capacitor 22uF	2.00	4	8
26	Capacitor 220uF	5.00	4	20
27	Capacitor 470uF	20.00	2	40
28	Terminal Block 4 pin	6.00	1	6
29	Terminal Block 6 pin	10.00	1	10
30	Resistor 100 Ohm	0.83	12	10
31	Resistor 270 Ohm	0.83	12	10
32	Resistor 68 Ohm	0.83	12	10
33	LM317	20.00	1	20
34	LM 317 Heat Sink	30.00	1	30
35	LED Blue	2.00	5	10
36	DIL Female Header	20.00	2	40
37	Terminal Block 2 pin	5.00	1	5
38	Transistor 2N3904	5.00	4	20
39	Resistor 10 Ohm	0.83	12	10
40	Resistor 220 Ohm	0.83	12	10
41	PCB Test Print	50.00	1	50
42	PCB Advance Payment	450.00	1	450
43	PCB Remaining Payment	500.00	1	500
44	UHU	25.00	1	25
45	Analysis Report	60.00	1	60
	Total			6275