Software Engineering

Analysis Report

Wii-Car

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# 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:

* Establishing a web-server (XAMPP stack).
* Designing an Android app.
* Constructing a website.
* Using an API (Google Maps).
* Employing Wi-Fi wireless.
* 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. A small camera on the car would also provide video stream back to the Android app running on the phone. The two pieces of hardware will communicate over a 2.4 GHz Wi-Fi wireless network.

## 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 Application

An android application will connect to the car using a Wi-Fi network. The application will utilize the accelerometer of the phone and the on app buttons to decide the state of the car and will send the appropriate signals to the car on the network.

### Car

An ARM Cortex-M based microcontroller STM32F407 from ST Microelectronics would control the car. The car’s mobile phone will be equipped with a Wi-Fi module to connect to a Wi-Fi network. Either the car or the Android application would establish a web-server to enable the two to communicate. The car’s android phone will communicate with the microcontroller using Bluetooth.

### 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.

# 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 |
| Arduino IDE | Quick Prototyping using Arduino board |
| Microsoft Word | Documentation and Report |
| Microsoft Visio | Flow charts and Diagrams |
| Microsoft Access | Expense Database |