

Software Engineering

# Project Proposal

“Wii-Car”



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## Introduction

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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 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 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.

### GPS

A GPS module available in the market easily provides GPS capability. The ARM microcontroller on board will be responsible for communicating with the module.

## 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

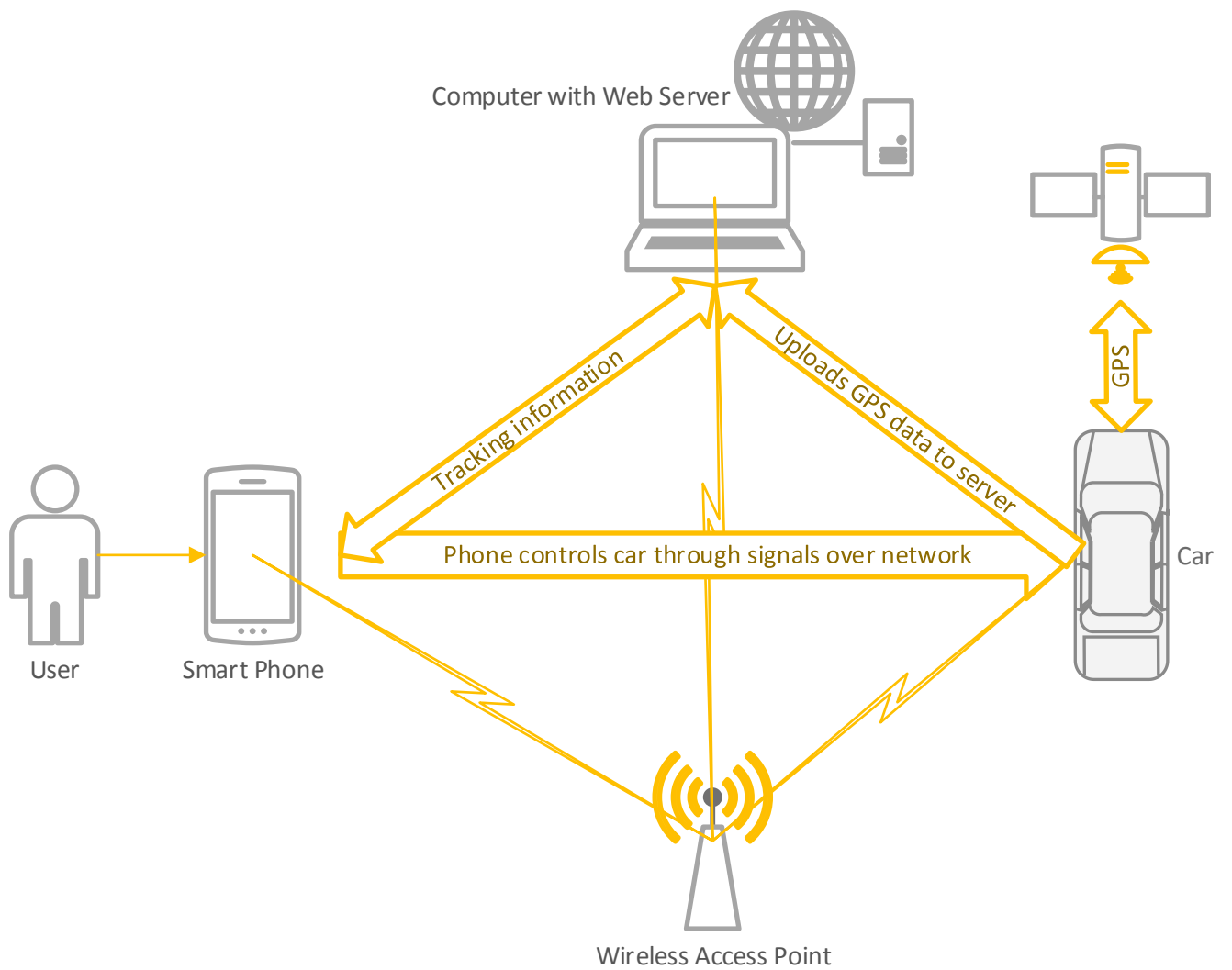
The web-server will host a website to view the tracking data of the car. The tracking data will be shown on a map by employing Google Maps API.

## System Dependencies

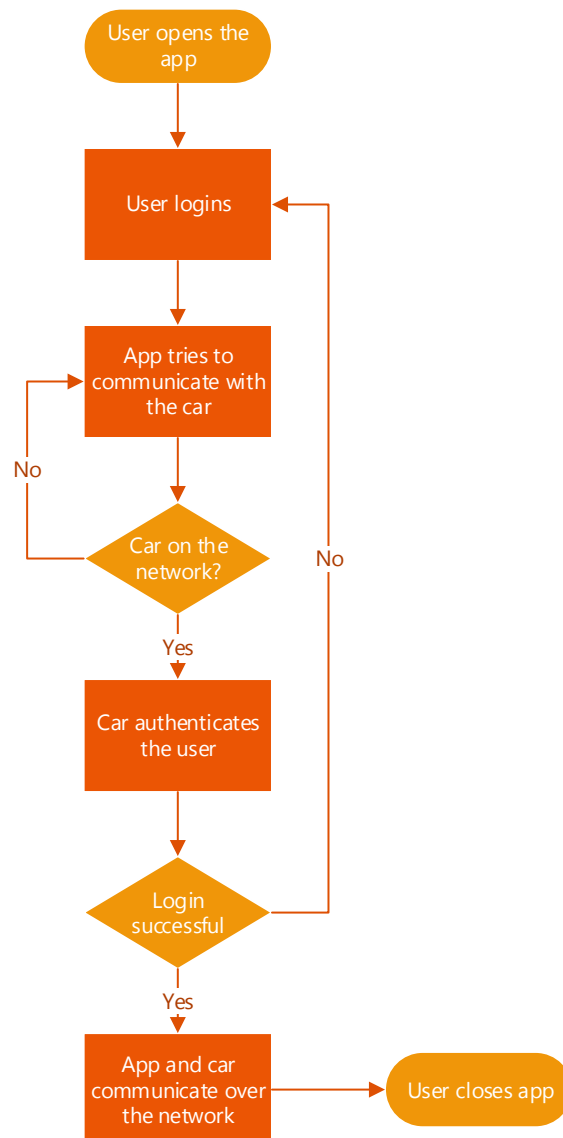
- The android application, car and the hosting computer all need to be connected to the same Wi-Fi network to be able to communicate.
- Wireless communication efficiency between the phone and the car depend on the Wi-Fi router as well as the Wi-Fi module used on the car.
- Features of the map on the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

## Proposed Methodology

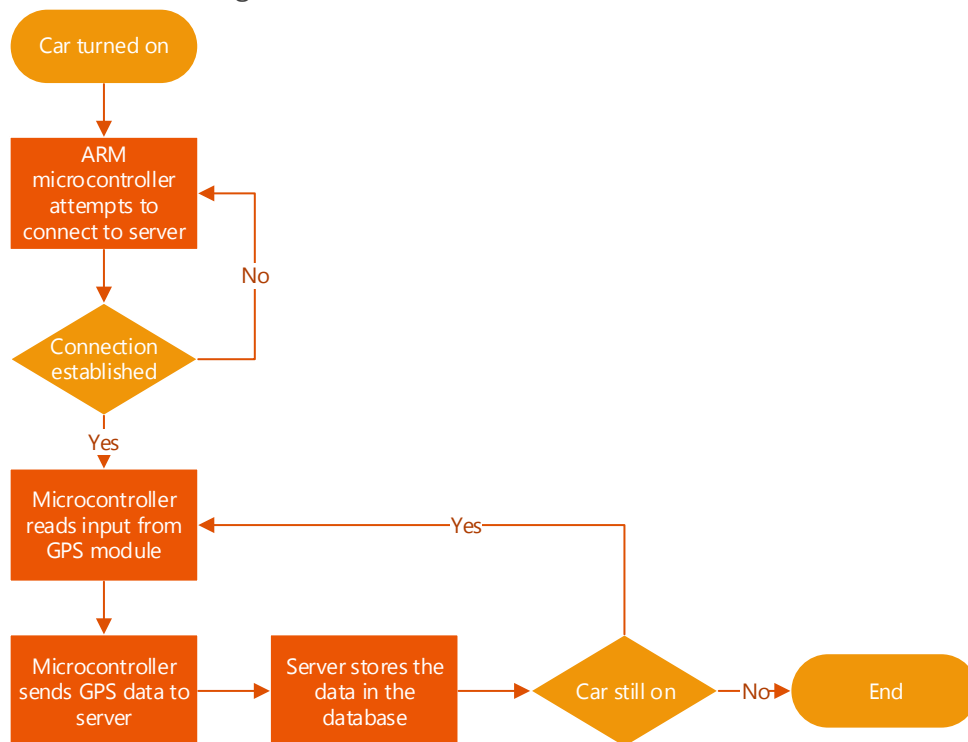
### System Layout



## App and Car



## Car and Server Interfacing



## Scope of the Project

The project aims to illustrate the basic use of the required technologies (Android, Wi-Fi, ARM, and Web). The Android application will be designed and tested for smart phones only and not tablets. Minimum supported version will be Gingerbread (2.3.6). The Wireless communication is not long distance and is limited by the range of the Wi-Fi router and the Wi-Fi module used. The web server to be implemented will be hosted locally.

## Individual Tasks

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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

## Deliverables Milestone & Time Schedule

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### Milestone Description

#### Requirement Specification

Description of the hardware and software requirements of the system listing all the required elements.

#### Software Design Document

Describes the design of the android app using diagrams. Also describes the flow of the embedded software of the car.

#### System Prototype

Will present the individual components of the system in their primary working condition.

#### Implementation

Description of how to combine individual components of the system to make the system as a whole.

#### Software Test Plan

A plan describing the tests to be carried out on the system and the individual components to verify the working of the system.

#### Project Deliverable

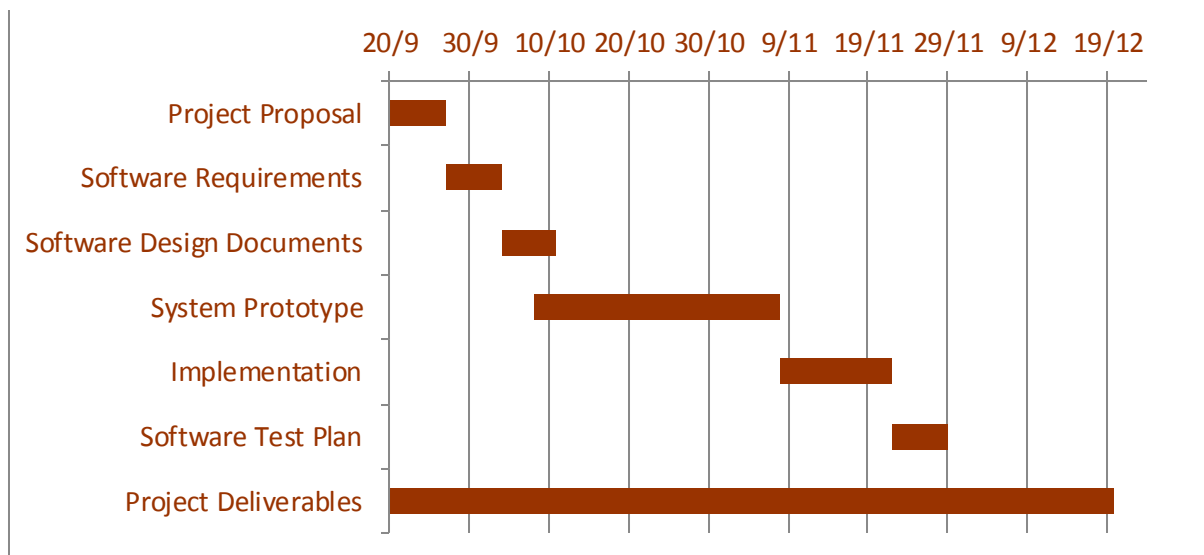
The final working project in presentable condition.



## Time Schedule

ID	Deliverable	Responsible Team Member	Due Date	Remarks
M001	Project Proposal	Abdullah Baig	27 Sep 14	
M002	Software Requirements	Ahmar Sultan	04 Oct 14	
M003	Software Design Document	Abdullah Baig	18 Oct 14	
M004	System Prototype	Asad Azam	08 Nov 14	
M005	Implementation	All four	22 Nov 14	
M006	Software Test Plan	Hassan Imam	29 Nov 14	
M007	Project Deliverable	All four	20 Dec 14	

## Gantt chart



## Project Risks

Possibility	Risk Level	Preventive Action
Expensive circuitry or modules can be damaged	High	Ensure proper supply and strict observance of maximum rating of circuit elements
Anyone can view the tracking data of the car (threat to privacy)	High	Adding authentication feature to the web-server

## Proposed Tools and Platforms

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