Software Engineering

Project Proposal

“Wii-Car”



*Department of Computer Science and Engineering*

*University of Engineering and Technology, Lahore*

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)

Contents

[Introduction 1](#_Toc399576203)

[Motivation and Objectives 1](#_Toc399576204)

[Problem Statement 1](#_Toc399576205)

[Description 1](#_Toc399576206)

[Android Application 1](#_Toc399576207)

[Car 1](#_Toc399576208)

[GPS 1](#_Toc399576209)

[Web Server 2](#_Toc399576210)

[Tracking Information 2](#_Toc399576211)

[System Dependencies 2](#_Toc399576212)

[Proposed Methodology 3](#_Toc399576213)

[System Layout 3](#_Toc399576214)

[App and Car 4](#_Toc399576215)

[Car and Server Interfacing 5](#_Toc399576216)

[Scope of the Project 5](#_Toc399576217)

[Individual Tasks 6](#_Toc399576218)

[Deliverables Milestone & Time Schedule 6](#_Toc399576219)

[Milestone Description 6](#_Toc399576220)

[Requirement Specification 6](#_Toc399576221)

[Software Design Document 6](#_Toc399576222)

[System Prototype 6](#_Toc399576223)

[Implementation 6](#_Toc399576224)

[Software Test Plan 6](#_Toc399576225)

[Project Deliverable 6](#_Toc399576226)

[Time Schedule 7](#_Toc399576227)

[Gantt chart 7](#_Toc399576228)

[Project Risks 7](#_Toc399576229)

[Proposed Tools and Platforms 8](#_Toc399576230)

# Introduction

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

|  |  |  |
| --- | --- | --- |
| 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

## 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 |