

Software Engineering - Term Project



Autonomous RC Car

AHSAN JAVED (153196)

JUNAID SAEED (153172)

JUNAID IQBAL RAJA (153179)

SYED ARHAM GILLANI (153165)

Supervisor: **Sir Ahmad Mohsin**

Department of Computer Science

Air University Multan Campus

REQUIREMENTS

BUISNESS REQUIREMENTS

The project aims to build autonomous RC car using Raspberry Pi as a processing chip. A camera along with an ultrasonic sensor is used to provide necessary data from the real world to the car. The car is capable of reaching the given destination safely and intelligently thus avoiding the risk of human errors. According to the World Health Organization, more than 1 million people lose their lives on the road due to car accidents. These numbers show that cars cause serious casualties. The motivation behind this project is to improve car safety and efficiency.

USER REQUIREMENTS

The user requirements are following:

- The user must enter a valid pin in order to control the RC car.
 - The user must select a route using Map for destination.
 - The system directs the RC car towards the destination.
 - Sensors and the camera helps the system to drive the RC car towards the destination safely.
 - The system should recognize all the traffic signs and signals in the path.
 - Whenever the system recognizes any traffic sign or signal, the system generates an automatic response against it.
 - When the RC car reaches the destination, the system will generate a signal that it has reached its destination safely.
 - The system will generate a response message in response to signal which will contain the average speed and the total distance travelled by RC car.
-

FUNCTIONAL REQUIREMENTS

Functional Requirements - Login

FR01-1	System shall allow user/driver to login.
FR01-2	System shall get Pin from user/driver.
FR01-3	System shall validate the Pin if the user/driver entered invalid number pin.
FR01-4	System shall get authenticate user/driver by verify the user entered Pin with the Pin stored in the system.

Functional Requirements - Route Selection

FR02-1	System shall display the route selection menu.
FR02-2	System shall get the route of destination from the user/driver.
FR02-3	System shall start the route using Google Map API.

Functional Requirements – Display Route

FR03-1	System shall display the route on the screen at real-time.
FR03-2	System shall display the approximate time to reach the destination on the screen.
FR03-3	System shall display the speed of RC Car on the screen.
FR03-4	System shall display the route on the screen.

Functional Requirements – Control RC Car

FR04-1	System shall get video streaming from the camera.
FR04-2	System shall get video frame per frame.
FR04-3	System shall check for traffic signals.
FR04-4	System shall trigger signal giving instruction if any traffic signal & object is identified.

NON-FUNCTIONAL REQUIREMENTS

Security	<ul style="list-style-type: none">➤ System shall be secured from any hacking attack.➤ System shall be secured from any DDOS attack.➤ System shall alert if any uncertain activity like changing the route happens.
----------	--

Performance	<ul style="list-style-type: none">➤ System should be good at performance.➤ System shall perform task at real time.
-------------	---

Primary Actors :

Driver , User

Secondary Actors :

Ultrasonic Sensor , GPS Sensor , Camera

DESCRIPTIVE USE CASE:

Primary Actor: Driver

Secondary Actors: Ultrasonic Sensor , GPS Sensor , Camera

Pre-condition:

- RC CAR should be connected to system before route initialization.

Trigger: To reach the desired destination autonomously avoiding accidents.

Scenario:

- The user must log in to system.
- User must enter username and password.
- System authenticates username and password.
- User can set the destination route.
- System should process request at real time.
- System shall send instruction to RC Autonomous Car about desired route.

- System shall reach the destination in given time.
- System shall avoid car collision with object using camera.
- System shall process traffic signals and ask car to perform programmed task.

Exceptions: Loss of internet connections or electricity.

Frequency of Use: Can be used 24/7.

USE-CASE UML DIAGRAM

