System Requirements Specifications for RoadTrip

Sponsor

Electrical, Computer, Software & Systems Engineering at Embry-Riddle Aeronautical University

Released **DATE**

Are We There Yet?

Contents

[Revision History 3](#_Toc398207222)

[1. Introduction 4](#_Toc398207223)

[1.1 Purpose 4](#_Toc398207224)

[1.2 Problem Statement 4](#_Toc398207225)

[1.3 Scope 4](#_Toc398207226)

[1.4 Team Information 4](#_Toc398207227)

[1.5 Overview 4](#_Toc398207228)

[2. Overall Description 6](#_Toc398207229)

[2.1 Stakeholders 6](#_Toc398207230)

[2.2 Product Perspective 6](#_Toc398207231)

[2.3 Product Functions 6](#_Toc398207232)

[2.4 Use Cases 6](#_Toc398207233)

[3. Functional Requirements 6](#_Toc398207234)

[3.1 General 6](#_Toc398207235)

[3.2 Movement 7](#_Toc398207236)

[3.3 Navigation 7](#_Toc398207237)

[3.4 Challenge Completion 7](#_Toc398207238)

[4. Non-Functional Requirements 7](#_Toc398207239)

[4.1 System Size 7](#_Toc398207240)

[4.2 Power Management 7](#_Toc398207241)

[4.3 Start Method/Operation 7](#_Toc398207242)

[5. Glossary 9](#_Toc398207243)

[6. Appendix A 10](#_Toc398207244)

[7. Appendix B 11](#_Toc398207245)

# Revision History

|  |  |  |
| --- | --- | --- |
| Date | Reason for Change | Version |
| 7 Sep. 2014 | Initial Draft | 0.1.0 |
| 9 Sep 2014 | In-class revision | 0.2.0 |
| 10 Sep 2014 | Added Overall Description | 0.3.0 |
|  |  |  |

# Introduction

## Purpose

The purpose of this document is to define the system requirements of RoadTrip, the robot put forth by Are We There Yet (AWTY) to compete in the 2015 Institute of Electrical and Electronics Engineers (IEEE) SoutheastCon student hardware competition. These requirements include the functional and non-functional requirements, system constraints, system interface constraints and standards compliance of the system. This document is intended for the customer of AWTY, the requirements engineering team for AWTY, the design, testing and quality assurance teams, as well as all other teams involved in the development and construction.

## Problem Statement

To create an autonomous robot to compete in the 2015 IEEE SoutheastCon student hardware competition.

## Scope

RoadTrip is intended to compete in the 2015 IEEE Southeast Con student hardware competition. The system is envisioned to complete four unique challenges:

* Correctly play Simon for 15 seconds
* Draw “IEEE” on an Etch-a-Sketch
* Twist one row of a Rubik’s cube 180 degrees
* Pick up and carry one playing card across the finish line

The autonomous system is intended to successfully complete the challenges outlined above within a time limit of five minutes.

The system built by AWTY is not intended to serve any other functions or fulfill any other purposes other than competing in the 2015 IEEE SoutheastCon competition.

## Team Information

|  |  |
| --- | --- |
| Name | Role |
| Michael Philotoff |  |
| Brian Powell |  |
| Alex Senopoulos |  |
| Brian Sterling |  |

## Overview

Section 1 of this document serves as introduction to the system designed by AWTY. Section 2 provides an overall description of the system, including stakeholders involved in the project, the functions of the system and proposed use cases for the system. Section 3 describes the functional and non-functional requirements of the system

The Glossary contains definitions of all industry and standard terms as well as ambiguous terms, used throughout this document. A table of acronyms and abbreviations is included in order to dispel ambiguity with any acronym or abbreviation used within this document. A picture of the course is included in Appendix.

# Overall Description

## Stakeholders

The following list describes the individuals and parties involved in, or that have a stake in, the development, productions and operation of RoadTrip.

* + 1. Team AWTY

As the development team has a vested interest as they will be graded on the completion of the system by the customers. Additionally, efforts should be made to apply principles and concepts learned while at Embry-Riddle Aeronautical University (ERAU).

* + 1. Dr. Barott, Dr. Seker and Jorge Torres

As customers of team AWTY, Dr. Barott, Dr. Seker and Jorge Torres are interested in the completion of the product as outlined in this document. Furthermore, Dr. Barott and Dr. Seker are interested in ensuring that the project meets the standards set forth by Department of Electrical, Computer, Software & Systems Engineering (ECSSE) at ERAU.

* + 1. ERAU

Since the University is an indirect sponsor of the project, any actions taken by the development team reflect directly back upon the University.

* + 1. ECSSE Department

As the direct sponsor of the project, the department is interested in making sure the project is delivered both on time and on budget.

* + 1. IEEE

As the sponsor of the competition for which the final system will compete in, the IEEE is interested in making sure that the final system complies with all competition rules and that the development team has conducted themselves in a manner befitting of a professional organization.

## Product Perspective

RoadTrip system is intended to be an autonomous robot whose sole purpose is to compete in the IEEE 2015 SoutheastCon student hardware competition.

## Product Functions

RoadTrip is broken down into five major subsystems: (1) the line following subsystem, (2) the Simon subsystem, (3) the Etch-a-Sketch subsystem, (4) the Rubik’s cube subsystem and (5) the playing card subsystem. The purpose of these subsystems is to facilitate the requirements engineering process.

## Use Cases

# Functional Requirements

## General

* + 1. The system shall identify red [RGB value TBD] LED in starting area.
    2. The system shall wait for red [RGB value TBD] LED to GO OUT (bad) before exiting starting area.

## Movement

* + 1. The system shall move in four directions.
       1. The system shall have the ability to move forward.
       2. The system shall have the ability to move backwards.
       3. The system shall have the ability to turn right.
       4. The system shall have the ability to turn left

## Navigation

## Challenge Completion

* + 1. System shall play Simon for 15 seconds.
       1. System shall initiate Simon game by depressing start button.
       2. System shall correctly sense color blue [exact RGB values TBD] when illuminated on Simon board.
       3. System shall correctly sense color red [exact RGB values TBD] when illuminated Simon board.
       4. System shall correctly sense color yellow [exact RGB values TBD] when illuminated Simon board.
       5. System shall correctly sense color green [exact RGB values TBD] when illuminated Simon board.
       6. System shall not obstruct Simon carabineer during play.
       7. Robot will respond to Simon within [TBD] amount of time.
    2. System shall twist one row of a Rubik’s cube 180 degrees.
       1. System shall not obstruct Rubik’s cube during play.
    3. System shall draw “IEEE” on an Etch-A-Sketch.
       1. Font and size shall [TBD].
       2. System shall not obstruct Etch-A-Sketch during play.
    4. System shall collect a single playing card.
       1. System shall carry playing card across finish line.
       2. System shall keep card in a usable condition.

# Non-Functional Requirements

## System Size

* + 1. The system size shall be no greater than 1’ x 1’ x 1’ within the starting area and the finishing area.

## Power Management

* + 1. The system shall operate for a minimum of three consecutive course rounds each having a duration of five (5) minutes, on one battery life.

## Start Method/Operation

* + 1. The system shall have a clearly indicated power switch
    2. The system shall be completely autonomous after being powered on
    3. The system shall maintain contact with course floor at all times

# Glossary

|  |  |  |
| --- | --- | --- |
| Entry | Definition | Aliases |
| SoutheastCon | SoutheastCon is the annual IEEE Region 3 Technical, Professional, and Student Conference. It brings together Computer Scientists, Electrical, and Computer Engineering professionals, faculty and students to share the latest information through technical sessions, tutorials, and exhibits. It is the most influential conference in Region 3 for promoting awareness of the technical contributions made by our profession to the advancement of engineering science and to the community. As usual, attendance and technical program participation from areas outside IEEE Region 3 are encouraged and welcomed. IEEE Region 3 encompasses the southeastern United States and includes the states of Alabama, Florida, Georgia, areas of Indiana, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee, Virginia and the country of Jamaica |  |
| ERAU |  |  |
| IEEE |  |  |

# Appendix A



# Appendix B

# References