**Robot Sprint 1 Design Document**

**October 10, 2019**

Use this Requirements Specification template to document the requirements for your product or service, including priority and approval (Must do).

This document will also serve as a System Design Document (How to) and will include sections detailing system flow, algorithms, staffing plan, software/hardware, and Test Plan

This document contains instructions and examples which are for the benefit of the person writing the document and should be removed before the document is finalized.

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**1.   Executive Summary**

***1.1*       *Project Overview***

This project will test your group’s and your individual ability to

problem solve, quantify, organize, document, code, test and present

a software system.

***1.2*       *Purpose and Scope of this Specification***

Your robot must successfully travel around the periphery of HH208

(circumnavigate). A clear path will be provided at a distance of 4 feet from each outside wall. This navigation automated by the software and not be driven manually.

**In scope**

This document addresses requirements related to phase 1 of the CS104 Robotics Triathlon:

·       Modified the angles which the Sphero robot will turn at

·        Lowered the speed of Sphero to allow the robot to execute the turns

**Out of Scope**

The following items in phase 3 of Project A are out of scope:

·       Going around the entirety of HH208

·       Robot should start with a green light and speak ‘ready set go’ and stop with a red light and say "I’m done and I need water"

**2.   Product/Service Description**

In this section, describe the general factors that affect the product and its requirements. This section should contain background information, not state specific requirements (provide the reasons why certain specific requirements are later specified).

    The Sphero robot is mobile rolling bot that can be directed by either a program or manually. These programs created by are group are designed to move the robot in the course that is instructed.

***2.1*       *Product Context***

How does this product relate to other products? Is it independent and self-contained?  Does it interface with a variety of related systems? Describe these relationships or use a diagram to show the major components of the larger system, interconnections, and external interfaces.

    This product uses a programming diagram to complete the written action. Whether it be rolling for a certain time, saying something, or completing a course.

***2.2*       *User Characteristics***

Create general customer profiles for each type of user who will be using the product. Profiles should include:

·       Student

***2.3*       *Assumptions***

List any assumptions that affect the requirements, for example, equipment availability, user expertise, etc.

    The pathway will be cleared of any obstacles

    The program will be executed without any errors

***2.4*       *Constraints***

· Miss typing the degrees at which the robot needs to turn to complete the lap

***2.5*       *Dependencies***

List dependencies that affect the requirements.  Examples:

·        This robot is operated fully by the Sphero app and the programs that are applied to it

**3.   Requirements**

·       Describe all system requirements in enough detail for designers to design a system satisfying the requirements and testers to verify that the system satisfies requirements.

·       Organize these requirements in a way that works best for your project.  See **Error! Reference source not found.Error! Reference source not found.**, **Error! Reference source not found.**  for different ways to organize these requirements.

·       Describe every input into the system, every output from the system, and every function performed by the system in response to an input or in support of an output.  (Specify what functions are to be performed on what data to produce what results at what location for whom.)

·       Each requirement should be numbered (or uniquely identifiable) and prioritized.

See the sample requirements in Functional Requirements, and **Error! Reference source not found.**, as well as these example priority definitions:

**Priority Definitions**

The following definitions are intended as a guideline to prioritize requirements.

·       Priority 1 – The requirement is a “must have” as outlined by policy/law

·       Priority 2 – The requirement is needed for improved processing, and the fulfillment of the requirement will create immediate benefits

·       Priority 3 – The requirement is a “nice to have”  which may include new functionality

It may be helpful to phrase the requirement in terms of its priority, e.g., "The value of the employee status sent to DIS **must be** either A or I" or "It **would be nice** if the application warned the user that the expiration date was 3 business days away". Another approach would be to group requirements by priority category.

·       A good requirement is:

·       Correct

·       Unambiguous (all statements have exactly one interpretation)

·       Complete (where TBDs are absolutely necessary, document why the information is unknown, who is responsible for resolution, and the deadline)

·       Consistent

·       Ranked for importance and/or stability

·       Verifiable (avoid soft descriptions like “works well”, “is user friendly”; use concrete terms and specify measurable quantities)

·       Modifiable (evolve the Requirements Specification only via a formal change process, preserving a complete audit trail of changes)

·       Does not specify any particular design

·       Traceable (cross-reference with source documents and spawned documents).

***3.1*       *Functional Requirements***

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Req#** | **Requirement** | **Comments** | **Priority** | **Date Rvwd** | **SME Reviewed / Approved** |
| CS01 | Our robot must successfully travel around the periphery of HH208 | Computer science="Triathlon Rules" | 1 | 10/28/19 | Charles, Luke |
| CS02 | Must travel at a distance of 4 feet from the wall, while traveling around the room | Computer science="Triathlon Rules" | 2 | 10/28/19 | Charles, Luke |
| CS03 | The robot must not collide with any objects in the room | Computer science="Triathlon Rules" | 2 | 10/28/19 | Charles, Luke |
| CS04 | Robot should start with a green light and speak ‘ready set go’ and stop with a red light and say "I’m done and I need water" | Computer science="Triathlon Rules" | 3 | 10/28/19 | Charles, Luke |
| CS05 | Points deducted if robot is not 4 feet from the wall throughout the circumnavigation, if  it does not light and speak at start and finish, if it collides with anything, or if it does not finish in  the square where it started | Computer science="Triathlon Rules" | 1 | 10/28/19 | Charles, Luke |

***3.2*       *Security***

**3.2.1       Protection**

Specify the factors that will protect the system from malicious or accidental access, modification, disclosure, destruction, or misuse. For example:

·       Each robot can be connected via one signal either to a laptop or mobile device

Each robot has its own ID number and is assigned one per groupd

**3.2.2       Authorization and Authentication**

    Each Sphero robot requires an account to be made before use and to be connected to the robot via bluetooth

***3.3*       *Portability***

If portability is a requirement, specify attributes of the system that relate to the ease of porting the system to other host machines and/or operating systems. For example,

·       Each robot can be connected to and each program can be run on the app no matter what bot is connected

**4.   Requirements Confirmation/Stakeholder sign-off**

Include documentation of the approval or confirmation of the requirements here.  For example:

|  |  |  |
| --- | --- | --- |
| **Meeting Date** | **Attendees (name and role)** | **Comments** |
| 11/8/19 | Brandon Merola, coder  Charles Klehr, design doc  Luke Medley, design doc | Worked on entire design doc |
| 11/4/19 | Brandon Merola, coder  Charles Klehr, design doc  Luke Medley, design doc | Mapped out algorithm and sprint details, tested sphero |

**5.   System Design**

This section will provide all details concerning the technical design, staffing, coding, and testing the system

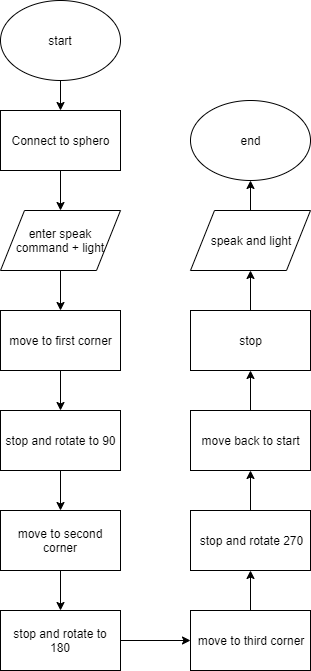
***5.1*       *Algorithm***

Develop and describe here the algorithm that will be used to provide the required performance of your software

1. Put robot on start tape.
2. Connect to sphero via bluetooth, begin code.
3. Speaks “ready set go,” light turns green.
4. Robot rolls at x speed at 0 degrees for y seconds.
5. Robot stops at corner.
6. Robot rolls at x speed at 90 degrees for y seconds.
7. Robot stops at corner.
8. Robot rolls at x speed at 180degrees for y seconds.
9. Robot stops at corner.
10. Speaks “I’m done, and I need water,” light turns red.

***5.2*       *System Flow***

Develop a flowchart (and show here) that accurately depicts how your software application will act to fulfill the algorithm



***5.3*       *Software***

Describe software languages/platforms/api’s used to develop and deploy this application

**Sphero and sphero mobile**

***5.4*       *Hardware***

Describe hardware platforms that were used to develop, test and demonstrate this application

**Python and Github**

***5.5*       *Test Plan***

Include a test plan showing all unit tests performed for this application, Include test rational, test date, staff member, pass/fail status

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Reason for Test Case** | **Test Date** | **Expected Output** | **Observed Output** | **Staff Name** | **Pass/Fail** |
| Robot speaking | 11/4/19 | Robot speaking out “ready, set, go” and “im done and need water” | Robot spoke correctly | Luke, Charles, Brandon | Pass |
| Measurement  checks on robot | 11/4/19 | Must be 4 feet from wall | Swayed but mostly was 4 feet from wall | Luke, Charles, Brandon | pass |
| Measure sphero units | 11/4/19 | Measure sphero units for distance | Units observed | Luke, Charles, Brandon | pass |
| Stop and rotation c2 | 11/4/19 | Make turn without hitting objects | Objects cleared | Luke, Charles, Brandon | pass |
| Stop and rotation c3 | 11/4/19 | Make turn without hitting objects | Objects cleared | Luke, Charles, Brandon | pass |
| Stop and rotation c4 | 11/4/19 | Make turn without hitting objects | Objects cleared | Luke, Charles, Brandon | pass |
| Stop on origin | 11/4/19 | Robot stops at start point | Took a few tries but got it | Luke, Charles, Brandon | pass |
| Measurement  checks on robot  Long length | 11/4/19 | All measurements up to par | Give or take a few units, measurements correct | Luke, Charles, Brandon | pass |
| Measurement checks on robot  Short length | 11/4/19 | All measurements up to par | Give or take a few units, measurements correct | Luke, Charles, Brandon | pass |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

***5.6*       *Task List/Gantt Chart***

Embed your gantt chart here

***5.7*       *Staffing Plan***

Insert a chart/table that depicts the roles and responsibilities of each team member that worked on this project

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Role** | **Responsibility** | **Reports To** |
| **Brandon Merola** | Coder/Planner | Test for, and code robot action. Plan project direction. | n/a |
| **Charles Klehr** | Design Doc | Worked on design document, tables, graphs etc. | n/a |
| **Luke Medley** | Design Doc | Worked on design document, tables, graphs etc. | n/a |