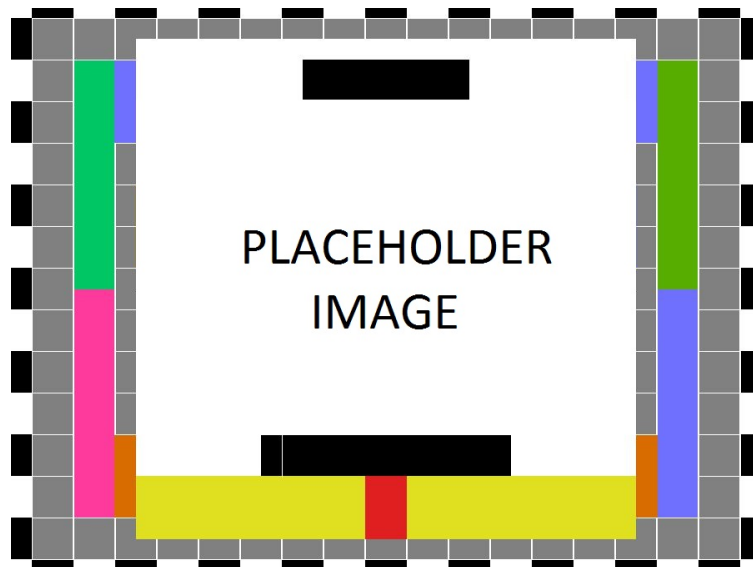


**DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
THE UNIVERSITY OF TEXAS AT ARLINGTON**

**SYSTEM REQUIREMENTS SPECIFICATION
CSE 4316: SENIOR DESIGN I
FALL 2021**



TEAM NAME
PRODUCT NAME

ALAN TURING
GRACE HOPPER
JOHN VON NEUMANN
ADA LOVELACE
CHARLES BABBAGE

REVISION HISTORY

Revision	Date	Author(s)	Description
0.1	10.01.2015	GH	document creation
0.2	10.05.2015	AT, GH	complete draft
0.3	10.12.2015	AT, GH	release candidate 1
1.0	10.20.2015	AT, GH, CB	official release
1.1	10.31.2015	AL	added customer change requests

CONTENTS

1	Product Concept	6
1.1	Purpose and Use	6
1.2	Intended Audience	6
2	Product Description	7
2.1	Features & Functions	7
2.2	External Inputs & Outputs	7
2.3	Product Interfaces	7
3	Customer Requirements	8
3.1	Requirement Name	8
3.1.1	Description	8
3.1.2	Source	8
3.1.3	Constraints	8
3.1.4	Standards	8
3.1.5	Priority	8
3.2	Requirement Name	8
3.2.1	Description	8
3.2.2	Source	9
3.2.3	Constraints	9
3.2.4	Standards	9
3.2.5	Priority	9
4	Packaging Requirements	10
4.1	Requirement Name	10
4.1.1	Description	10
4.1.2	Source	10
4.1.3	Constraints	10
4.1.4	Standards	10
4.1.5	Priority	10
5	Performance Requirements	11
5.1	Requirement Name	11
5.1.1	Description	11
5.1.2	Source	11
5.1.3	Constraints	11
5.1.4	Standards	11
5.1.5	Priority	11
6	Safety Requirements	12
6.1	Laboratory equipment lockout/tagout (LOTO) procedures	12
6.1.1	Description	12
6.1.2	Source	12
6.1.3	Constraints	12
6.1.4	Standards	12
6.1.5	Priority	12

6.2	National Electric Code (NEC) wiring compliance	12
6.2.1	Description	12
6.2.2	Source	12
6.2.3	Constraints	12
6.2.4	Standards	12
6.2.5	Priority	12
6.3	RIA robotic manipulator safety standards	12
6.3.1	Description	12
6.3.2	Source	13
6.3.3	Constraints	13
6.3.4	Standards	13
6.3.5	Priority	13
7	Security Requirements	14
7.1	Requirement Name	14
7.1.1	Description	14
7.1.2	Source	14
7.1.3	Constraints	14
7.1.4	Standards	14
7.1.5	Priority	14
8	Maintenance & Support Requirements	15
8.1	Requirement Name	15
8.1.1	Description	15
8.1.2	Source	15
8.1.3	Constraints	15
8.1.4	Standards	15
8.1.5	Priority	15
9	Other Requirements	16
9.1	Requirement Name	16
9.1.1	Description	16
9.1.2	Source	16
9.1.3	Constraints	16
9.1.4	Standards	16
9.1.5	Priority	16
10	Future Items	17
10.1	Requirement Name	17
10.1.1	Description	17
10.1.2	Source	17
10.1.3	Constraints	17
10.1.4	Standards	17
10.1.5	Priority	17

LIST OF FIGURES

1	X conceptual drawing	6
---	--------------------------------	---

1 PRODUCT CONCEPT

This section provides a high-level statement of your product concept - what it is intended to do and how it is intended to be used. Include in this header paragraph, a brief synopsis of what is described here. For example, this header paragraph might say something like: "This section describes the purpose, use and intended user audience for the X product. X is a system that performs Y. Users of X will be able to Z..."

1.1 PURPOSE AND USE

This is where you describe in a brief, yet clear and concise, manner what your product should do and how you expect it should be used.

1.2 INTENDED AUDIENCE

This is where you describe the intended audience(s) of your product. If this product were to be made available publicly or commercially, who would purchase or use it? Is the product designed for a particular customer, or an overall class of customers? Is it intended for general use, or is it a specific component of a more complex system?

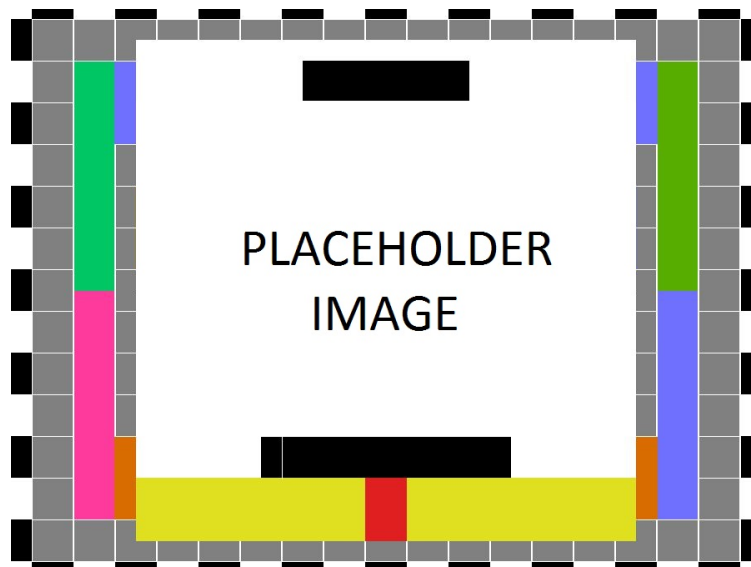


Figure 1: X conceptual drawing

2 PRODUCT DESCRIPTION

This section provides a description of your product and defines its primary features and functions. The purpose is to give the document reader/reviewer enough information about the product to allow them to easily follow the specification of requirements found in the remainder of the document. Your header for this section should introduce the section with a brief statement such as: "This section provides the reader with an overview of X. The primary operational aspects of the product, from the perspective of end users, maintainers and administrators, are defined here. The key features and functions found in the product, as well as critical user interactions and user interfaces are described in detail." Using words, and pictures or graphics where possible, specify the following:

2.1 FEATURES & FUNCTIONS

What the product does and does not do. Specify in words what it looks like, referring to a conceptual diagram/graphic (Figure X). Define the principle parts/components of the product. Specify the elements in the diagram/graphic that are part(s) of this product as well as any associated external elements (e.g., the Internet, an external web server, a GPS satellite, etc.)

2.2 EXTERNAL INPUTS & OUTPUTS

Describe critical external data flows. What does your product require/expect to receive from end users or external systems (inputs), and what is expected to be created by your product for consumption by end users or external systems (outputs)? In other words, specify here all data/information to flow into and out of your systems. A table works best here, with rows for each critical data element, and columns for name, description and use.

2.3 PRODUCT INTERFACES

Specify what all operational (visible) interfaces look like to your end-user, administrator, maintainer, etc. Show sample/mock-up screen shots, graphics of buttons, panels, etc. Refer to the critical external inputs and outputs described in the paragraph above.

3 CUSTOMER REQUIREMENTS

Include a header paragraph specific to your product here. Customer requirements are those required features and functions specified for and by the intended audience for this product. This section establishes, clearly and concisely, the "look and feel" of the product, what each potential end-user should expect the product do and/or not do. Each requirement specified in this section is associated with a specific customer need that will be satisfied. In general Customer Requirements are the directly observable features and functions of the product that will be encountered by its users. Requirements specified in this section are created with, and must not be changed without, specific agreement of the intended customer/user/sponsor.

3.1 REQUIREMENT NAME

3.1.1 DESCRIPTION

A detailed description of the feature/function that satisfies the requirement. For example: *The GUI background will be slate blue. This specific color is required in order to ensure that the GUI matches other similar software products offered by the customer. Slate blue is specified as #007FFF, using six-digit hexadecimal color specification.* It is acceptable and advisable to include drawings/graphics in the description if it aids understanding of the requirement.

3.1.2 SOURCE

The source of the requirement (e.g. customer, sponsor, specified team member (by name), federal regulation, local laws, CSE Senior Design project specifications, etc.)

3.1.3 CONSTRAINTS

A detailed description of realistic constraints relevant to this requirement. Economic, environmental, social, political, ethical, health & safety, manufacturability, and sustainability should be discussed as appropriate.

3.1.4 STANDARDS

A detailed description of any specific standards that apply to this requirement (e.g. *NSTM standard xx.xxx.x. color specifications [1]*). Standards exist for practically everything (ATC standard fuses, IEEE 802.15.4 embedded wireless, TLS 1.3 encryption, etc.), so be sure that you research and document which ones will be followed in meeting this requirement.

3.1.5 PRIORITY

The priority of this requirement relative to other specified requirements. Use the following priorities:

- Critical (must have or product is a failure)
- High (very important to customer acceptance, desirability)
- Moderate (should have for proper product functionality);
- Low (nice to have, will include if time/resource permits)
- Future (not feasible in this version of the product, but should be considered for a future release).

3.2 REQUIREMENT NAME

3.2.1 DESCRIPTION

Detailed requirement description...

3.2.2 SOURCE

Source

3.2.3 CONSTRAINTS

Detailed description of applicable constraints...

3.2.4 STANDARDS

List of applicable standards

3.2.5 PRIORITY

Priority

4 PACKAGING REQUIREMENTS

Include a header paragraph here. Packaging requirements are those requirements that identify how the delivered product will be packaged for delivery to the end-user; or how it will "look" when finished and delivered. For example, you might specify that the software required for operation will be pre-loaded on the hard drive, delivered on CD/DVD, or available via download. Software might be customer installable, or not, etc. Hardware components could be all in a single package, provided as a "bag of parts" to be assembled/installed by the user, painted a certain color, logos affixed, etc. Care should be taken not to duplicate requirements found in other sections of this document.

4.1 REQUIREMENT NAME

4.1.1 DESCRIPTION

Detailed requirement description...

4.1.2 SOURCE

Source

4.1.3 CONSTRAINTS

Detailed description of applicable constraints...

4.1.4 STANDARDS

List of applicable standards

4.1.5 PRIORITY

Priority

5 PERFORMANCE REQUIREMENTS

Include a header paragraph specific to your product here. Performance requirements address items such as: how fast specific critical operations must complete; how long it takes to start/stop activities; how long the battery must last; maximum time it must take to set up; etc.

5.1 REQUIREMENT NAME

5.1.1 DESCRIPTION

Detailed requirement description...

5.1.2 SOURCE

Source

5.1.3 CONSTRAINTS

Detailed description of applicable constraints...

5.1.4 STANDARDS

List of applicable standards

5.1.5 PRIORITY

Priority

6 SAFETY REQUIREMENTS

Include a header paragraph specific to your product here. Safety requirements might address items specific to your product such as: no exposure to toxic chemicals; lack of sharp edges that could harm a user; no breakable glass in the enclosure; no direct eye exposure to infrared/laser beams; packaging/grounding of electrical connections to avoid shock; etc.

6.1 LABORATORY EQUIPMENT LOCKOUT/TAGOUT (LOTO) PROCEDURES

6.1.1 DESCRIPTION

Any fabrication equipment provided used in the development of the project shall be used in accordance with OSHA standard LOTO procedures. Locks and tags are installed on all equipment items that present use hazards, and ONLY the course instructor or designated teaching assistants may remove a lock. All locks will be immediately replaced once the equipment is no longer in use.

6.1.2 SOURCE

CSE Senior Design laboratory policy

6.1.3 CONSTRAINTS

Equipment usage, due to lock removal policies, will be limited to availability of the course instructor and designed teaching assistants.

6.1.4 STANDARDS

Occupational Safety and Health Standards 1910.147 - The control of hazardous energy (lockout/tagout).

6.1.5 PRIORITY

Critical

6.2 NATIONAL ELECTRIC CODE (NEC) WIRING COMPLIANCE

6.2.1 DESCRIPTION

Any electrical wiring must be completed in compliance with all requirements specified in the National Electric Code. This includes wire runs, insulation, grounding, enclosures, over-current protection, and all other specifications.

6.2.2 SOURCE

CSE Senior Design laboratory policy

6.2.3 CONSTRAINTS

High voltage power sources, as defined in NFPA 70, will be avoided as much as possible in order to minimize potential hazards.

6.2.4 STANDARDS

NFPA 70

6.2.5 PRIORITY

Critical

6.3 RIA ROBOTIC MANIPULATOR SAFETY STANDARDS

6.3.1 DESCRIPTION

Robotic manipulators, if used, will either housed in a compliant lockout cell with all required safety interlocks, or certified as a "collaborative" unit from the manufacturer.

6.3.2 SOURCE

CSE Senior Design laboratory policy

6.3.3 CONSTRAINTS

Collaborative robotic manipulators will be preferred over non-collaborative units in order to minimize potential hazards. Sourcing and use of any required safety interlock mechanisms will be the responsibility of the engineering team.

6.3.4 STANDARDS

ANSI/RIA R15.06-2012 American National Standard for Industrial Robots and Robot Systems, RIA TR15.606-2016 Collaborative Robots

6.3.5 PRIORITY

Critical

7 SECURITY REQUIREMENTS

Include a header paragraph specific to your product here. In this section specify any requirements related to information security or privacy. This may include items such as encryption standards, data storage procedures, authentication, password strength, etc.

7.1 REQUIREMENT NAME

7.1.1 DESCRIPTION

Detailed requirement description...

7.1.2 SOURCE

Source

7.1.3 CONSTRAINTS

Detailed description of applicable constraints...

7.1.4 STANDARDS

List of applicable standards

7.1.5 PRIORITY

Priority

8 MAINTENANCE & SUPPORT REQUIREMENTS

Include a header paragraph specific to your product here. Maintenance and support requirements address items specific to the ongoing maintenance and support of your product after delivery. Think of these requirements as if you were the ones who would be responsible for caring for customers/end user after the product is delivered in its final form and in use "in the field". What would you require to do this job? Specify items such as: where, how and who must be able to maintain the product to correct errors, hardware failures, etc.; required support/troubleshooting manuals/guides; availability/documentation of source code; related technical documentation that must be available for maintainers; specific/unique tools required for maintenance; specific software/environment required for maintenance; etc.

8.1 REQUIREMENT NAME

8.1.1 DESCRIPTION

Detailed requirement description...

8.1.2 SOURCE

Source

8.1.3 CONSTRAINTS

Detailed description of applicable constraints...

8.1.4 STANDARDS

List of applicable standards

8.1.5 PRIORITY

Priority

9 OTHER REQUIREMENTS

Include a header paragraph specific to your product here. In this section specify anything else that is required for the product to be deemed complete. Include requirements related to customer setup and configuration if not specified in a previous requirement. Add any known requirements related to product architecture/design, such as modularity, extensibility (for future enhancements), or adaptation for a specific programming language. Consider requirements such as portability of your source code to various platforms (Windows, Linux, Unix Mac OS, etc.).

9.1 REQUIREMENT NAME

9.1.1 DESCRIPTION

Detailed requirement description...

9.1.2 SOURCE

Source

9.1.3 CONSTRAINTS

Detailed description of applicable constraints...

9.1.4 STANDARDS

List of applicable standards

9.1.5 PRIORITY

Priority

10 FUTURE ITEMS

In this last section, you will reiterate all requirements that are listed as priority 5. This is repetitive, but necessary as a concise statement of features/functions that were considered/discussed and documented herein, but will NOT be addressed in the prototype version of the product due to constraints of budget, time, skills, technology, feasibility analysis, etc. Use the following format for this section.

10.1 REQUIREMENT NAME

10.1.1 DESCRIPTION

Detailed requirement description...

10.1.2 SOURCE

Source

10.1.3 CONSTRAINTS

Detailed description of applicable constraints...

10.1.4 STANDARDS

List of applicable standards

10.1.5 PRIORITY

Priority

REFERENCES

- [1] Kenneth S Rubin. *Essential Scrum: A Practical Guide to the Most Popular Agile Process*. Addison-Wesley Professional, 1st edition, 2012.