Software Requirements Specification
Mechtronics Enigeering

Team 32, Wingman
Edward He
Erping Zhang
Guangwei Tang
Peng Cui
Peihua Jin

Contents

Table 1: Revision History

Date	**Developer(s)**	**Change**
2022-10-04	Edward He, Erping Zhang Guangwei Tang, Peng Cui Peihua Jin	Revision 0

List of Tables

List of Figures

This document describes the requirements for Mechtronics Enigeering. The template for the Software Requirements Specification (SRS) is a subset of the Volere template **?**. If you make further modifications to the template, you should explicitly state what modifications were made.

1 Project Drivers

1.1 The Purpose of the Project

1.2 The Stakeholders

1.2.1 The Client

1.2.2 The Customers

1.2.3 Other Stakeholders

1.3 Mandated Constraints

1.4 Naming Conventions and Terminology

1.5 Relevant Facts and Assumptions

User characteristics should go under assumptions.

2 Functional Requirements

2.1 The Scope of the Work and the Product

2.1.1 The Context of the Work

2.1.2 Work Partitioning

2.1.3 Individual Product Use Cases

2.2 Functional Requirements

3 Non-functional Requirements

3.1 Look and Feel Requirements

3.2 Usability and Humanity Requirements

3.3 Performance Requirements

3.4 Operational and Environmental Requirements

3.5 Maintainability and Support Requirements

3.6 Security Requirements

3.7 Cultural Requirements

3.8 Legal Requirements

3.9 Health and Safety Requirements

This section is not in the original Volere template, but health and safety are issues that should be considered for every engineering project.

4 Project Issues

4.1 Open Issues

- Limit of 180 rotation degree of servo motor

- Accuracy of object detection
- How to distinguish two objects with very limited resources
- How to recognize the same object in different angles
- How to guarantee the stability of the serial communication

4.2 Off-the-Shelf Solutions

- Huskylens - is a AI camera which can learn new objects and recognize them. It has the machine learning technology enables projects to interact with people and environments which allows many kinds of system control.
- NVIDIA Jetson TX2 - is an embedded AI computer device. It has 8GB memory and 59.7GB/s of memory bandwidth which provides a high quality AI performance to build efficient AI models including computer vision.

4.3 New Problems

4.3.1 Effects on the Current Environment

Any changes to the exist database may cause the data related to each object missing

4.3.2 Effect on the Installed Systems

Changes to the motorized camera mount will affect the algorithm or logic of the controller board

4.3.3 Potential User Problems

Changes to the user interface may change the way that user used to search the object

4.3.4 Limitations in the Anticipated Implementation Environment

NA

4.3.5 Follow-Up Problems

The changes in computer vision algorithm may cause the whole system malfunction

4.4 Tasks

4.4.1 Project Planning

NA

4.4.2 Planning of the Development Phases

NA

4.5 Migration to the New Product

4.5.1 Requirements for Migration to the New Product

- All the objects data should be stored
- Motorized camera mount should be calibrated before using
- The spec of camera should be kept in same as possible

4.5.2 Data that Has to be Modified or translated for the new system

- Objects data need to be transfer ed into the new system

4.6 Risks

- Connection lost between the board and camera during the motor movement.
- Inappropriate distance measure and control between the object and the motor which furthermore cause damage or stuck.
- Physical damage from collision with objects .
- Physical damage from wire twisting during rotation.
- Unexpected movement caused by the delay of data transfer

4.7 Costs

Product	Price
USB Camera	$30
PTZ Mount	$25
Arduino	$30
Motors	$15
Total	$100

4.8 User Documentation and Training

4.8.1 User Documentation Requirements

- User manuals
- Installation manuals
- Technical specifications to accompany the product

4.8.2 Training Requirements

NA

4.9 Waiting Room

- Expanding chassis's activity area including rotation angle and planar movement.
- Developing new algorithm regarding data transfer to enable faster real-time reaction.
- Adding alarm in case that object not found in the assigned area as an application of storage security.

4.10 Ideas for Solutions

- Use DC motor with decoder to implement the unlimited rotation degree of camera mount

- Use Field Oriented Control algorithm to implement the unlimited rotation degree of camera mount
- Use frame-to-frame compassion to detect the relocation of objects
- Predict the possible location of objects by tracking the users path in the room
- Beeper alert when the camera view is not cleared

5 Appendix

This section has been added to the Volere template. This is where you can place additional information.

5.1 Symbolic Parameters

The definition of the requirements will likely call for SYMBOLIC_CONSTANTS. Their values are defined in this section for easy maintenance.

5.2 Reflection

The information in this section will be used to evaluate the team members on the graduate attribute of Lifelong Learning. Please answer the following questions:

1. What knowledge and skills will the team collectively need to acquire to successfully complete this capstone project? Examples of possible knowledge to acquire include domain specific knowledge from the domain of your application, or software engineering knowledge, mechatronics knowledge or computer science knowledge. Skills may be related to technology, or writing, or presentation, or team management, etc. You should look to identify at least one item for each team member.

2. For each of the knowledge areas and skills identified in the previous question, what are at least two approaches to acquiring the knowledge or mastering the skill? Of the identified approaches, which will each team member pursue, and why did they make this choice?