Table 1: Revision History

Date	**Developer(s)**	**Change**
Date1	Name(s)	Description of changes
Date2	Name(s)	Description of changes
...	...	...

Hazard Analysis
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Contents

1 Introduction

2 Component Overview

The project can be divided into five different main components. Those components are listed in the paragraphs below.

2.1 Movement of Camera

A stable and accurate motorized camera mount is necessary for the movement tracking. The servos need to move in a appropriate speed and angle in order to make the camera capture the best view of both objects and user.

2.2 Human Body Detection

A good detection method should be used so that the human body can be detected by the program in the images provided by the camera. The movement of the human body shoudl also need to be detected to help the camera to judge its angular position.

2.3 User Interface

This component provides a communication layer between the system and the user through a computer app.

2.4 Database

2.5 Objection Detection

This system is responsible for detecting any moving object in the area and identifying each object with unique set of characteristics. The is the main logical system for smartVault to help locate a "lost" item.

3 Safety Considerations and Connection with Requirements

3.1 Movement of Camera

3.1.1 Servo motor overload

When the camera got block by something or the gear of servo get stuck during the rotation, the system will lose the tracking of user and the worst result could be a motor overheat and burn.

3.1.2 Short circuit

If some liquid gets spilled on the parts, it might cause the short circuit of the controller board and servo motor, which will cause the entire system stop working and possible to lose data.

3.1.3 Unstable connection with other components

If the connection between camera and system is unstable during rotation, the detection and tracking system will stop working since the system cannot capture the image.

3.1.4 Risk of falling

When the parts assembly get loosen after a long-term operation, there is a chance for the parts to fall off from mount or the main body. This situation will cause the injure of user and the damage of the entire system.

3.1.5 Non-appropriate angular velocity of camera

If the rotation speed of the camera go too fast or too slow, the the system may lose the tracking of user. It is also possible to cause injure of user by hitting the users' body.

3.2 Human Body Detection

3.2.1 Human Body not Detected

When a human presents in the room and the images have been shown in the computer, the program fail to detect the human body in the screen.
Related Requirements: IPR1

3.2.2 Wrong Human Body Detected

When the software component of the oobject detects a human body shown in the camera, the body shown on the screen is not actually a body of a person.
Related Requirements: IPR1

3.2.3 Body Movement not Detected

When people moves in the room and thhe images has been sent to the computer, the program cannot detect the movement of the body.
Related Requirements: IPR4

3.2.4 Wrong Body Movement Detected

When the program detects the movements of human body, only part of movement or wrong movement is identified by the program.
Related Requirements: IPR4

3.3 User Interface

3.3.1 General

App closes unexpectedly, it could lead to the loss of current progress.

3.3.2 Login In Issue

User cannot log in to the app successfully, such that he/she do not have the ability to interface with the system.

3.3.3 Authentication

An unauthorized user logs in as a privileged user with high-level access.

3.4 Database

3.5 Object Detection

SmartVault will return error message when connection between camera and the object detection system is lost. When connection is lost, object detection system will not be able to monitor moving objects.

4 FMEA Worksheet

Table 1: The FMEA Table

Components	Failures	Cause of Failure	Recommended Action
Movement of Camera	N	N	N
Human Body Detection	Human Body not Detected	a. Detection method failure b. Wrong posture of human	a. Restart the program b. request help from development team
	Wrong Human Body Detected	a. Detection method failure	a. Restart the program b. Request help from development team
	Body Movement not Detected	a. Detection method failure b. Human body moves too fast	a. Restart the program b. Request help from Development team
	Wrong Body Movement Detected	a. Detection method failure	a. Restart the program b. Request help from development team
General	App closes unexpectedly	a. Host device loses power b. Crash due to instabilty	a. Store unsaved data locally on user's device
Login In Issue	User cannot log in to the app successfully	a. User's credentials are unmatched	a. Reset user's credentials
Authentication	An unauthorized user logs in as a privileged one with high-level access	Authentication issue	a. Fix the account permission and undo changes made by unauthorized user
Database	N	N	N
Object Detection	N	N	N

Failure Mode and Effects Analysis							
Components	**Failure Modes**	**Causes of Failure**	**Effects of Failure**	**Severity**	**Recommended Actions**	**SR**	**Ref**
Movement of Camera	Servo motor overload	Servo gear or components stuck	Motor overheat and damage	Strongly High	Lubricate the parts when hear uncommon noise	NA	NA
	Short circuit	Liquid spill	The camera stop moving, and the whole system may stop working	Strongly High	Need technician to repair	NA	NA
	Unstable connection	Loosen connection during rotation	Whole system stop working, cannot tracking new objects	High	Unplug the connections and plug in again then restart the whole system	NA	NA
	Risk of falling	Loosen assembly	The parts will disassembly and may cause injury	Strongly High	Concern about any abnormal movement or noise of the camera, technician may needed depend on situation	NA	NA
	Abnormal rotation speed of camera	Caused by the control algorithm error	High	System will lose the tracking of user and objects	Restart the system	NA	NA
Human Body Detection	Human body detection failure	a. Detection method Failure b. Wrong Human Body Detected c. Wrong postures of human body	a. Wrong position description of the objects	High	a. Restart the program b. Compare detected body with human body database stored inside the system	IPR1	H3-1
	Body movement detection failure	a. Detection method failure b. Wrong movement detected	Hard to associate movement of objects with movement of human body	High	a. Retart the program b. Rejudging movement zone around the human body	IPR4	H3-2
User Interface	App closes unexpectedly	Host device loses power, or Crash due to instabilty	Current progress is lost	High	a. Store unsaved data locally on user's device	NA	NA
	User cannot log in to the app successfully	User's credential is unmatched	User is unable to use the system	High	a. Reset user's credentials	NA	NA