Hazard Analysis
Mechatronics

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Revision History

Table 1: Revision History

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

1 Introduction

This document is a hazard analysis of Group 20's ASL Translator. The ASL Translator is a real-time sign language translation device intended to aid individuals who are hard of hearing in day to day communication tasks. This device may also be used for the purpose of facilitating the learning of sign language in an educational setting.

2 Scope and Purpose

The purpose of this document is to identify hazards that may occur when using the ASL Translator specifically in the components, their causes and consequences on user operation, hazard mitigation, and their respective safety requirements.

3 System Boundaries

4 Definition of Hazard

The definition of a hazard is based on the definition from Nancy Leveson's work. A hazard is a property or condition in the system along with a condition in the environment that results in a loss. A hazard is anything that can cause our system to function incorrectly, or not function at all. In the ASL Translator, there exists only hazards that affect safety during operation.

5 Critical Assumptions

6 Failure Modes and Effects Analysis

The hazard analysis tool being used is the Failure Modes and Effects Analysis (FMEA). This will enable hazard identification and analysis such that additional safety requirements can be created and considered in the implementation of the project.

6.1 Hazards Out of Scope

The out of scope hazards for our project is primarily based on the user's decision. This is because we do not have control over the following:

- The camera that is to be used in conjunction with the system
- The Raspberry Pi model and microSD card capacity being used

Both components listed above are essential to the functionality of the system. However, there is no enforcement on these aspects as the user may prefer something less costly or more costly. The user's decision towards these components may vary and can affect the overall performance of the system. Steps will be taken to minimize the impact of the user's choice in these categories such as ensuring backwards compatibility is possible with our implementation of code on the Raspberry Pi and camera calibration methods.

6.2 Failure Modes and Effects Analysis Table

Below is the FMEA table for the project.

Component	Failure Modes	Effects of Failure	Causes of Failure	Recommended Action	SR	Ref.
Raspberry Pi	Fail to output translated results					
	Hardware failure (board)	Raspberry Pi cannot function	a. The board is not powered due to faulty power supply	a. Ensure that the board is properly plugged in. Use another power cable to verify that the board itself is not faulty. The raspberry pi is equipped with a polyfuse to prevent over-current. If the board does not power on after 24 hours, the fuse should be replaced.	a. HR1	H1-2
			b. The software is corrupted	b. Remove the microSD card and ensure that the card is not corrupted using a computer. If it is corrupted, attempt to reformat the microSD card and write the software onto it again.	b. HR1	

Component	Failure Modes	Effects of Failure	Causes of Failure	Recommended Action	SR	Ref.
Raspberry Pi	Hardware failure (board)	Raspberry Pi cannot function	c. The board is faulty or defective	c. Attempt to run the software on an identical model using the same cables, microSD card, and peripherals. If the software works, then the existing board is faulty and should be replaced. Otherwise, test using the newer components until the problem is isolated.	c. HR1	H1-2
			d. The microSD card cannot be read	d. Same as H1-2b	d. HR1	

7 Safety Requirements

7.1 Requirement Category 1

7.2 Requirement Category 2

8 Roadmap