Spotter

McMaster University

Development Process
SE 4G06 & TRON 4TB6

Group 12

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1. Revisions

Date	Revision Number	Authors	Comments
Dec 4, 2021	Revision 0	Artemiy Kokhanov Winnie Liang Donisius Wigie	Created Document and added Sections
Dec 6, 2021	Revision 0	Artemiy Kokhanov Winnie Liang	Added Notes and Introduction
Dec 7, 2021	Revision 0	Artemiy Kokhanov Ridhwan Chowdhury Winnie Liang Donisius Wigie Juwon Adeola Zuhair Makda	Completed Remaining sections Final Touch-ups before submission

2. Introduction

Purpose:

The purpose of this document is to identify the components of Spotter that if failure occurs during usage of one of these components there may be hazardous consequences and either eliminate these potential hazards or mitigate them. Hazard analysis is important because being aware of potential hazards during planning development phases will allow the final product to minimize the risk of a potential hazard occurring.

This document will identify potential hazards during the planning and development lifecycles of our application as well as potential hazards once the final product is released and how we deal with these potential hazards.

We will be only analyzing software systems as our product has no mechanical aspects apart from a visual sensor (which will be briefly discussed).

Scope:

Our product is an application that helps people workout by tracking them and providing live feedback on whether the user is performing an exercise correctly or not. Our product utilizes a camera on your personal device to be able to track you while you workout.

3. Component Overview and Descriptions

3.1 Video Capture System

This component captures live video for analysis.

3.2 Video Analysis System

3.2.1 Landmark Detector

This component analyses data provided by the video capture system to identify points of interest - landmarks, and their respective coordinates.

3.2.2 Translator

This component returns results based on user selections using constraint and landmark data. Results include the tracking of repetitions and whether exercises were done in accordance with chosen constraints.

3.3 GUI

This component provides a graphical user interface for the user to interact with the system. This allows the user to select constraints, modify constraints, review historical data and live results produced by the video analysis system.

4. Safety Considerations

4.1 Video Capture System

Software Issues:

- Poor environmental conditions (E.g. lighting, tint, visual obstructions) may cause issues in capturing and tracking user movements
- Attacks where the video feed is corrupted

Hardware Issues:

- Missing Camera Input leading to an inability to track user exercises

4.2 Video Analysis System

Software Issues:

- Attacks where incorrect tracking data is recorded

Hardware Issues:

- Lack of an internet connection may result in an inability to access the application
- Poor video capturing feed may result in inaccuracy of landmark and movement tracking.

4.3 GUI

Software Issues:

- Incompatible applications may result in a loss of features and application functionality

Hardware Issues:

- Lack of an internet connection may result in an inability to access the application
- Lack of peripherals on a computer will result in an inability to interact with the application
- Incompatible hardware may result in an inability for the application to function

5. Correlation between Hazard Functions and Requirements

List of Functions and Associated F/NF Requirements:

- F1: Access Device Hardware for Visual Tracking
    - NF6
    - NF7
    - NF14
    - NF5
    - NF15
- F2: Imprint landmarks and identifying lines on body
    - NF5
    - NF7
    - NF18
- F3: Collect user input for exercise tracking
    - NF14
    - NF12
    - NF14
    - NF15
    - NF17
- F4: Follow user exercise and verify correctness of form/movement
    - NF5
    - NF7
    - NF15
- F5: Notify findings to the user
    - NF1
    - NF2
    - NF18
    - NF14

6. FMEA Worksheet

Design component	Ref #	Failure modes	Causes of failure	Effects of failure	Detection	Controls	Recommended Action
Video analysis system	6.1.0	Point of interest is not detected	Poor video quality Multiple people in the video feed Poor lighting in video feed	Incorrect or insufficient data	Software to check if all landmarks are present and detected Software to check for video quality or multiple people in the video feed	Design a default strategy.	Indicate to the user if their video quality may cause the detector to not be as accurate If there are multiple people in the video feed, detect landmarks on the closest figure
	6.1.1	Translator incorrectly processes data	Poorly designed constraints	Incorrect classification of correct and incorrect form.	Visual check	N/A	Sufficiently test the built in constraints with multiple users of different body types
	6.1.2	Low/insufficient framerate	User hardware	Insufficient number of frames being received to get accurate data	Software to detect low or insufficient framerate	N/A	Indicate to the user that framerate is low/insufficient and the analysis may not be accurate Account for lower framerates within the analysis algorithm
Video capture system	6.2.0	Low/insufficient framerate	User hardware	Insufficient number of frames sent per time interval for analysis to get accurate data	Software to detect low or insufficient framerate	N/A	Indicate to the user that framerate is low/insufficient and the analysis may not be accurate
GUI	6.3.0	Interface display stops working	Unsupported browser version	The system is unable to run on the browser	Software to detect what browser is being used	N/A	Detect what browser is being used, and have code designed to run specific for browsers in order to support as many browsers as possible.

7. Conclusion

At a justified development stage, it is essential in creating a thorough hazard analysis to ensure that the system design is safe for users to interact with. It is important to note that the safety considerations are held to the highest priority and the necessary actions are taken to identify potential hazardous scenarios so that they can be avoided and/or mitigated. The hazards can be completely eliminated through our functional and nonfunctional requirements, time, and budget constraints that are put in place for our project. In situations where certain hazardous scenarios cannot be mitigated, there will be an adequate amount of warnings put in place allowing the user to be aware of the safest way in interacting with our product. This, in effect, reinforces the system to be regulated and adhered to the standards of design within the development phase of Spotter.