Hazard Analysis
Software Engineering

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Table 1: Revision History

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

Contents

1 Introduction

2 Scope and Purpose of Hazard Analysis

3 System Boundaries and Components

This section is broken down into two subsections: one for components within the system boundary, and one for components outside the system boundary.

3.1 Inside the System Boundary

The following components are within the system's control and responsibility:

- **Embedded firmware:** Real-time operating system and all embedded software running on the processing unit.

- **Signal processing module:** Real-time digital signal processing algorithms including frequency domain transforms, filtering, and time-domain analysis.

- **Direction of arrival (DoA) estimation:** Algorithms for computing sound source direction on a 2D plane based on time difference of arrival and phase differences across microphones.

- **Audio classification engine:** Sound fingerprinting and classification logic to identify and categorize detected sounds (e.g., speech, vehicles, alarms).

- **Visualization Controller:** Component reposonsible for creating and sending visualization output to the glasses.

- **Configuration and calibration:** Microphone array calibration routines and system configuration parameters.

3.2 Outside the System Boundary

The following external entities interact with the system but are not under its direct control:

- **Users:** Individuals who are deaf or hard of hearing wearing the device. Their actions, responses to alerts, and interpretation of displayed information are outside the system's control.

- **Environmental sounds:** Acoustic signals in the physical environment, including speech, vehicle noises, alarms, and ambient sounds. The system detects and processes these but does not generate or control them.

- **Audio capture subsystem:** Synchronized sampling logic for the microphone array, including analog-to-digital conversion interfaces and buffer management. This component is included in the microcontroller and is not within our system's control.

- **Physical microphone hardware:** Microphone sensors that capture acoustic pressure waves. While the system controls their digital interface, the physical transduction mechanism is external.

- **Smart glasses hardware:** The physical display device, including its screen, optics, power management, and form factor. The system sends display commands but does not control the hardware's internal operation.

- **Microcontroller:** Component responsible for processing real time data of sensor inputs. This hardware component's performance and reliability are outside our system's control.

- **Power supply:** Battery or external power source providing electrical power to system components. Power management at the hardware level is external to the software system.

- **Physical environment:** Room acoustics, ambient noise levels, temperature, and other environmental factors that affect sound propagation and microphone performance.

4   Critical Assumptions

[These assumptions that are made about the software or system. You should minimize the number of assumptions that remove potential hazards. For instance, you could assume a part will never fail, but it is generally better to include this potential failure mode. —SS]

5   Failure Mode and Effect Analysis

[Include your FMEA table here. This is the most important part of this document. —SS] [The safety requirements in the table do not have to have the prefix SR. The most important thing is to show traceability to your SRS. You might trace to requirements you have already written, or you might need to add new requirements. —SS] [If no safety requirement can be devised, other mitigation

strategies can be entered in the table, including strategies involving providing additional documentation, and/or test cases. —SS]

6 Safety and Security Requirements

[Newly discovered requirements. These should also be added to the SRS. (A rationale design process how and why to fake it.) —SS]

7 Roadmap

[Which safety requirements will be implemented as part of the capstone timeline? Which requirements will be implemented in the future? —SS]

Appendix — Reflection

The purpose of reflection questions is to give you a chance to assess your own learning and that of your group as a whole, and to find ways to improve in the future. Reflection is an important part of the learning process. Reflection is also an essential component of a successful software development process.

Reflections are most interesting and useful when they're honest, even if the stories they tell are imperfect. You will be marked based on your depth of thought and analysis, and not based on the content of the reflections themselves. Thus, for full marks we encourage you to answer openly and honestly and to avoid simply writing "what you think the evaluator wants to hear."

Please answer the following questions. Some questions can be answered on the team level, but where appropriate, each team member should write their own response:

1. What went well while writing this deliverable?

2. What pain points did you experience during this deliverable, and how did you resolve them?

3. Which of your listed risks had your team thought of before this deliverable, and which did you think of while doing this deliverable? For the latter ones (ones you thought of while doing the Hazard Analysis), how did they come about?

4. Other than the risk of physical harm (some projects may not have any appreciable risks of this form), list at least 2 other types of risk in software products. Why are they important to consider?