

# Project Plan

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## Status

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## DOCUMENT HISTORY

<b>Version</b>	<b>Date</b>	<b>Changes made</b>	<b>Sign</b>	<b>Reviewer</b>
0.1	2023-09-15	First draft.	ME	EW
0.2	2023-09-20	Second draft, changes made according to feedback from orderer and supervisor.	ME	EW
1.0	2023-10-03	Final version after adaptation to new requirement specification.	EW	AR

## 1 OVERVIEW OF THE PROJECT

Communicating in noisy environments like restaurants, festivals and exhibitions remain troublesome for people suffering of impaired hearing. Traditionally, hearing aid devices have amplified all surrounding sounds of the user, making them avoid these types of rowdy environments. One way to improve the experience of hearing aid users would be to understand the environment and the intent of the user, enabling focused sound amplification combined with noise reduction.

This project aims to investigate and develop methods for using information about the environment to be able to extract useful sound to the user. This will be done with the assistance of a pair of wearable glasses providing sensors like camera and eye-tracker.

In collaboration with the hearing aid company Oticon and Linköpings University, we aim on this year's CDIO-project to further develop the research field to help people suffering from hearing problems with the focus on real-time implementation. The project will be carried out using the LIPS-model and this document will describe overall project plan.

### 1.1 Project goals

The goals in this project are mainly separated into two parts. The first one is to develop models such as beam forming and sound detection from the measured signals of the hearing earpieces. This goal requires to assess and evolve the existing software which enables the earpiece to operate independently. The second one one is to improve and develop features for the software used in Tobii Pro Glasses (G3). Amongst these features are eye tracking and target detection that will be implemented in real-time functionality. Finally, both devices and their softwares are going to get integrated to increase the efficiency and reliability of the generated output signal that the user experiences. The user's comfortability is going to be evaluated.

### 1.2 Deliveries

The deliveries that are included in this project can be seen in Table 1.

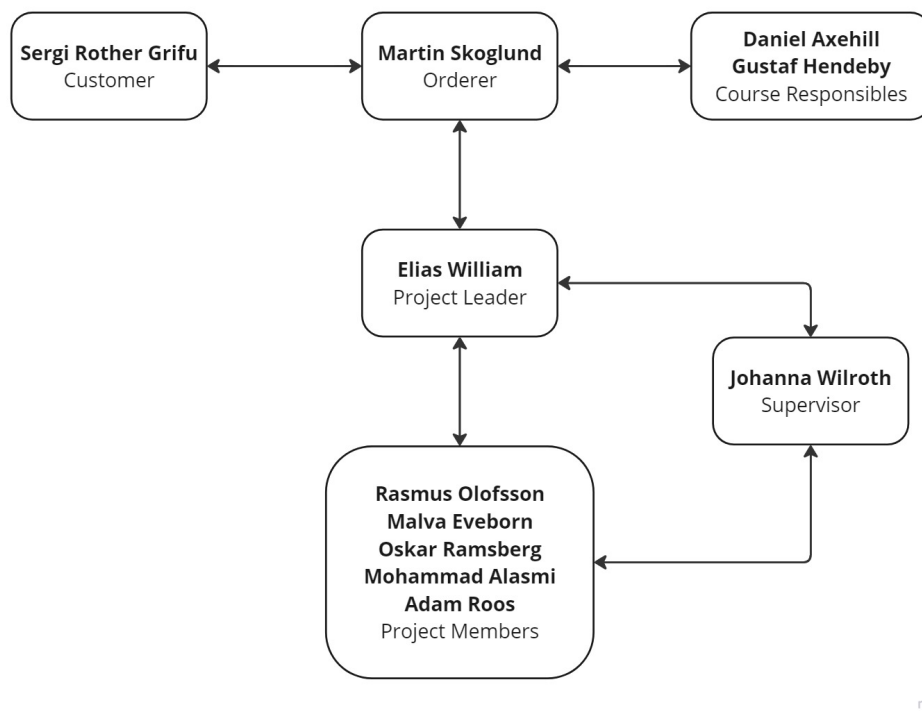
### 1.3 Limitations

The project group can only spend a total of 1440 hours on this project, which corresponds to 240 hours per person. Since the project is building onto previous year's projects, some of that time will be going towards setting up the old system and thus limit the time available for this year's project. Furthermore, the software used in this project can be computationally expensive which demands powerful computers. Another limitation in the project is the new equipment consisting of the hearing aids. Since they never been used before, more time may be needed to acquire knowledge of how they behave and to make them work with G3.

## 2 ORGANISATION

### 2.1 Overview

Figure 1 shows an overview of the project organisation.



**Figure 1:** Overview of the project organisation.

**Table 1:** The different deliveries to the customer and the orderer.

Delivery	Type	Date
A status report including a time report	Document	Every Monday
Project plan including time plan	Document	2023-09-21
Requirement specification	Document	2023-09-21
First draft of design specification	Document	2023-09-21
Final draft of design specification	Document	2023-10-05
Test plan	Document	2023-10-05
Project; all functionality implemented and a presentation showing it, test protocols and user manual	Project	2023-12-05
Technical documentation	Document	2023-12-15
After study	Document	2023-12-15
Poster presentation	Poster	2023-12-15
Website and a movie about the project	Website	2023-12-15

## 2.2 Responsibilities within the project group

The project members have different areas of responsibility. Table 2 lists a description of the different roles.

**Table 2:** Responsibilities within the project

Responsibility	Role Description	Name
Project Leader	Leads the project and is responsible for reaching the goals of the project.	Elias William
Responsible for Software	Ensure that the code follows the given code standard, is well structured and documented.	Rasmus Olofsson
Responsible for Documentation	Responsible for planning the writing and verification of documents and that the documents are finished in time.	Malva Eveborn
Responsible for Design	Responsible for making guidelines for the design implementation.	Oskar Ramsberg
Responsible for Hardware	Responsible for product safety and ensuring that the group is informed on how to use the product safely.	Mohammad Alasmi
Responsible for Testing	Responsible for planning and synchronizing tests, making sure that tests are relevant and correctly documented.	Adam Roos

## 2.3 Terms for cooperation within the project group

Weekly meetings with the project group will take place on Mondays. All group members are expected to attend and if a group member is not able to attend, a notice should be sent to the project leader 48 hours in advance. A notice later than 48 hours in advance may be approved by the group if the reason is deemed significant enough.

**Table 3:** The documents to be produced in the project.

Document	Language	Aim	Target	Date
Project Plan	English	Description of the conduction of the project.	Project members, Orderer	2023-09-21
Time Plan	English	Specify the time allocated for each activity and finish dates.	Project Members, Orderer	2023-09-21
Requirement Specification	English	Specify the requirements for the project.	Project Members, Orderer	2023-09-21
Design Specification	English	Description of the design of the system in order to meet the requirement specification.	Project Members, Orderer	2023-10-09
Test Plan	English	Detail which tests to be carried out and when to test the systems different modules.	Project Members, Orderer	2023-10-09
Test Protocols	English	Description of each of the tests carried out and the results of them.	Project Members, Orderer	2023-12-05
Technical Documentation	English	A technical description of the system.	Project Members, Orderer	2023-12-05
User Manual	English	To guide a potential user, the customer and future developers on how to operate the system.	Orderer, Customer	2023-12-05
Technical documentation	English	Detailed description of the project and its results.	Project Members, Customer, Course administrators	2023-12-15
After Study	English	A recall on the project and thoughts about it.	Course administrators	2023-12-15
Status Report	English	To give the orderer an update on the progress in the project.	Orderer	Weekly

### 3 DOCUMENT PLAN

All documents to be produced within the project are listed in Table 3.

### 4 DEVELOPMENT METHODOLOGY

The project group is split up into two subgroups. One subgroup will be responsible for the development of the softwares and models for the hearing aid prototypes. The other subgroup will be responsible for the development of algorithms for G3. On the weekly meetings the subgroups are to discuss developments and design decisions to facilitate future integration between the hearing aid prototypes and G3.



## 5 EDUCATION PLAN

All project members are responsible for educating themselves on necessary subject areas and programming languages to be used in the project.

## 6 REPORT PLAN

A status report containing activities worked on during the week, time spent of said activities and any eventual issues should be produced by all group members each week. The status reports should be sent to the project leader at the end of each week who then combines them into a full status report and send it to the orderer and customer.

## 7 MEETING PLAN

Each week a project group meeting will take place. During the weekly meetings the following points are to be discussed:

- The progress of the previous week and any issues that may have arisen.
- Design choices that affect the whole group.
- The plan for the following week and the activities of each project member.
- A review and any eventual necessary updates of the time plan.

## 8 RESOURCE PLAN

The resources for the project are listed below.

### 8.1 Personnel

The project group is consisting of 6 students at Linköping University taking the course TRST10 - Automatic Control: Project Course. Additional members of the project are the orderer Martin Skoglund, the customer Sergi Rotger Griful, the supervisor Johanna Wilroth and the course responsables Daniel Axehill and Gustaf Hendeby.

### 8.2 Material

The material available in the project are:

- One set of Tobii Pro Glasses 2
- One set of Tobii Pro Glasses 3
- Two hearing aid prototypes

- Two laptops capable to perform the necessary programs
- A GitLab repository with code and documentation from similar projects previous years

### 8.3 Premises

The premises available to the project are:

- A project room on Campus Valla, Linköping
- Access to booking Visionen, a testing room located on Campus Valla, Linköping

### 8.4 Economy

- All project members are to spend 240 hours on the project. This results in a total of 1440 hours.
- 40 hours of guidance by the supervisor of the project should be received by the group.
- All necessary equipment and hardware is to be provided by Linköping University and Eriksholm Research Centre.

## 9 MILESTONES AND DECISION POINTS

The project milestones and decision points are listed below.

### 9.1 Milestones

Table 4 contains the project milestones.

**Table 4:** Milestones

#	Description	Date
1	First draft of project plan, time-plan and requirement specification.	2023-09-16
2	Have existing code up and running.	2023-10-01
3	First draft of design specification.	2023-10-09
4	Delivery of project.	2023-12-05
5	After study finished.	2023-12-15
6	Poster finished.	2023-12-15
7	Movie and website finished.	2023-12-15

### 9.2 Decision Points

Table 5 lists the decision points (DP) for the project.

**Table 5:** Decision points of the project

#	Description	Date
DP2	Delivery of the project plan, requirement specification and a first draft of the design specification.	2023-09-21
DP3	Delivery of the design specification and a test plan.	2023-10-05
DP4	All functionality in the sub-modules should be finished.	2023-11-28
DP5	All functionality of the project should be finished and presentation showing that all requirements are fulfilled. Delivery of the test protocol and user manual.	2023-12-05
DP6	Delivery of the technical report, after study, poster presentation, website and a movie about the project.	2023-12-15

## 10 ACTIVITIES

Table 6 lists the project activities.

**Table 6:** Project activities

#	Activity	Dependency	Requirement	Time
1	Requirement specification	-	64	75
2	Project plan	-	64	19
3	Time plan	1	64, 63	4
4	Design specification	1	65	70
5	Test plan	1	65	30
6	Hardware	-	1	4
7	Sound source tracking I (HA)	6	2-7, 49, 50, 70	55
8	Noise reduction (HA)	6	8-15, 49, 50, 70	110
9	Face detection (G3)	-	16,17, 51, 70	20
10	Face tracking (G3)	9	18-21, 51, 70	25
11	Depth estimation (G3)	9	22, 51, 70	15
12	Eye-tracking (G3)	-	23-25, 51, 70	20
13	Orientation (G3)	-	26-28, 51, 70	70
14	Relative orientation (HA & G3)	-	29-31, 49-51, 70	45
15	Sound source tracking II (HA & G3)	7, 8, 10, 11, 12	32-36, 49-51, 70	220
16	GUI	-	37-48, 70	70
17	Technical report	1 - 16	68	100
18	Poster	1 - 16	68	25
19	Website	1 - 16	68	45
20	Video	1 - 16	68	25
21	After study	1 - 20	68	17

22	User manual	1 - 16	67	55
23	Project meetings	-	-	233
24	Administrative work	-	-	7,5
25	Lectures	-	-	24
26	Testing	5 - 16	1-51, 59-62, 67, 69	80
27	Research	-	-	25
28	Buffer	-	-	52

## 11 TIME PLAN

A time plan for the project can be found in a separate Excel sheet. The time plan states all activities and the hours allocated to them. The time plan is a document that will be updated as conditions change during the project.

## 12 PRIORITIES

The priorities for the project are listed in the requirement specification. Any changes in priorities are to be discussed with and approved by the orderer.

## 13 COMPLETION OF PROJECT

In order to complete the project, all high-priority requirements in the requirement specification need to be fulfilled. A project conference will take place 2023-12-18 after which the project will be considered completed.