

Month Mar 2

Mon	Tue	Wed	Thu	Fri	Sat	Sun
			1	2 Meeting	3	4
5	6	7	8	9 Meeting	10	11
12	13	14	15	16 - "Mini" Meeting	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

Month April

Mon	Tue	Wed	Thu	Fri	Sat	Sun
						1
2	3	4	5	6	7	8
g	10					15
16						22
23	24					29
30						

Month Mai

Mon	Tue	Wed	Thu	Fri	Sat	Sun
	1	2	3	4	5	6
7						
14						
21						
28	29	30	31			

Month Juni

Mon	Tue	Wed	Thu	Fri	Sat	Sun
				1		
				8		
				15		
			Due date	22		
				29	30	



Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

Integrated Systems Laboratory

Group project at the
Department of Information Technology and
Electrical Engineering

for

Menachery Kiran, Hombach Paula, Scherer Moritz

**Design and Implementation of a long-
lifetime miniaturize smart hearing aid
for stutterers.**

Advisors: Michele Magno

Professor: Prof. Dr. Luca Benini

Handout Date: 26.02.2018

Due Date: 21.06.2018

1 Project Goals

The main goal of this project is to develop a wearable device with smart capability to help stutterers. The system will be designed using the best sensor(s) and actuator to give a feedback to the user. The main goal of this project is to develop and test the hardware-software system in a real application scenario. Both lab and in-field test are planned to evaluate the system developed in terms of performance (ie. Accuracy, latency, etc) and lifetime.

2 Tasks

The project will be split up into three phases, as described below:

Phase 1 (4-6 Months)

1. An important investigation of the state-of-the-art off-the-shelf components, processing and sensing will be the first step of this project. The student together with the supervisors will decide the main components according to the power consumption, the functionality and the availability on the market.)
2. The first preliminary algorithm and sensors interface will be studied and implemented to cover the stringent requirements of the wearable device and application scenario. This part can be done using a demo board of the selected hardware components (microcontroller, sensors, speakers)
3. Preparation of the measurements set up and preliminary lab test of the developed algorithm implemented in the hardware platform.
4. Preliminary schematic and layout of the first version of the hardware selected.

→ Start design PCB

Phase 2 (4-5 Weeks)

1. Testing, measurements and eventually simulations for estimation of performance of the developed system.
2. In-field evaluation of the developed solution.

3. Optimization of the algorithms and sensors interface to improve the performance

Phase 3 (1-2 Weeks)

1. Finalizing the tests and optimizations.
2. Write final document and prepare presentation.

3 Milestones

By the end of **Phase 1** the following should be completed:

- Preliminary control system that include the sensor acquisition and the algorithm
- Preliminary schematics, layout and eventual PCB ready.

By the end of **Phase 2** the following should be completed:

- Accurate in-field test and performance evaluation
- A working version of the control system in the application scenario.

By the end of **Phase 3** the following should be completed:

- Final version and working demo.
- Final Presentation
- Final Report, including final results.

4 Project Organization

4.1 Weekly Report

There will be a weekly report sent by the student at the end of every week. The main purpose of this report is to document the project's progress and should be used by the student as a way to communicate any problems that arise during the week. The report, along with all other relevant documents (source code, datasheets, papers, etc), should be uploaded regularly to remote repository.

4.2 Final Report

PDF copy. All copies remain the property of the Integrated Systems Laboratory. A copy of the developed software needs to be handed in on CD or DVD at the end of the project.

4.3 Final Presentation

At the end of the project, the outcome of the thesis will be presented in a 15 minutes task, again during a group meeting of the Integrated Systems Laboratory.

9.3.18

☒ Presentation: before or after due date? → up to us, important is the report

- Skizze Moritz: (about phase 1)

- Analog part: Amplifier, Pre- and Postfilter (Kiran)

- ADC and DAC (Paula)
 - im Board
 - outside → buy! → depends on speaker
 - PWM used

- Algorithm (Moritz)

☒ Can detector output an interrupt signal? → microcontroller, which can be tuned

☐ Information about "Chor-Effekt"

• 1 Mal pro Woche treffen & besprechen

• new Version of detector paper (detector still in work)

• detector output can't be used as data output

• first stage: get data, test components

• store data: accelerator output

 ↳ find algorithm

• DAC and output signals not the most important

• solder station: ask Hansjörg (he instructs too)

• for accelerator an amplification is needed

 ↳ if needed, ask Michele

 ↳ filter because of Aliasing

→ try microphones and input out and accumulate data

→ try Apollo out

• not everything is possible with microcontroller

• meeting 15' to 30' to see progress

 ↳ E-Mail when there are questions

☒ Amplifier

☐ Draht anlöten

• 2 Wochen für Daten → Microphon testen & ADC

- ↳ in Apollo
- ↳ Anschlüsse finden

Paula

☒ ADC auf Apollo testen & Verstehen

☐ 1st: Spitzenspannung Input ADC → Kiran

Deadline 21.03

Kiran

☒ Amplifier für Input

 ↳ bis zu ~20kHz

Deadlines: Amplifier 16.03.

Filter 21.03.

☒ Schauen, was es schon gibt (AIC/EC-Notes)
auch auf Markt verfügbar

☐ Lötzstation & Jumper-Kabel

Moritz

☒ Mikrophon & Accelerator Testen

☒ Löten von Accelerator (mit Hansjörg reden)

Deadlines: 21.03.

☒ Algorithmus weitertreiben

☒ RC-Filter für Output informieren

☒ Informationen Chor-Effekt suchen
& weiterleiten

☒ Github-Infos schicken

16.03.18

- Moritz:
 - FFT / IFFT : 2 Verfahren für variable Länge
 - Hanningfenster : Overlap add
 - Blackman-fenster : Overlap add
 - Löten (Kontakte an Kehlkopfmikros)
 - Filter schreiben
 - Ordentlicher Aufbau von Testmikrofon
- Blasenpflaster / Plastiksack für Mikrofon

- Kiran:
 - Verstärker gefunden (LT11396)
 - ↳ Gain einstellbar
 - ↳ Vorfilter included
 - ↳ Michele approved
 - ↳ Problem: Effizienz da Angabe nur max. 1W
 - ↳ Idee Amplifier von Bird-paper
 - Abklären ob Amplifier von Michele oder bestellen

- Paula:
 - Infos zu Apollo 2
 - Interface zum Programmieren

- ADC bis aller spätestens 23.03 → Paula
 - Output auf Pin und mittels UART (oder so) auf PC geben → Kiran
 - Programmieren Filter: Tiefpass & Frequenzschiebefilter → Moritz
- } Deadline 23.03.18

- GitHub:
 - Source Tree → downloaden → bei Fragen an Moritz
 - "Alles vormerken" → hochladen mit Notiz, was passiert ist
"Commit"
 - mit Push ins Internet laden
 - Möglichkeit auch PDFs hochzuladen

- Interface Apollo:
 - jvision 5, ARM
 - Apollo 2 ambig Seite

- Es gibt Beispielprojekte zum Anschauen & Lernen

- Meeting mit Michele nächsten Freitag → Kiran