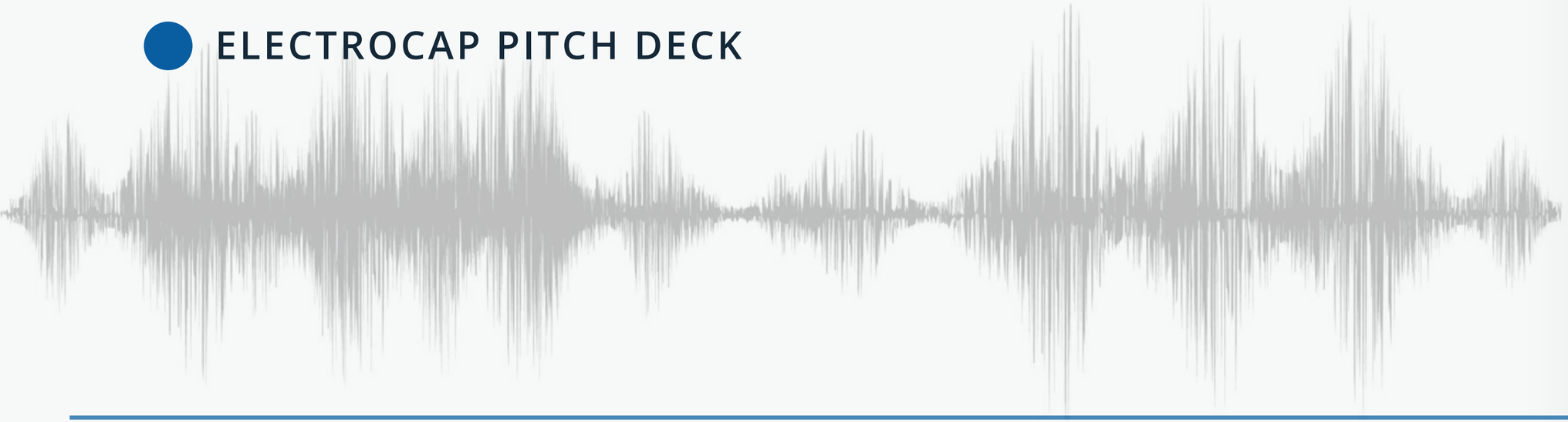
Team 8

SAFENOISE

ELECTROCAP PITCH DECK



Website: Team 8

https://web.tecnico.ulisboa.pt/~ist1106327/public/

TÉCNICO LISBOA

U LISBOA | UNIVERSIDADE DE LISBOA

SAICA

June 2025

PROBLEM DEFINITION

→ Workers exposed to environments with intense but non-permanent noise often neglect the use of Personal Protective Equipment (PPE).

→ Occupational Hearing Loss is one of the most common work-related illnesses, often going unnoticed until irreversible damage occurs.

→ Workplace safety personnel lack adequate tools to measure and analyze the severity of this issue.

SOLUTION BENEFICIARIES

01 **Workers and Employers**

Workers become aware of noise levels through real-time alerts, reducing the risk of hearing loss caused by improper PPE usage.

02 **Ineffective Digital Presence**

Employers benefit by minimizing workplace injuries and avoiding legal responsibilities.

03 **Occupational health care**

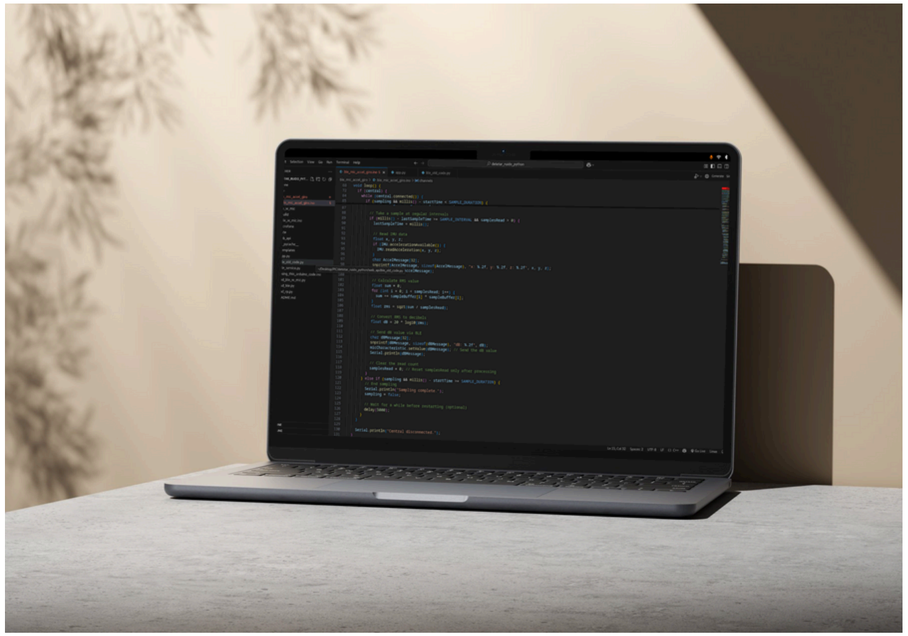
Occupational health care can use this data to improving support.

04 **Technicians of Safety and Health**

Technicians of Safety and Health at Work can get more data to support improvements in workplace and raise awareness to the importance of the use of PPE.

INTERVIEW FRAMEWORK

INTERVIEWS



01

Occupational Noise Measurement Specialist

Joao S.
Tomás D.

- No existing devices integrate measurement, alerts, and PPE verification.
- Both portable and static devices are useful depending on the context.
- Must comply with standards like Decree-Law No. 182/2006 and NP EN ISO 9612:2011.

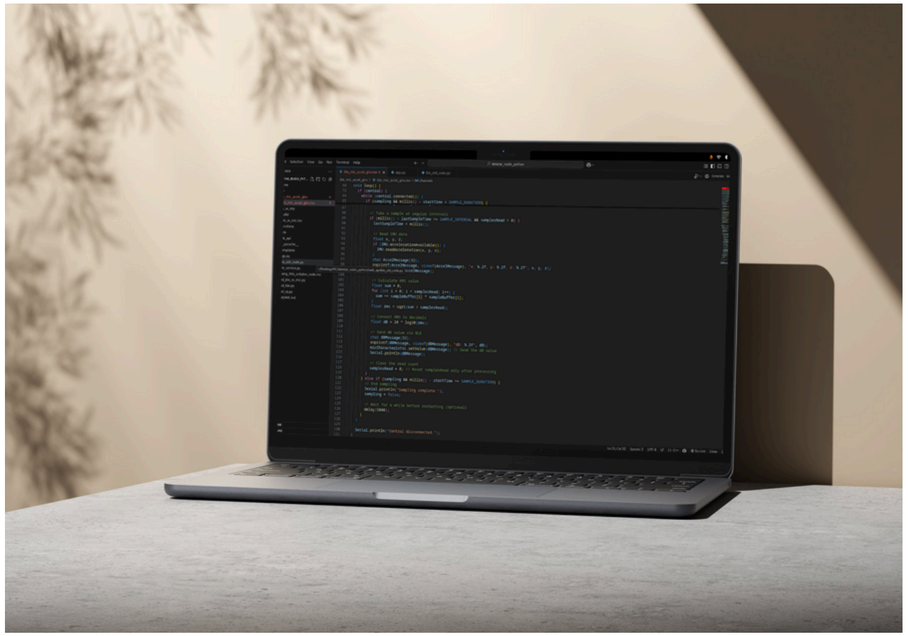
02

QSE Manager

Joao S.
Tomás D.

- Portable devices suit dynamic environments; static devices fit controlled spaces.
- Solution should benefit workers and safety professionals.

INTERVIEWS



03 QSE Director in Construction

Joao S.
Tomás D.

- PPE negligence is common due to cultural factors.
- Portable devices are better for dynamic environments.

04 QSE Manager

Joao S.
Tomás D.

- Workers often neglect PPE despite knowing risks.
- Solution must be low-cost and protect both workers and companies.

05 QESH Director in Industrial Environments

Joao S.
Tomás D.

- Adaptability to different environments is crucial.
- Portable devices are versatile; static devices suit fixed areas.

GENERAL CONCLUSIONS FROM THE INTERVIEWS

01 Problem confirmed:

- Negligence in using EPI in noisy environments is a real issue, especially in sectors like construction and industry.
- There are some gaps/failures in the products already available on the market.

02 Proposed solutions:

- Portable devices are preferred for dynamic environments.
- Static devices are suitable for controlled environments.

03 Priority features:

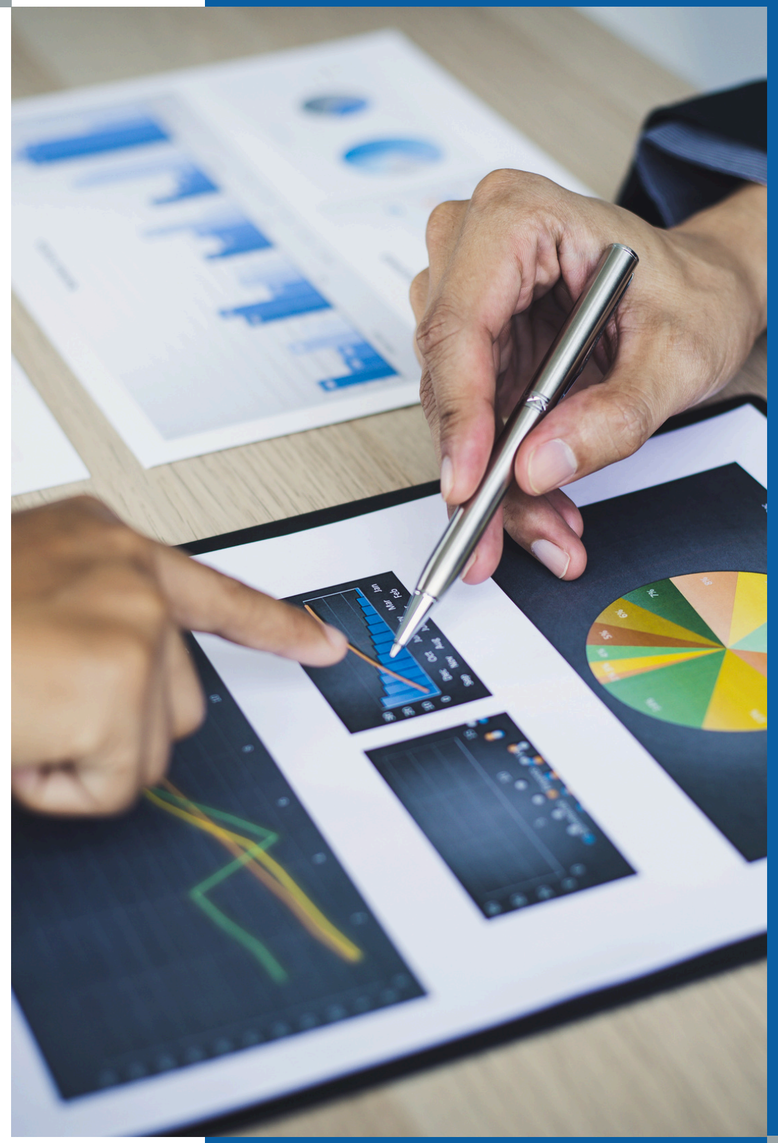
- Real-time alerts.
- Verification of correct EPI usage.
- Daily reports for monitoring and awareness.
- Affordable cost and ease of use.

04 Standards and legislation:

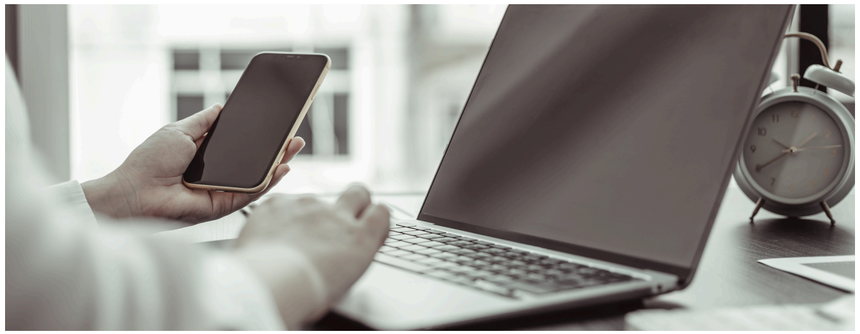
- The solution must comply with applicable standards and legislation, such as Decree-Law No. 182/2006 and the NP EN ISO 9612:2011 and EN 458:2016 standards.

TECHNOLOGICAL SOLUTION

A system of sensors integrated into the earmuff that detects whether the worker is using the PPE correctly, along with another device that communicates with it and measures the noise level the worker is exposed to, alerting them when necessary.



SOLUTION REQUIREMENTS



01 **Compliance with Legal Standards**

Accuracy in Noise Level Detection: Spectral Analysis in 1/1 Octave bands from 63 Hz to 8000 Hz.

02 **User Alerts & Awareness**

Ensuring that workers receive real-time alerts and respond appropriately to hazardous noise levels.

03 **Daily reports**

Implement a formal report or a visual scoreboard system.

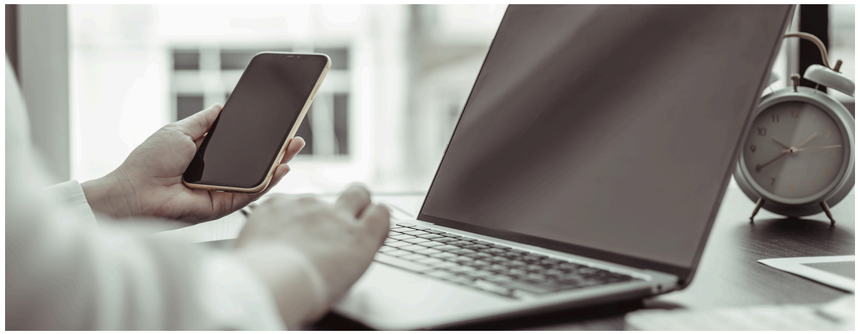
04 **Monitoring Correct Use of PPE**

Verifying whether employees are properly using earmuffs.

05 **Scalability**

Scalability to accommodate future expansions.

TESTING AND VALIDATION METRICS



01 **Proof of Concept**
Conduct user acceptance testing to ensure the system solves the problem.

02 **PPE Usage Monitoring**
Detection accuracy, false positive/negative rates.

03 **Noise Level Accuracy**
Precision of noise measurements, frequency response, and real-time processing.

04 **Battery Life Assessment**
Continuous operation tests to confirm battery life under work shift.

05 **BLE Connection Stability**
Ensure consistent and stable Bluetooth communication between components during operation.

COMPETITORS AND PREVIOUS WORK

COMPETITORS

→ Sound Level Meters for measurements on fixed machines.

→ Dosimeters, developed for dynamic exposure profiles and fixed measurements.

PREVIOUS WORK

We are unaware of measurement equipment that fully meet the proposed requirements, but this may be achievable by integrating it into tools we are considering developing. If feasible and available, both proposals could be useful.

COMPETITORS - MARKET OPTIONS

SC202 CLASS 2 SOUND LEVEL METER AND SPECTRAL ANALYZER* (1/1 AND 1/3 OCTAVE BANDS)

Sound level meters (with 1/1 octave spectral analysis from 63Hz to 8000Hz) for measurements on fixed tasks/machines; Examples: (SC250 sound level meter (Class 1) and SC202 (Class 2));

SC250 CLASS 1 SOUND LEVEL METER AND SPECTRAL ANALYZER* (1/1 AND 1/3 OCTAVE BANDS)

Dosimeters (ideally with 1/1 octave spectral analysis from 63Hz to 8000Hz), developed primarily for measurements on workers with more dynamic exposure profiles (mobile, performing a wide variety of tasks), but also adapted for fixed measurements; attached is an example of our doseBadge5 dosimeter.

COMPETITORS - COMPARISON

	SC202	SC250	doseBadge5	Our
Spectral Analysis	1/1 Octave bands: 63 Hz to 8000 Hz	1/1 Octave bands: 63 Hz to 8000 Hz	1/1 Octave bands: 63 Hz to 8000 Hz	1/1 Octave bands: 63 Hz to 8000 Hz
Alerts	-	-	Extra: APP	Yes
Daily Report	-	-	Yes	Yes
PPE Usage	-	-	-	Yes
Price	> 1700 €	> 2300 €	> 2000 €	< 60 €

PARTNERS

OUR CLIENTS COME FROM EVERYWHERE

With more than 12,000 employees and operations in Spain, France, Italy, Portugal, the United Kingdom, Ireland, Turkey, Luxembourg, the Netherlands, the United States and Poland, the Saica Group provides sustainable solutions for paper and packaging manufacturing, as well as for waste management and recovery. Saica has been developing sustainable and innovative solutions for more than eight decades.

Saica Pack, Lisboa

The Saica Group provides sustainable solutions for paper and packaging manufacturing, as well as for waste management and recovery

Others

During the semester, we had the opportunity to talk with several companies. Some of them helped us achieve the specifications of our prototype and provided other information.

ADVISORS AND MENTORS

Director of Quality, Environment, Safety and Occupational Health at Saica Group

Scientific Advisor and Mentor
Eng. Patrícia Prudêncio

Quality, Environment and Safety Technician Saica Group

Scientific Co-advisor and Mentor
Catarina Teixeira

Co-Director of iStartLab Innovation Laboratory, Instituto Superior Técnico

Coordinator
Prof. Luís Caldas Oliveira

MSc. Student in Electrical & Computer Engineering

Co-coordinator
Tiago Lourinho

DIVISION OF LABOR (1)

João Campos	Miguel Simões	Tiago Gonçalves
Capacitive Sensor	Capacitive Sensor	3D Model*
Systems connections	BLE: RP2040-ESP32C3	Electronic connections Schematic
Video*	Electronic connections*	Mid-Term Presentation
Poster	Video*	Poster*
		PCB Project**

The “*” represents the responsible for that task
The “**” represents not done work, difficult to implement.

DIVISION OF LABOR (2)

David Antunes	João Silvestre	Tomás Dias
Noise Detection*	Alerting System	Alerting System*
Data Analysis: Interface*	Computer Connection*	Computer Connection
Website Design*	Logistics*	Logistics
Poster	Mid-Term and Final Presentation	Mid-Term* and Final Presentation*
Data Analysis: Report	Capacitive Sensor	Poster

The “*” represents the responsible for that task

SCHEDULE

SCHEDULE TEAM 8

CORRECTED VS ORIGINAL SCHEDULE

Added Task Responsibles

Specified Prototype Tasks:

- **Noise detection algorithm**
- **3D Model**
- **Capacitive Sensor**
- **Systems connections**

Also added diferenciated tests:

- **User acceptance testings**

Our partners asked us to change our schedule (anticipate a week)

Part of the team put in extra effort to compensate for the delays on the other side.

OUR SOLUTION

PRODUCT DESCRIPTION

The main device detects noise across various frequencies and calculates the different weightings presented in Portuguese legislation. It then displays the noise level in dB on the screen.

At the same time, the second device, integrated into the PPE, detects whether it is being used correctly or not, sending the information via BLE (Bluetooth) to the other device.

Next, the LED color is updated according to the collected data. The alerts are emitted when noise levels exceed safe limits, indicating the need for the use of Personal Protective Equipment (PPE).

Finally, the information is sent to an external server where the data is processed and presented. These reports are of crucial importance to all beneficiaries.

PRODUCT CHARACTERISTICS

01 **Real-time monitoring**

Continuously tracks noise levels in the workplace.

02 **Immediate alerts**

Notifies workers when PPE is required due to high noise levels.

03 **Daily and monthly reports**

Provides detailed data on noise exposure throughout the day.

04 **Verification of PPE usage**

Ensures workers are correctly using hearing protection equipment.

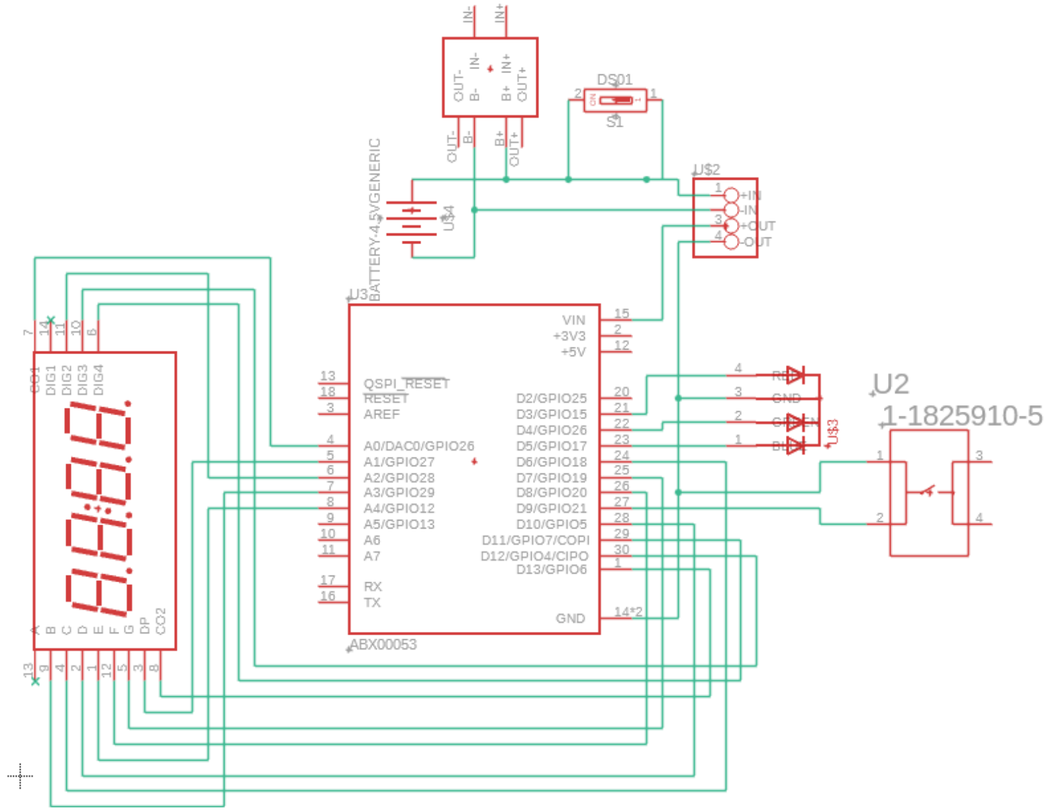
MATERIALS

Team 8					
Name:	Link:	Quantity:	Price: €	Description:	Process
RP2040	https://mauser.pt/catalog/product_info.php?product	3	259	Arduino Nano RP2040 Connect with Headers - Arduino	Acquired
Battery Charger	https://mauser.pt/catalog/product_info.php?product	2	11	Li-Ion 1A battery charger module - USB-C input - w/ output	Acquired
Battery: 2	https://mauser.pt/catalog/product_info.php?product	1	956	3.7V 1100mAh Li-Po Battery - 34x50x6mm	Acquired
Battery: 1	https://mauser.pt/catalog/product_info.php?cPath=7	1	971	3.7V 720mAh Li-Po Battery - 30x48x5mm	Acquired
Battery: 3	https://mauser.pt/catalog/product_info.php?product	1	625	Battery for Bluetooth Headset compatible with Cardo Scala Rider Q1, Li-Po 3.7V 400mAh 1.5Wh	Acquired
LED Arduino	https://mauser.pt/catalog/product_info.php?product	2	582	3-Color SMD RGB LED Module Compatible with Arduino	Acquired
ESP32C3	https://mauser.pt/catalog/product_info.php?product	2	73	Microcontrolador Seeed Studio XIAO ESP32C3 c/ Wi-Fi, Bluetooth 5.0 e carregamento de bateria - Seee	Acquired
Button module	https://mauser.pt/catalog/product_info.php?product	2	245	Button module (Joystick) 5 directions compatible w/ Arduino and Raspberry Pi - JOY-IT COM-5WS	Acquired
Button, On/Off	https://mauser.pt/catalog/product_info.php?product	4	55	Simple button	Acquired
Step up	https://mauser.pt/catalog/product_info.php?product	1	1,026	Step-up Converter Uin: 2.5..12V Uout: 5/8/9/12V (5 units)	Acquired
Each set (1st and 2nd device)				5,786	
Total:			14,902		

PROTOTYPE SCHEME

1ST DEVICE

BLE connection - between 1st device and computer



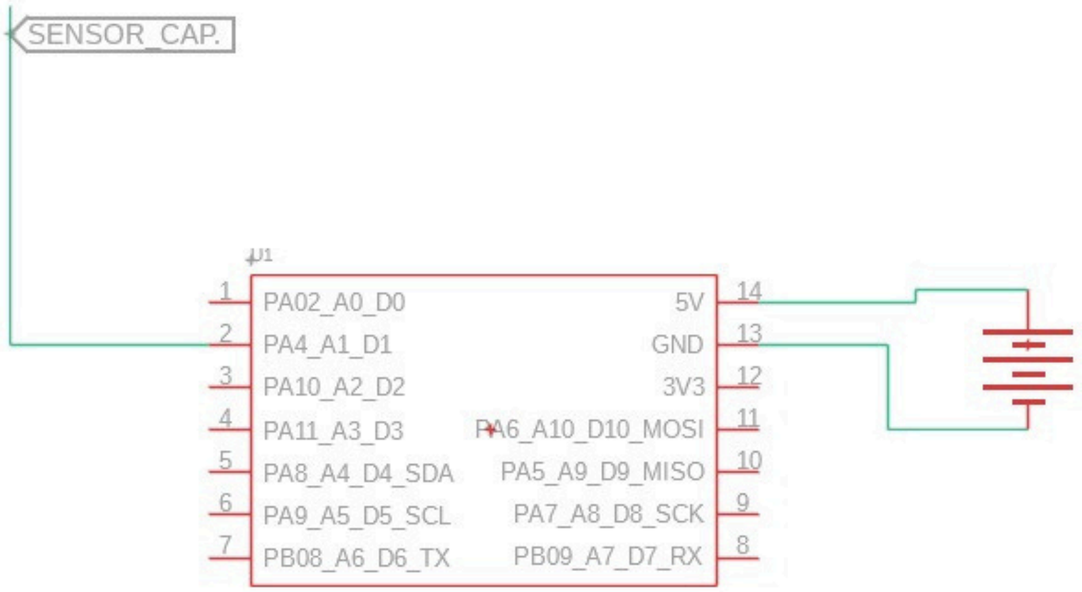
BLE connection - between 2nd and 1st device

System's operation and structure

PROTOTYPE SCHEME

2ND DEVICE

BLE connection - between 2nd and 1st device



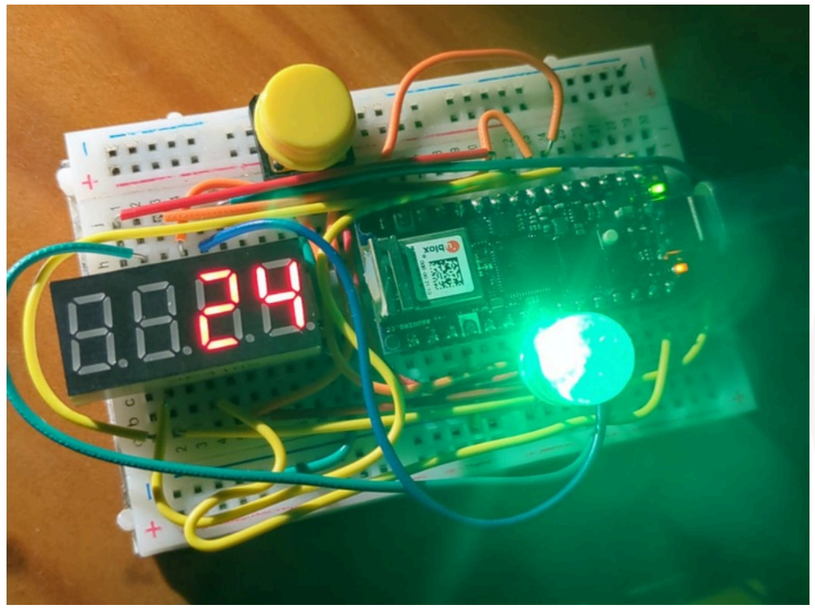
Skin connection

System's operation and structure

IMPLEMENTATION

LED COLOURS

- **Green:** It’s good.
- **Yellow:** It’s recommend using headphones.
- **Red:** High noise levels with correct use of EPI.
- **Yellow** and **Red** blinking: Ear protection is mandatory.



BLUETOOTH (BLE) CONNECTION

Between the two microcontrollers, we use BLE, as it is a solution that works in all environments and has low power consumption.

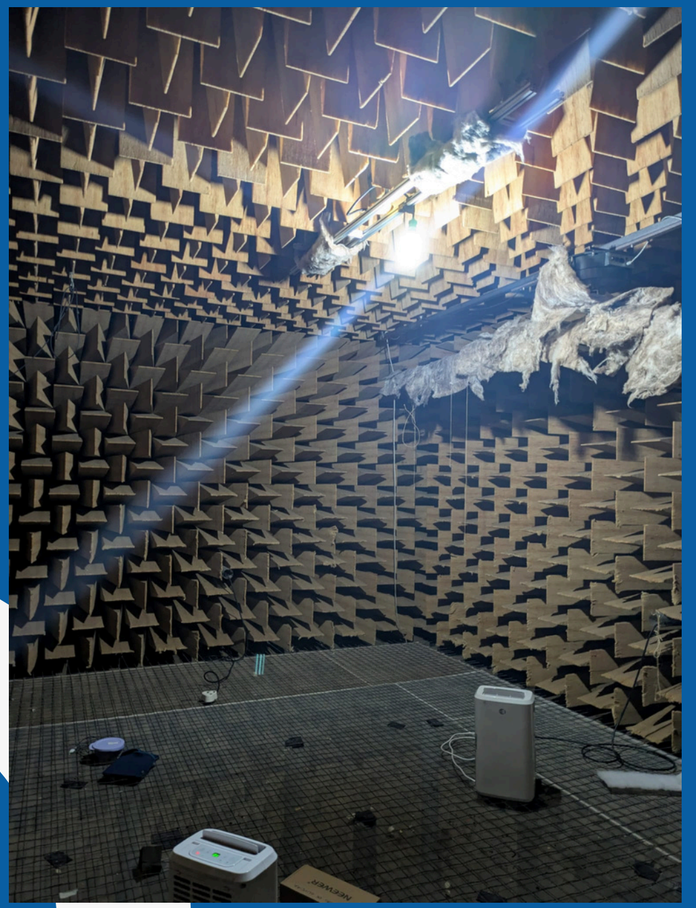
To transfer information from the RP to the PC, it is necessary to press the button on the device. The information is transmitted via USB.

Using the cloud would be another possible approach; however, in addition to requiring more time, it would also need constant Wi-Fi access and would not be as energy efficient. (Our partner does not have Wi-Fi in their facilities.)

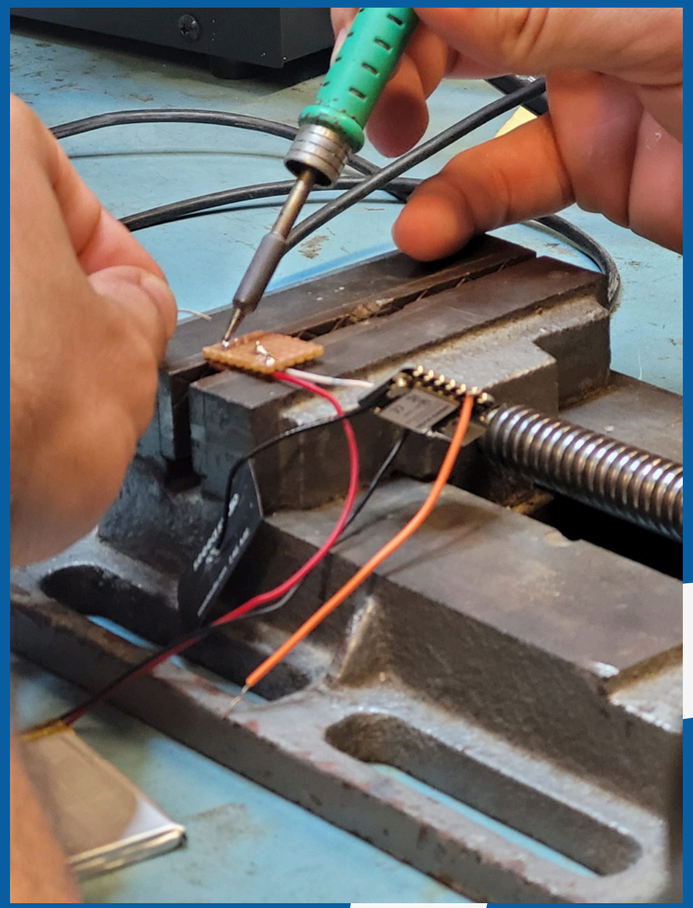
CALIBRATION

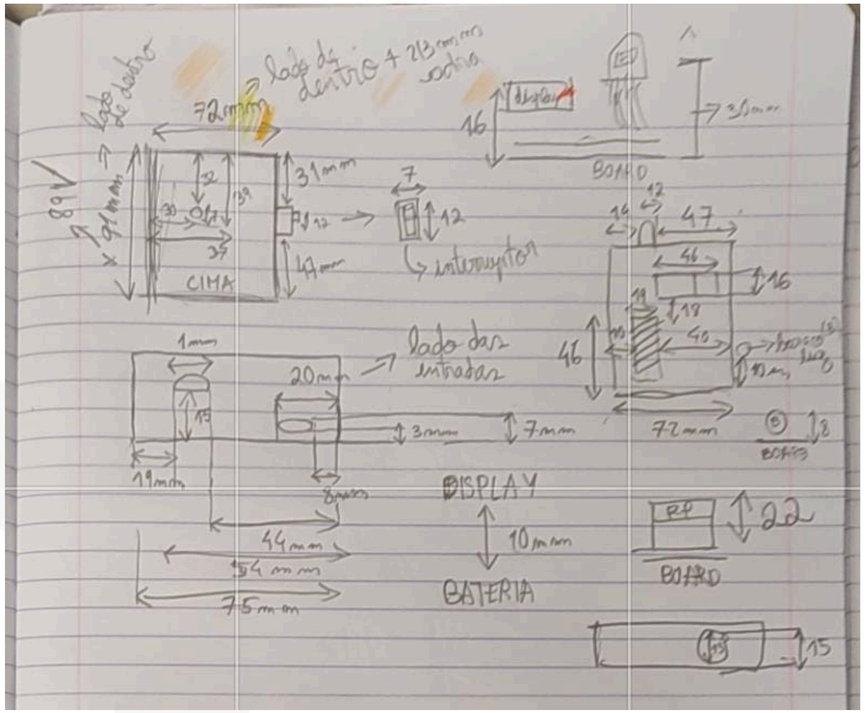
We calibrated our noise detection device using a sound level meter and a pistometer from Prof. Luís Caldas Oliveira.

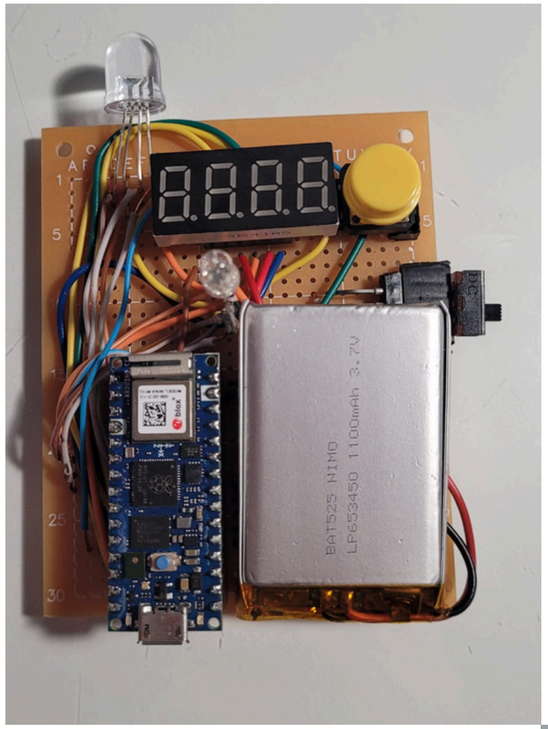
We used the anechoic chamber at Instituto Superior Técnico.



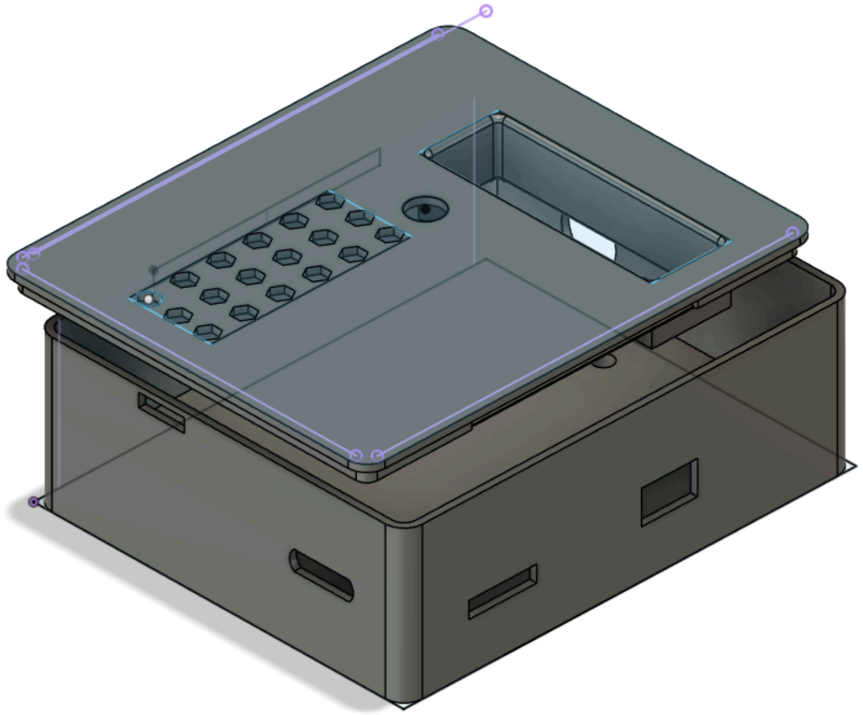
SOLDERING

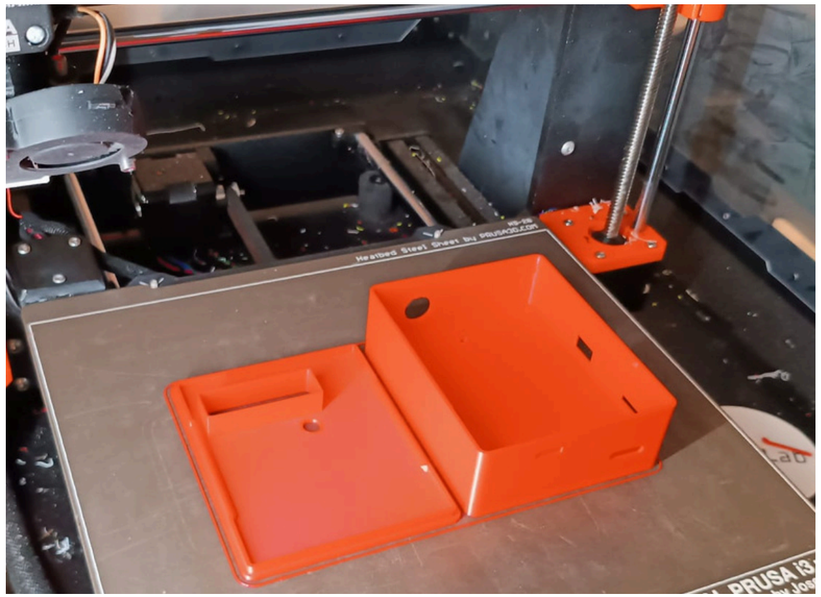



lado de dentro
lado de fora
72mm
89mm
31mm
CIMA
12
interruptor
BOTÃO
47
46
16
lado das entradas
20mm
3mm
7mm
72mm
19mm
8mm
44mm
54mm
75mm
DISPLAY
10mm
BATERIA
22
15


BAT525 NIMO
LP653450 1100mAh 3.7V

3D MODEL

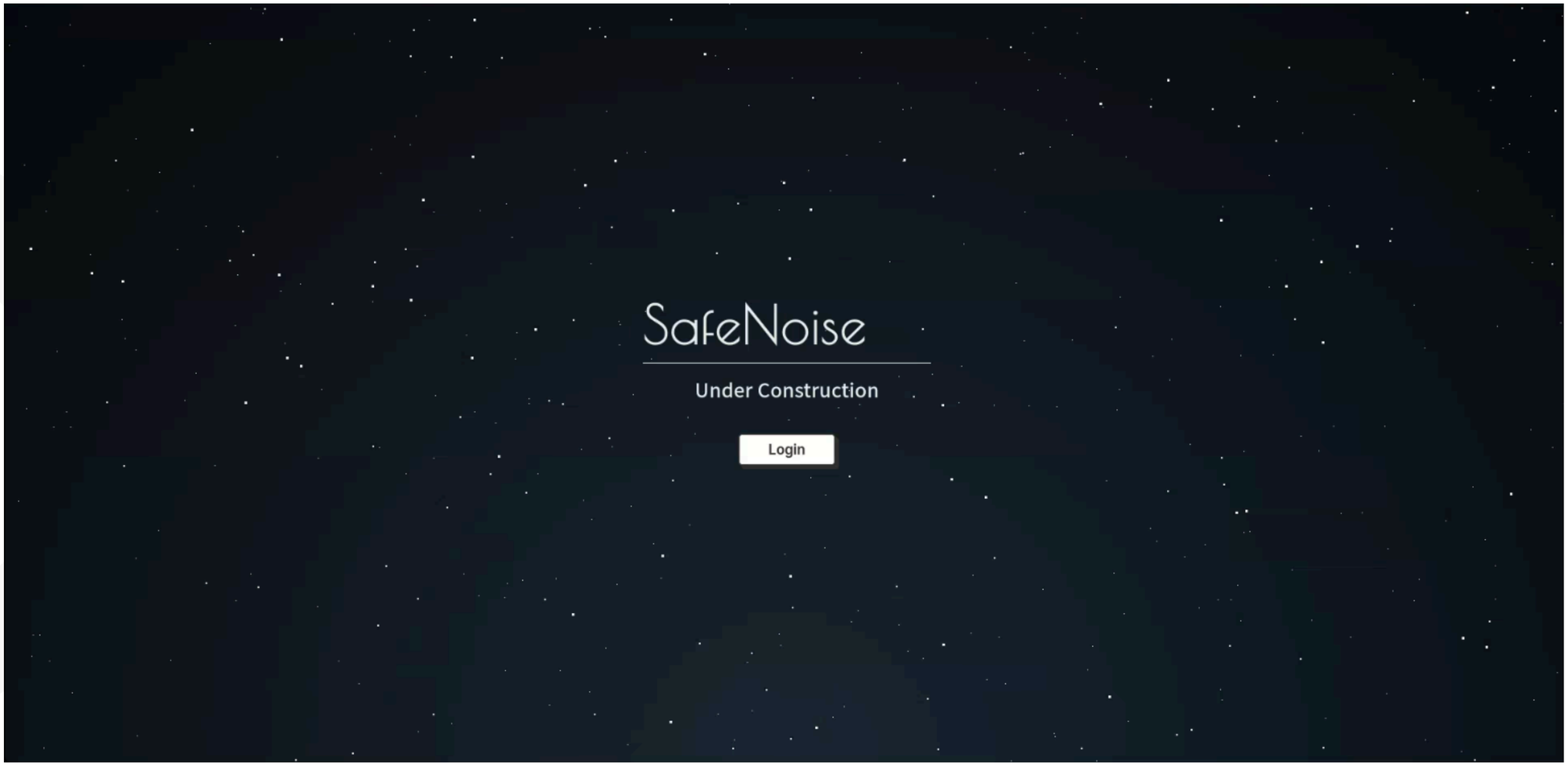




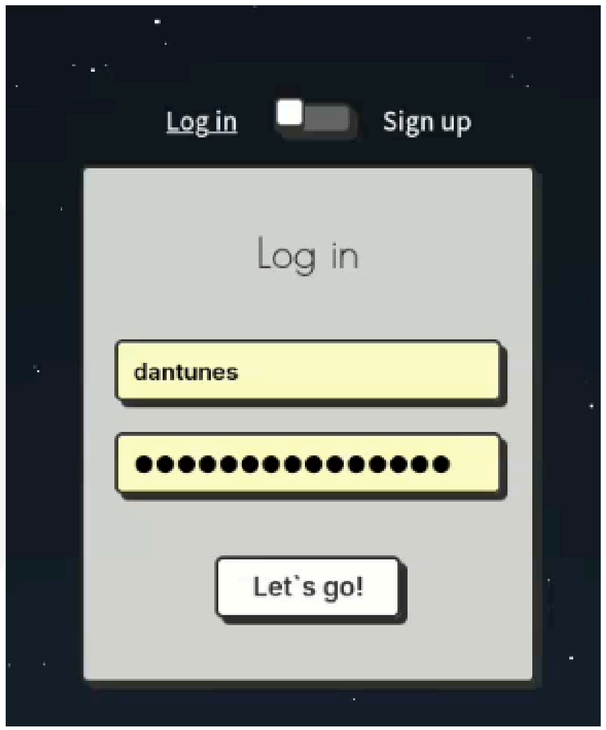
3D Case Model

WEB APP

WEB DESIGN

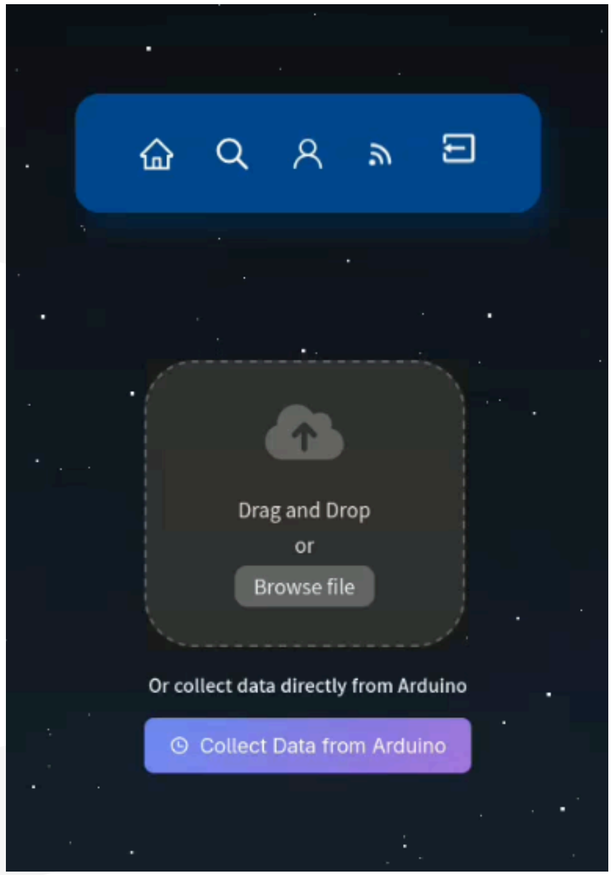


WEB DESIGN - PERSONNEL ACCOUNT

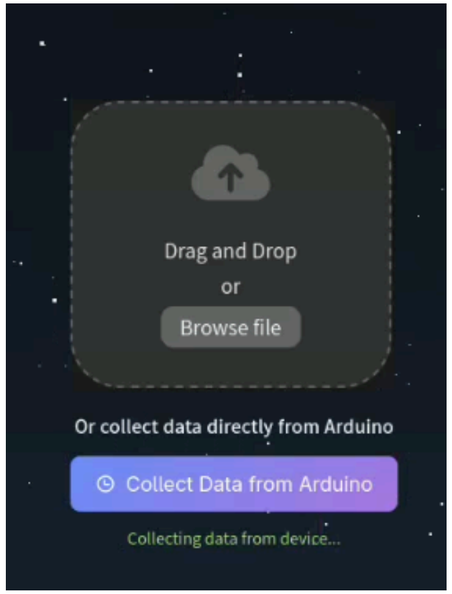


Log In
or
Sign Up

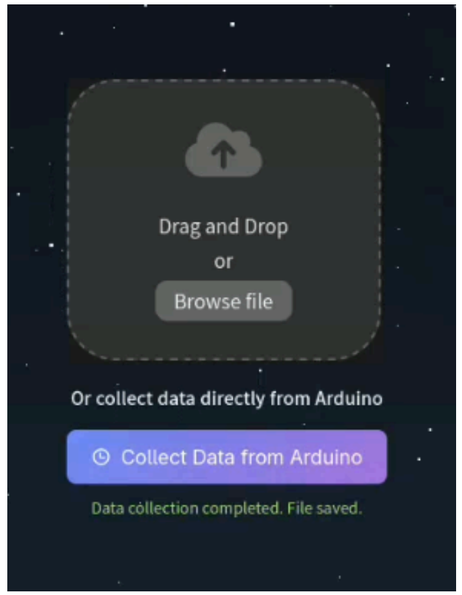
WEB DESIGN - UPLOAD



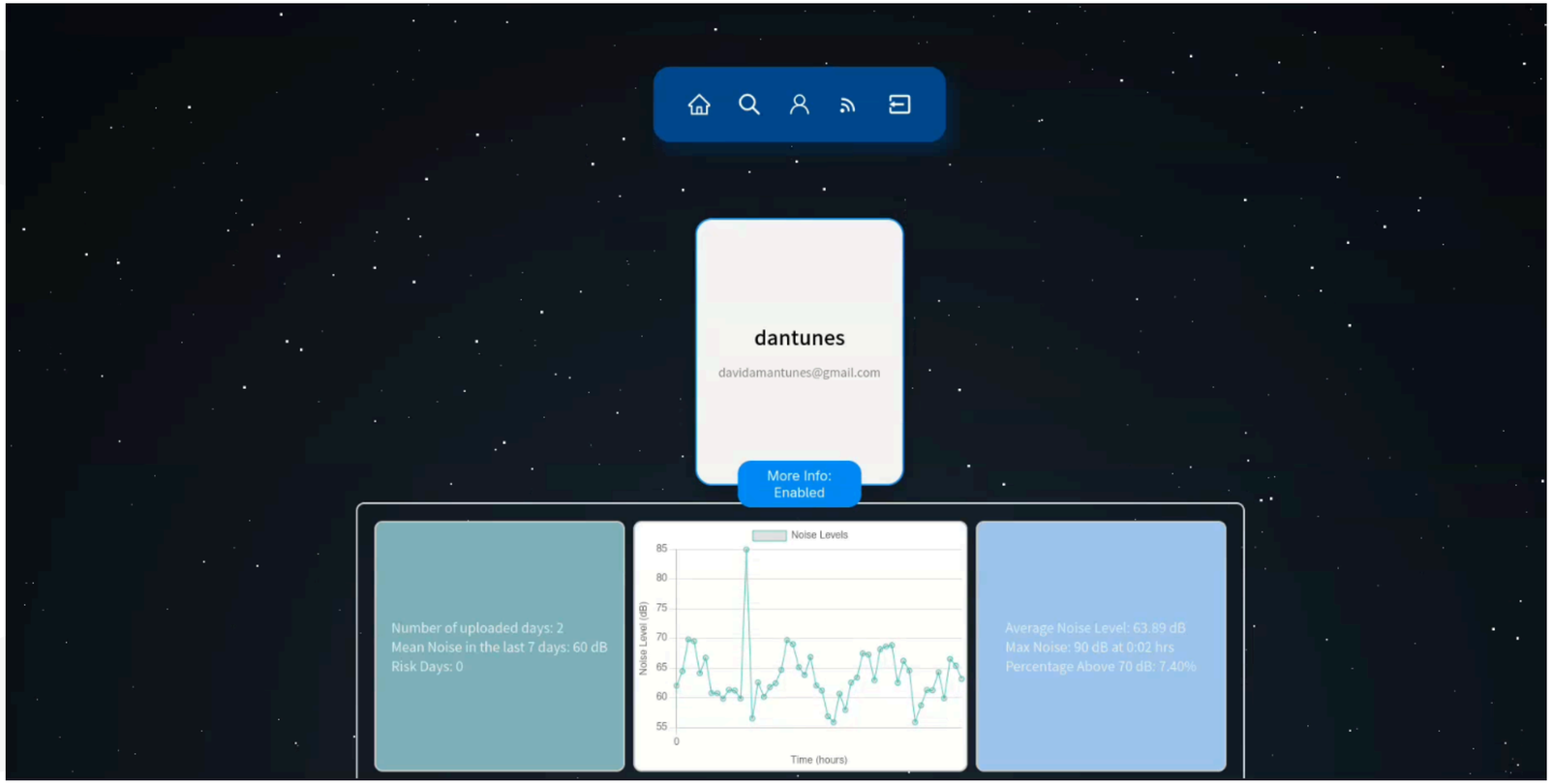
Click on Arduino Button



Upload information



WEB DESIGN - PERSONAL DATA



SEE FULL VIDEO HERE:

HTTPS://1DRV.MS/V/C/C407C5DD659B29CF/ETNB_8I_DBBBMWPTMWLXHXOBIKXA0C2MY5PYEJO58KFJZW?E=CYAFUK

DATA ANALYSIS

Data analysis information

FINAL PROTOTYPE

ALL FEATURES ARE OPERATIONAL

PROTOTYPE

SOME PRECAUTIONS

3D MODEL WITH A FITTING MECHANISM

3D model with a fitting mechanism for quick replacement of components in case of malfunction.

HEAT SINK

Heat sink to prevent excessive heating of the capacitive sensor.

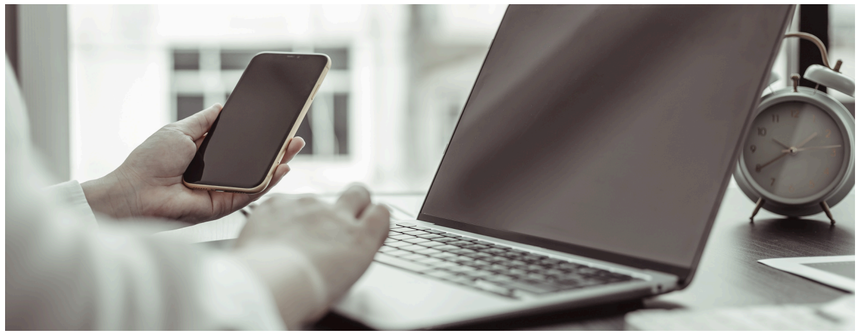
TESTS AND RESULTS

BATTERY AUTONOMY

We went to IStarLab and, with their help, measured the current used by our main device while running at full operation.

The measured current was 150mA, which could easily be reduced by lowering the intensity of the LEDs, but that would make it less appealing to our visitors at ElectroDay. Thus, our device had an autonomy of over 7 hours, as we later verified

TESTING AND VALIDATION METRICS- RESULTS



01 **Proof of Concept**
User acceptance testing confirmed the system effectively addresses the problem.

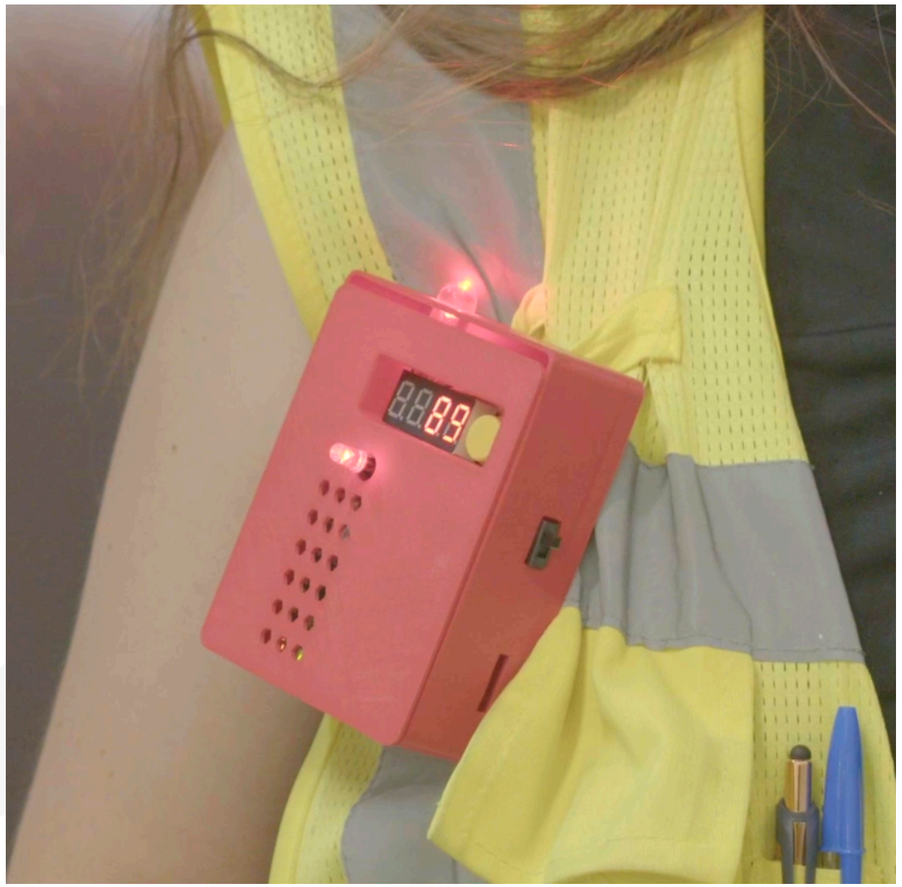
02 **PPE Usage Monitoring**
Detection accuracy, one false positive (bald workers).

03 **Noise Level Accuracy**
The calibrated device detects noise with acceptable error.

04 **Battery Life Assessment**
The battery has enough autonomy for a work shift.

05 **BLE Connection Stability**
Devices establish a stable Bluetooth connection without problems.

TESTS



SAICA PACK VISIT

VALIDATION

According to our Scientific Advisor and Mentor Eng. Patrícia Prudêncio, our Scientific Co-advisor and Mentor Catarina Teixeira, and other professionals who tested our prototype*, the problem that previously existed has been resolved. After the testing period, we verified that our solution is functional in all environments and scenarios, except for bald users who place the PPE on their head. This issue could be solved with a custom ear mold on the inner part of the PPE. However, this would increase the cost of implementation and make large-scale deployment more difficult.

All the metrics and requirements of the solution were successfully implemented and tested.

* They do not appear in the video or in this presentation due to data protection.

REAL-WORLD SCENARIO TESTING

Normal day at work.

The worker noticed the Safe Noise warning.

REAL-WORLD SCENARIO TESTING

Put on personal protective equipment.

REAL-WORLD SCENARIO TESTING

Device color change: Green.

Continuation of work, but safely.

REAL-WORLD SCENARIO TESTING

SEE FULL VIDEO HERE:

HTTPS://1DRV.MS/V/C/C407C5DD659B29CF/EEPRDSOXOQ9JUPM2MBBSNEOBG1WGTPESGKEC_TUY_UV7YQ?E=WRYG4C

OPINIONS

USER AND PARTNER OPINION

We spoke with our partners about the work developed. This was the speech by Scientific Advisor and Mentor Eng. Patrícia Prudêncio and Scientific Co-advisor and Mentor Catarina Teixeira.

USER / PARTNER OPINION

“Boa tarde aceitamos este desafio com o Instituto Superior Técnico porque as parcerias entre universidades e indústrias são fundamentais para a inovação, para o desenvolvimento de competências, pondo os conhecimentos científicos em prol da indústria e da melhoria das condições de trabalho.

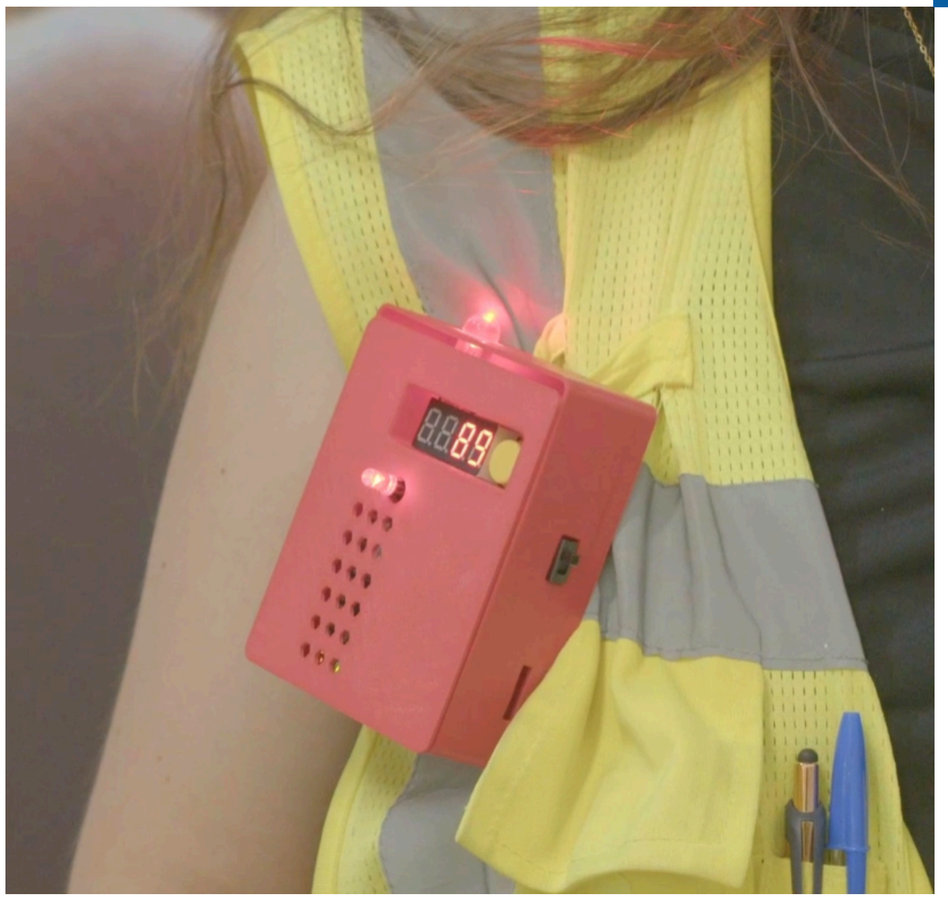
Na nossa indústria nós temos investimentos para redução de ruído, nomeadamente implementação de medidas técnicas. No entanto, em algumas zonas continua a ser importante e fundamental o uso do Equipamento de Proteção Individual. [...]”

USER / PARTNER OPINION

“[...] Para além de ser um projeto único em Portugal, neste tipo de equipamento. É uma mais-valia para qualquer empregador e nesse sentido, vamos conseguir, com certeza, promover uma maior cultura de segurança junto dos nossos trabalhadores. Servirá também de informação e de alerta para os mesmos quando não estão a fazer o devido uso do equipamento ou quando lhes possa passar despercebido o ruído a que estão expostos.

Agradecemos também todo o empenho. Foi um processo bastante interessante e sem dúvida vai-nos ajudar na prevenção da segurança e da saúde do trabalho.”

CONFORT SOLUTION



CONFORT SOLUTION

SEE FULL VIDEO HERE:

HTTPS://1DRV.MS/V/C/C407C5DD659B29CF/EYEXQLDGXEJJUK8YNDDGE9WB_MABQDQYNQ-KAKRD5NO6GA?E=C2XWJE

CHALLENGES

CHALLENGES FACED BY THE TEAM

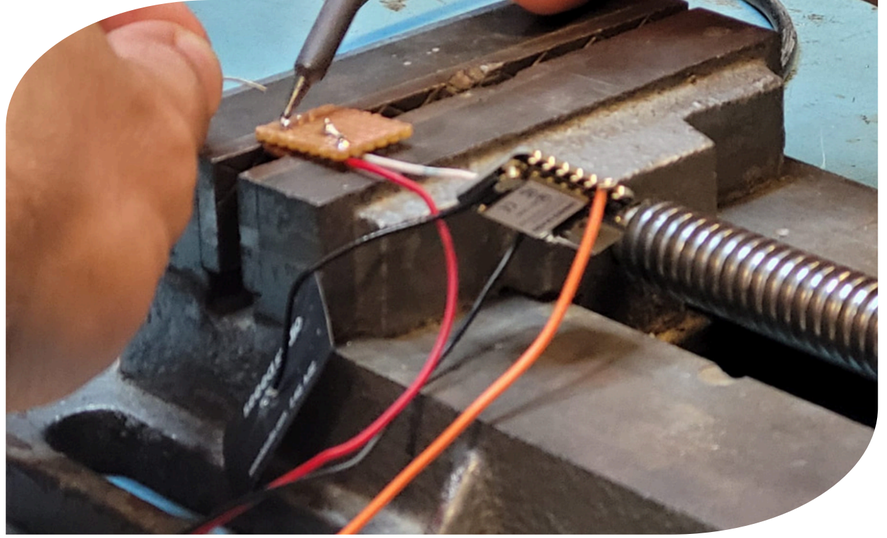
01 Communication challenges between Alameda and Tagus.

02 Task management has been difficult. One of us quit.

03 Companies are not always available to assist us.

04 We had little time to implement the prototype.

TECHNICAL CHALLENGES(1)



01 Real-time noise detection accuracy and range.

02 Verification of PPE usage, using a capacitive sensor.

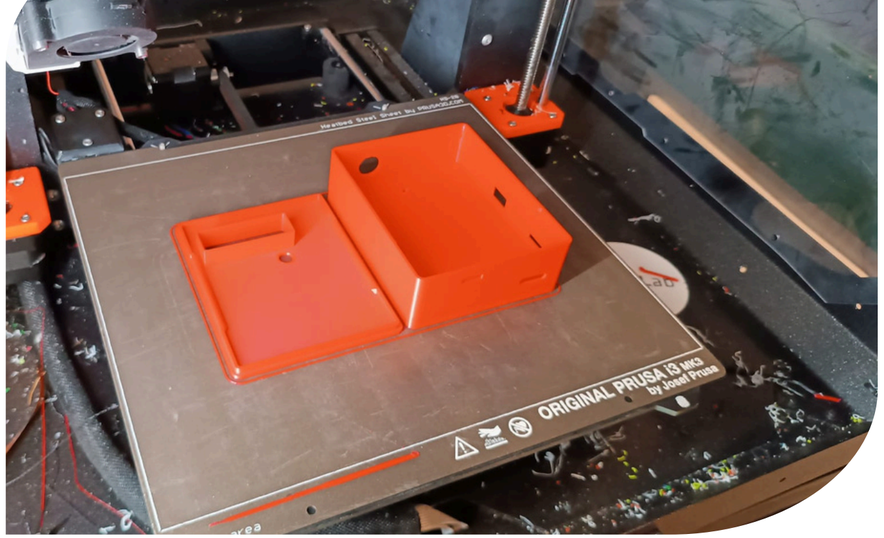
03 User Compliance: Ensuring workers comply with using this device.

04 Data analysis: The algorithm to group data and treat noises measurements.

05 Ensure proper calibration of the device.

06 Battery Life and Power Consumption: Ensuring the device operates continuously for entire work shifts (8 hours).

TECHNICAL CHALLENGES(2)



07 Ensure the device maintains an acceptable level of comfort.

08 Due to time constraints and the need for device reliability, developing a PCB became impractical for this project.

09 PCB design is challenging and success is not guaranteed; the tight schedule forced us to abandon that idea.

10 Choosing an ESP32C3 without a touch sensor led to unnecessary extra work, as a model with an integrated sensor was found later.

11 Learning 3D design tools was challenging. Achieving optimal results required reprinting parts and adjusting parameters.

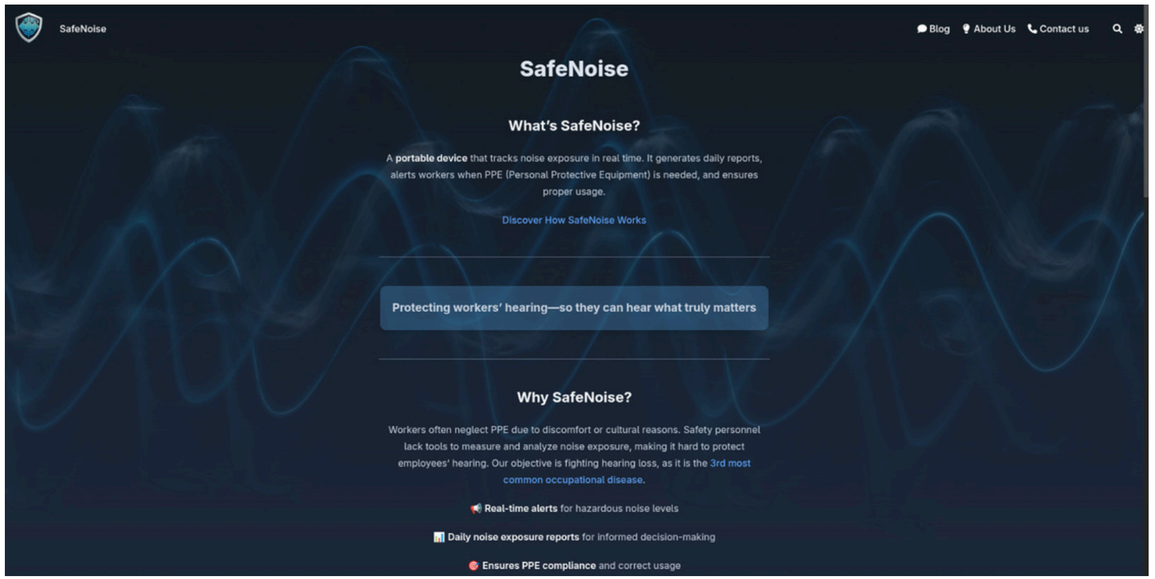
12 Integrating different features in a web app can be challenging and time-consuming.

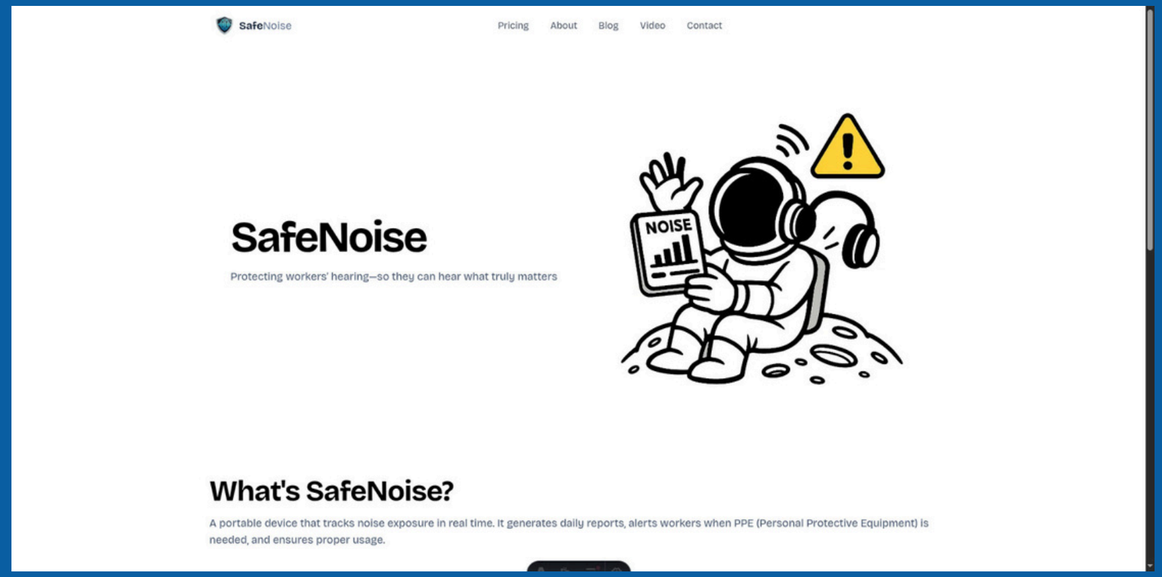
BLOG / WEBSITE

Initially, we started developing our blog using Hugo. Despite the efforts of several team members, we were unable to customize the site as we wanted. So, we decided to rebuild our site, keeping the same information but with a more intuitive interface, adapted for different screen sizes (mobile). Now we are using a library called Astro, which is based on JavaScript and Tailwind.

A blog with a good presentation and landing page is essential to make a strong impression

BEFORE

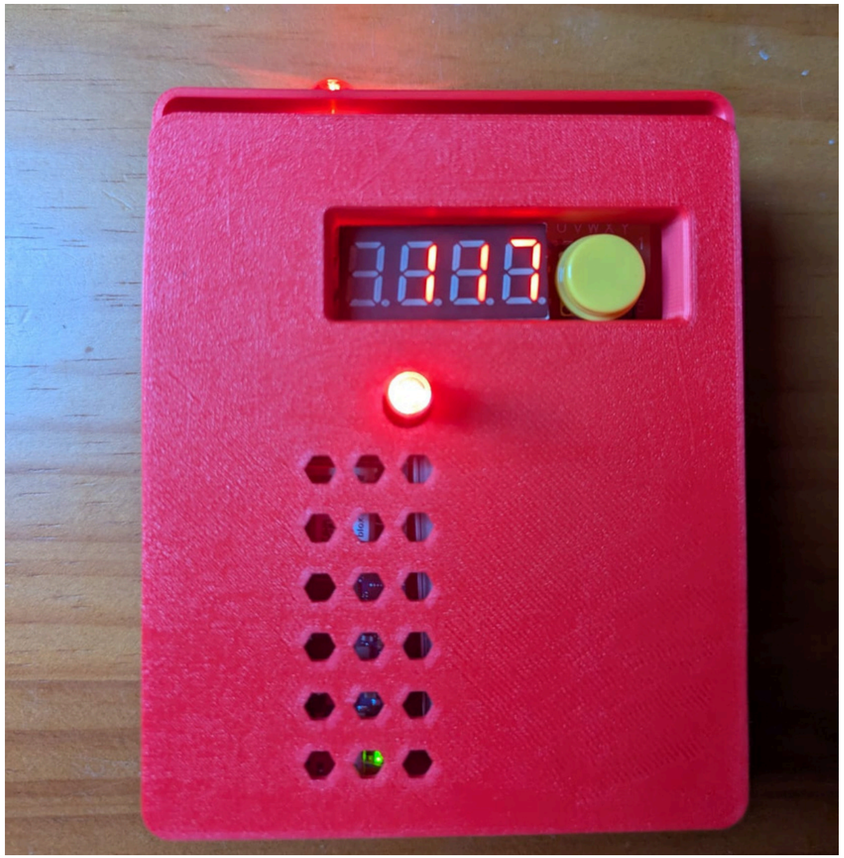




AFTER

WHAT WE ACHIEVED ?

ACHIEVED RESULTS (1)



01 All team

Project Definition and Scope

Our goals are to measure noise, develop a PPE detection system, alert workers, and analyze daily noise exposure.

02 Tomás D. João S.

Background Research

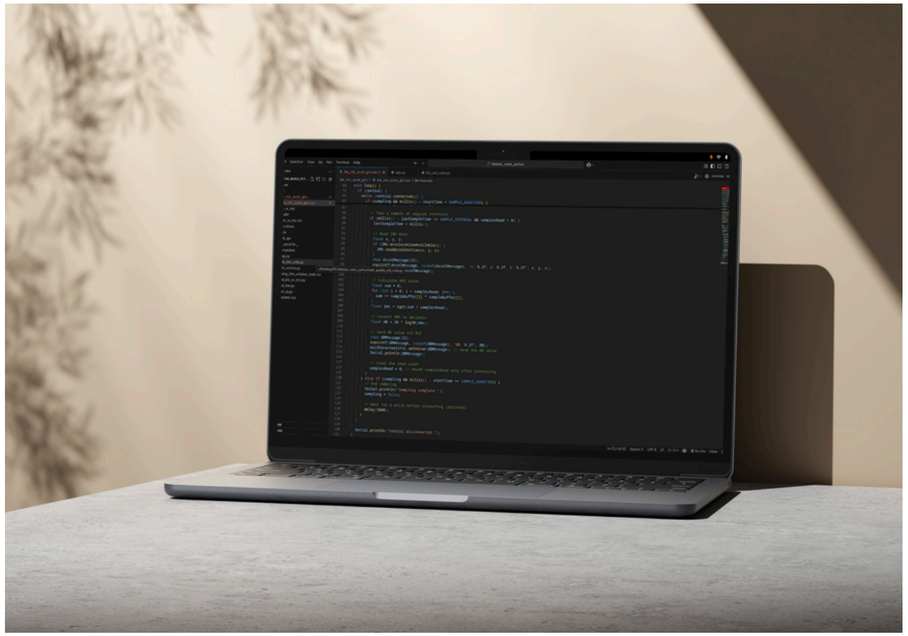
We talked to the competition in Portugal and noticed that there is a gap in the market. We are trying to fight it with a focus on Portuguese and European legislation.

03 All team

Requirements

The system detects noise and verifies the correct use of PPE, alerting the user through a device. It operates offline, communicating via BLE with a mobile application for monitoring and report generation. It must be affordable, easy to use, and compliant with safety regulations.

ACHIEVED RESULTS (2)



04 All team

System Design

An RP2040 detects noise and alerts the user if levels are high (with LEDs). A Bluetooth transmission module verifies PPE usage.

05 Joao S. Tomás D. David A.

Project Management

The team has WhatsApp and Discord groups where project-related debates take place. With partners and interested parties, we communicate in person and via email. We have reunions, and website/blog is updated at least once a week.

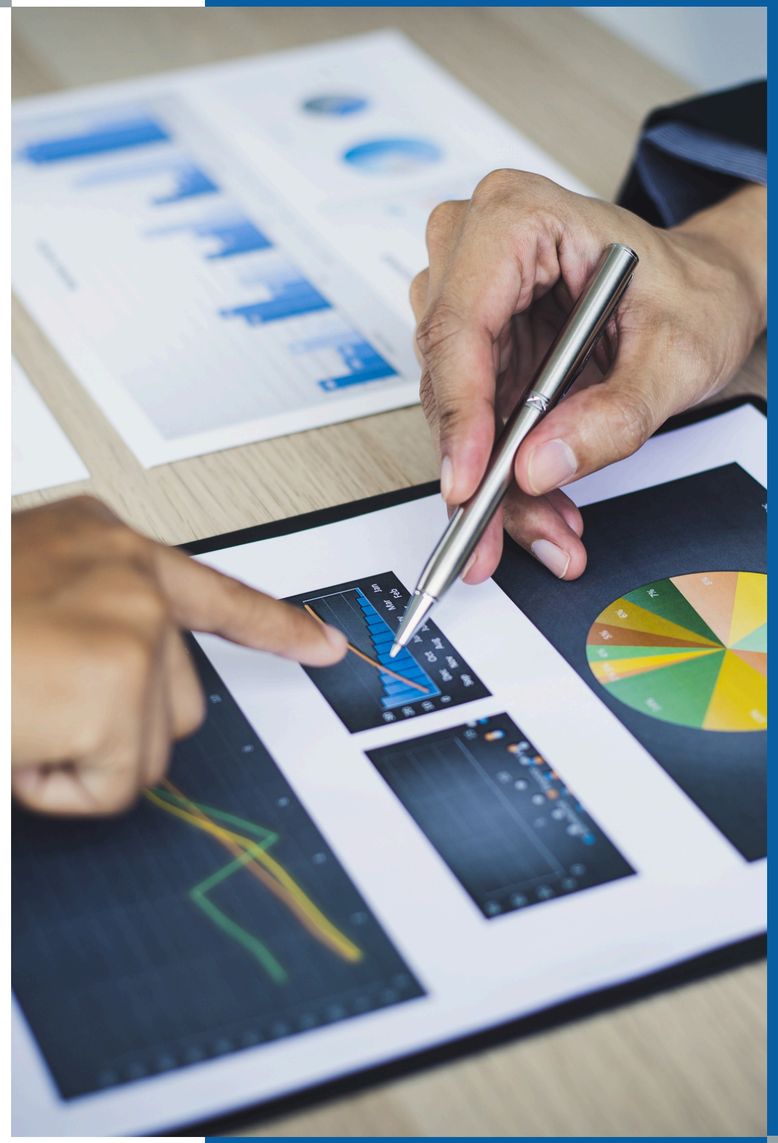
06 All team

Prototyping

Two devices are made using 3D printing. The noise detector is versatile and can be used in various contexts.

OPTIMIZATIONS

- We improved memory by storing fewer samples per second (without reducing the sampling frequency and keeping peaks in mind);
- We reduced the LED brightness;
- Reduced CPU usage: it's only used when the buffer is full;
- Battery life maximized through previous optimizations;
- BLE.



WHAT COULD BE IMPROVED

- Wireless charging;
- Send data to the cloud/Bluetooth;
- Turn off the LED;
- Sensor on both sides;
- Autonomous data transmission;

The essential was done; the rest could have been achieved with more time and greater interest from the partners in these features.

PROGRAM STATUS

FINAL STATUS OF THE PROJECT

01 We followed the UC calendar.

02 We have a partner and adjusted the project according to their input.

03 We have test our implementation and design.

04 Validation of the problem, solution and implementation.

ADDITIONAL INFORMATONS

COSTS AND BENEFITS

The price is very low. For less than €60 (excluding 3D printing), it is possible to build our solution. With large-scale production, the cost could be even lower, as only the necessary components would be manufactured — we are not using the full potential of the purchased components.

Our solution, besides being more affordable, enables the generation of daily and personalized reports, which are useful for beneficiaries. The devices are compact, lightweight, offer long battery life, and have a wide operating range. Thanks to its modular features, the 1st device can operate autonomously, if needed. On one hand, our implementation is portable; on the other, it can also be static. With this implementation, the alert is faster.

WHY PORTABLE ?

PORTABLE DEVICE

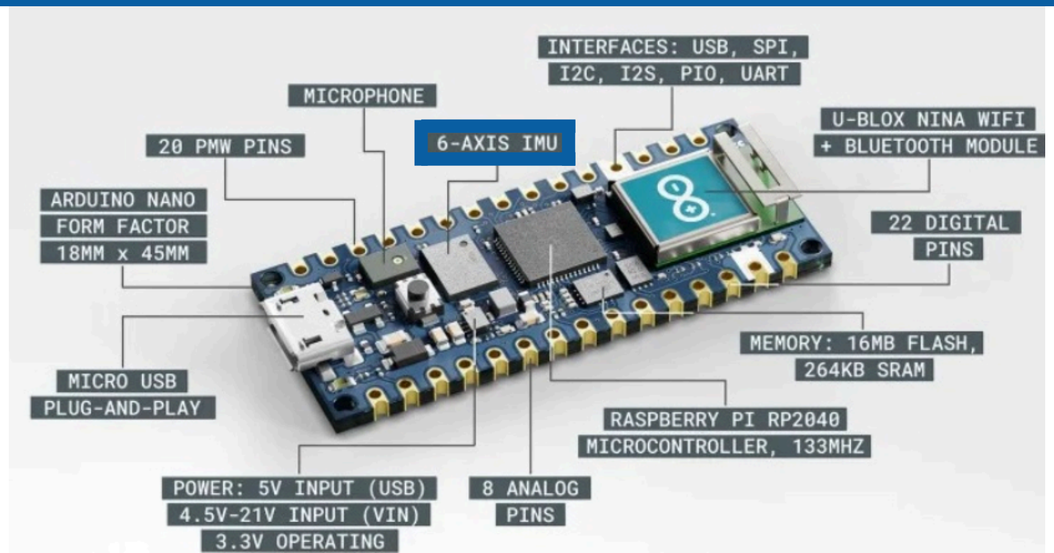
- More personal data, greater usefulness for the beneficiaries;
- Device independence: the 1st device can operate autonomously, as if it were static;
- Fast and effective alert.

STATIC DEVICE

- Hard to predict which workers should be alerted;
- Difficulty in notifying the worker (three devices were needed);
- More devices, higher cost;
- No charging problems.

OTHER POSSIBLE IMPLEMENTATION

- Instead of the capacitive sensor, have an accelerometer sensor that detects position in XYZ.
  - Disadvantage: Difficult to calibrate because it would depend on PPE to PPE, e.g., PPE attached to the helmet.
  - It would be possible to check whether the worker was working or not.



ELETRO DAY MATERIALS

VIDEO

URL

https://web.tecnico.ulisboa.pt/~ist1106327/public/video/

POSTER

SafeNoise Team 8 - EletroCap 2024/2025 2º Semester

ULisboa - Instituto Superior Técnico


Tiago Gonçalves
LEEC


David Antunes
LEEC


João Silvestre
LEEC


Tomás Dias
LEEC


Miguel Simões
LEE

Problem

Unprotected noise exposure in workplaces leads to unnoticed, irreversible hearing loss.

Beneficiaries

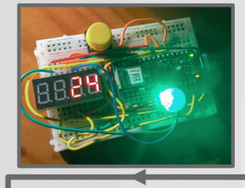

Health care

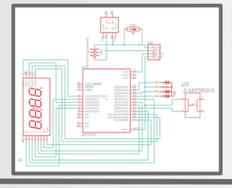

Workers


Technicians of Safety

Interviews

Development





Solution Requirements

- Compliance with Legal Standards
- User Alerts & Awareness
- Daily reports
- Monitoring Correct Use of PPE
- Scalability

Product Description

Smart device monitors workplace noise, detects PPE usage, and provides instant alerts and detailed safety reports.

Results and Users opinion

- PPE Usage Monitoring.
- Proof of Concept.
- Noise Level Accuracy.
- Battery Life Assessment.
- BLE Connection Stability.
- Unique project in Portugal.
- Raises workers' awareness.

Benefits

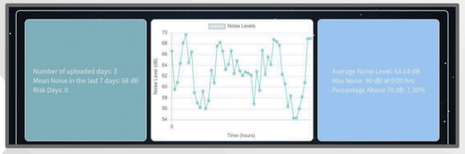
- Cost-effective
- Easy Integration
- User Friendly
- Scalable Design

Features

- Compact and lightweight
- Daily report generation
- Long-lasting battery life
- Solution can be portable or static

Competitors

We are unaware of measurement equipment that fully meet the proposed requirements, but this may be achievable by integrating it into tools we developed.

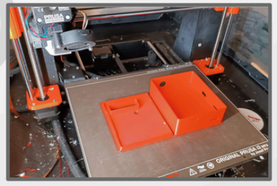


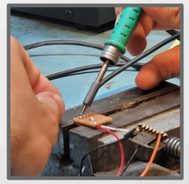
What we learned

- Developing websites and web applications.
- Electrical circuit schematic design.
- PCB schematic development
- 3D Modeling.
- Using a sound level meter for device calibration.
- Soldering electronic components.
- Selecting appropriate components for the project.
- Learning how to design and deliver a pitch deck.

Technology Used

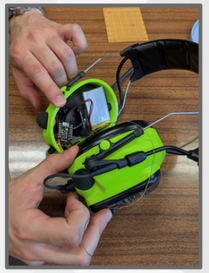
- Microcontroller
- Capacitive Sensor
- LEDs
- 3D Printer
- Bluetooth Low Energy
- Charging module





Optimizations

- We improved memory by storing fewer samples per second (without reducing the sampling frequency and keeping peaks in mind).
- We reduced the LED brightness.
- Reduced CPU usage: it's only used when the buffer is full.
- Battery life maximized through previous optimizations.
- Reduce device size for increased portability.



External Links

To better understand our solution, we present:

- The QR code to our blog with our materials.
- Video.

Acknowledgements

We would like to express our heartfelt gratitude for all the support we received from our family and friends throughout this journey. Your encouragement and understanding were invaluable.

A special thank you to Eng. Patrícia Prudêncio; Catarina Teixeira; Prof. Luís Caldas Oliveira; Tiago Lourinho whose support were particularly meaningful.

TÉCNICO LISBOA

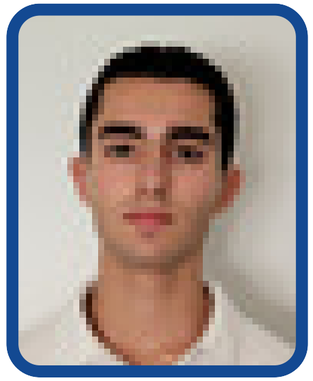
SAICA

LEARN MORE
CONTACT US

ABOUT US

WHO WE ARE

Team 8



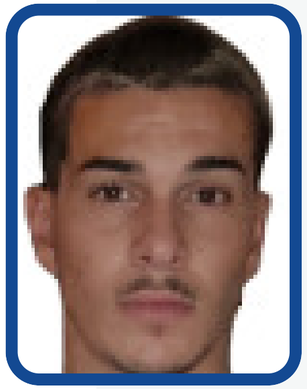
Tiago Gonçalves

David Antunes

João Silvestre

Tomás Dias

On May 12, 2025, João Campos withdrew from the course.



Miguel Simões

SAFENOISE BLOG

URL

https://web.tecnico.ulisboa.pt/~ist1106327/public/

WEB DEV

David Antunes

WEB UPDATES Weekly summary

Tiago Gonçalves

Team 8

End

SAFENOISE

ELECTROCAP PITCH DECK

Website: Team 8

https://web.tecnico.ulisboa.pt/~ist1106327/public/

TÉCNICO LISBOA

U LISBOA | UNIVERSIDADE DE LISBOA

SAICA

June 2025