RESCUE TRACKER

Real-Time Biometric Monitoring for Emergency and Military Personnel

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Our Team

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Problem Definition

High-Risk

Emergency responders operate in high levels of stress and high-risk environments

Health Issues

Prolonged exposure to stress, fatigue and physical strain increases the risk of injury and also affects the performance and safety of emergency workers

No Monitoring

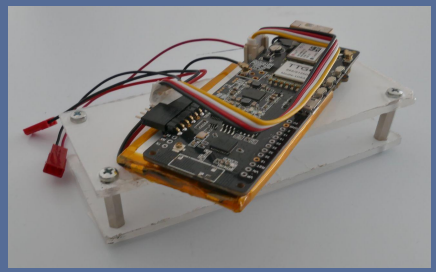
There is no real-time monitoring systems for these high-stakes environments that could identify early signs of physical and mental exhaustion

SOLUTION

- The solution consists of a **specialized technical clothing** equipped with **integrated sensors** to ensure a complete biological and physiological data analysis.
- These sensors collect real-time data such as **heart rate (BPM)**, **body temperature** , **GPS location** , and **user posture** .
- The collected data is transmitted via **LoRa communication** to **base receiver module** , which then forwards the information to the **central database** , via Wi-Fi.
- Once stored, the **data is analyzed** and made accessible through a dedicated mobile application, where healthcare professionals and specialists can monitor the user's condition and **provide assistance** if necessary.

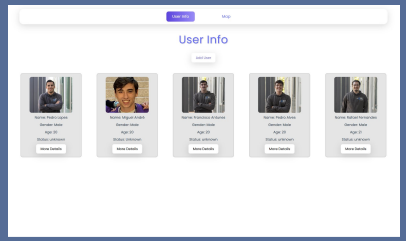
Components

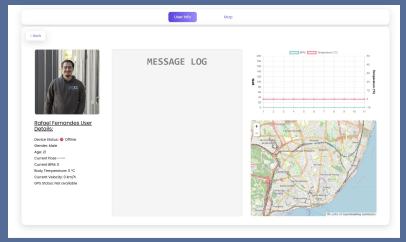
Personal Module



Data Receiver

Web App





Components

Personal Module

1) The personal module consists in a **LilyGo ESP32 T-Beam** , with built-in **GPS, BLE and LoRa** . Connected to it is a **Garmin Heart Rate chest strap** , that sends the current **BPM** of the user through BLE.

2) A **gyroscope** , an **accelerometer** , and a **temperature sensor** are connected to the controller to gather relevant **data** from the user.

Data Receiver

1) The data **receiver is also a LilyGo ESP32 T-Beam** , that connects to **Wi-Fi** and **sends the data received** from the personal module by LoRa.

2) It is supposed to be located not very far from the user, and near a **Wi-Fi network** .

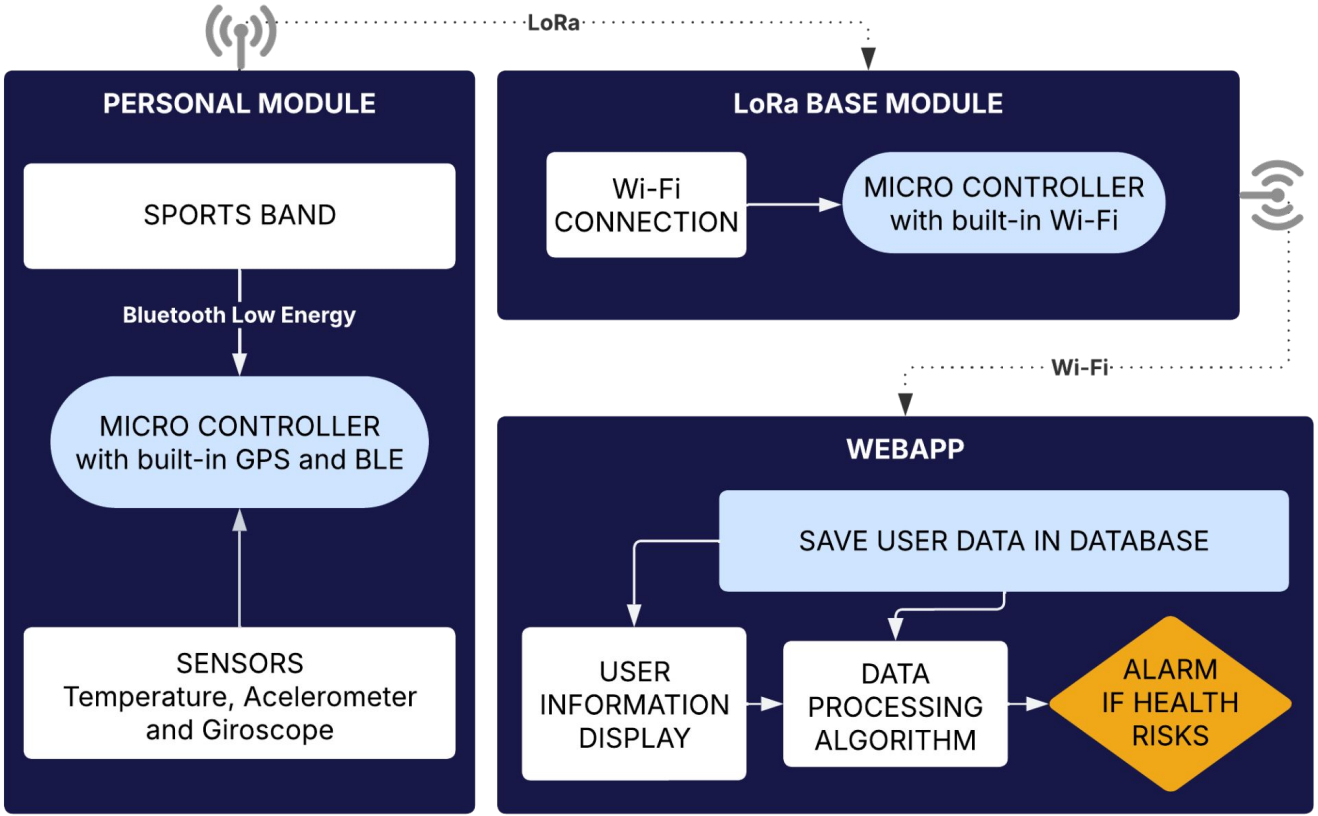
Web App

1) The WebApp was made using **Vite** (front-end), **Flask** and **Render** (back-end and its hosting service) and **Firebase** (database).

2) It implements a **global vision** of the **users** and its **locations** .

3) The details of **each user** are also displayed. The interface shows the **device status** , the **user status** , its **biometrical data** , a **message log** , a **map** and a **line chart** .

VISUAL SOLUTION



Solution Beneficiaries

Emergency Responders

Firefighters
Emergency Paramedics

Military Personnel

Military on duty
High-Risk Military Trainings

Secondary Stakeholders

Medical Personnel
General Public

COMPETITORS

	RESCUE TRACKER	CATAPULT	Zephyr™ by Medtronic	HEXOSKIN HEALTH SENSORS & AI
BATTERY AUTONOMY				
AFFORDABILITY				
BIOMETRIC DATA ANALYSIS				
BODY POSTURE				
REAL-TIME ALERTS				

PARTNERS

- The Alvalade Firefighters Regiment helped us understand the challenges faced by professionals in this field. They contributed valuable insights that improved our prototype and also supported its testing phase.

- Another valuable partner was an emergency nurse from the Santo André Hospital in Leiria, who supported us in analyzing biological and physiological data.

Costs and Benefits

Development

- Personal prototype + Data receiver = 180€

Product

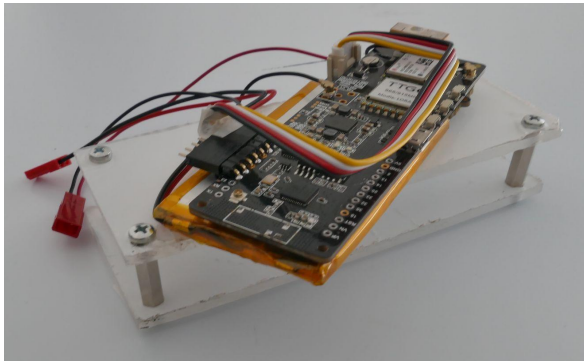
- Commercialised version = 120€, plus additional costs for professional evaluation and personal data analysis

Key advantages

- Real-Time emergency detection.
- The battery duration is one of the best in its category.
- Designed specifically for professionals in high-risk work environments.

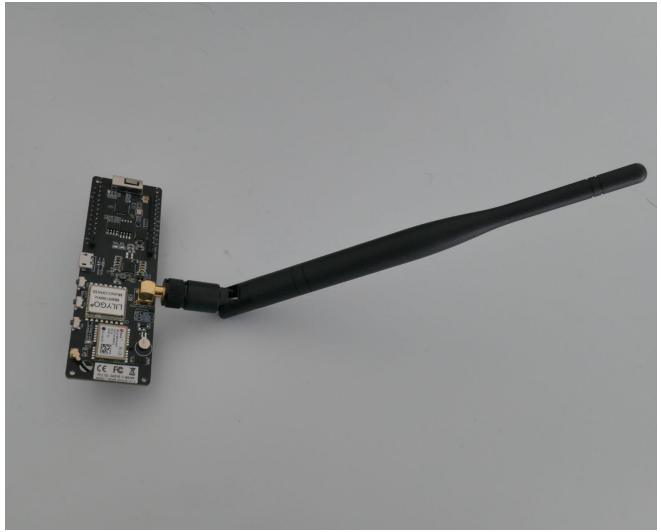
Results – Personal Module

- **BLUETOOTH LOW ENERGY COMMUNICATION**
  - Very effective BLE communication (98% rate) and the Garmin HRM-Dual was a solid choice and very easy to implement
- **LORA COMMUNICATION**
  - Effective Peer-to-peer Lora communication. More difficult to implement, but solid final results. The communication can be done effectively from at least 500 meters away from the receiver.
- **SENSORS IMPLEMENTATION**
  - The sensors give accurate data. The gyroscope is works very well. The temperature one needs to be allocated in a specific body part to give more accurate data
- **PROTOTYPE ASSEMBLY. ACHIEVED MINIMUM SIZE AND WEIGHT AND MAXIMUM COMFORT**



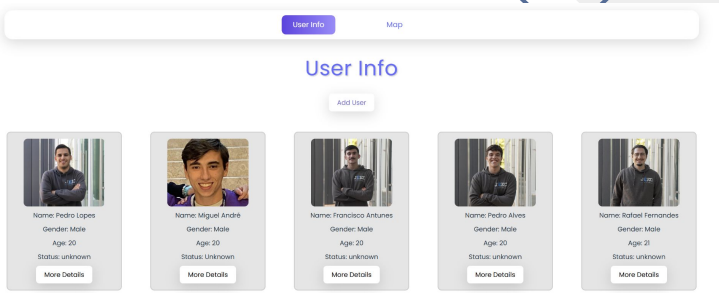
Results – Data Receiver

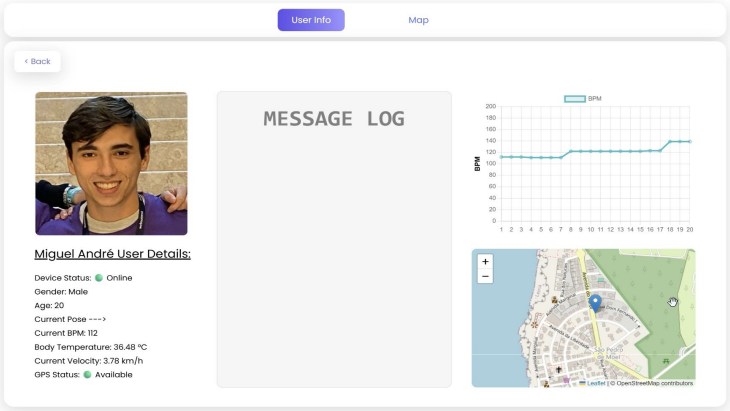
- **WI-FI COMMUNICATION**
  - Very effective Wi-Fi communication. Sends the data received from the personal module by LoRa to the Firebase Real-Time Database.
- **EXPANDABILITY**
  - The same device can be used for various users, as long as the personal modules are in LoRa range.



Results - Web-App

- **EFFECTIVE USER INFO DISPLAY**
  - User friendly display, show real-time data received from the database. Possible to add various users and check its biometrica data, location and status.
- **DATA ANALYSIS**
  - Algorithms made to analyze the user data received in real-time and send warnings or alerts, depending on the seriousness of the situation.
- **DETAILED MESSAGE LOG VISUAL CHARTS**
  - The message log displays the last messages received. Depending on the user status, they have different colours. The graphic shows the evolution of the heart rate and temperature.





Contributions of each team member

Francisco Antunes

- Components research
- Interviews
- Prototype assembly and testing
- Poster

Pedro Alves

- Website
- Hardware
- Database
- Web App development

Miguel André

- Interviews
- Software
- Hardware and communications
- Video production

Rafael Fernandes

- Blog
- Software
- Video recording
- Pitch Deck Presentation

Pedro Lopes

- Interviews
- 3D Modeling
- Prototype assembly and testing
- Video production support

RESCUE TRACKER

Thank You

For more information:

Website/Blog

Video