RESCUE TRACKER

Real-Time Biometric Monitoring for Emergency and Military Personnel

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TÉCNICO LISBOA

ADVISORS & MENTORS

- **Scientific Advisor** : Pedro Vítor and João Gaspar
- **Scientific Co-advisor** :
- **Coordinator** : Pedro Vítor
- **Mentor** :

Problem Definition

Real-time biometric monitoring for emergency and military personnel to identify early signs of health risks during medical emergencies, catastrophes or high intensity training.

High-Risk

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

Health Effects

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

PREVENTION

Real-time monitoring systems for these high-stakes environments could identify early signs of physical and mental exhaustion and send the needed medical aid.

Solution Beneficiaries

Emergency Responders

Firefighters
Emergency Paramedics

Military Personnel

Military on duty
High-Risk Military Trainings

Secondary Stakeholders

Medical Personnel
General Public

Technological Solution

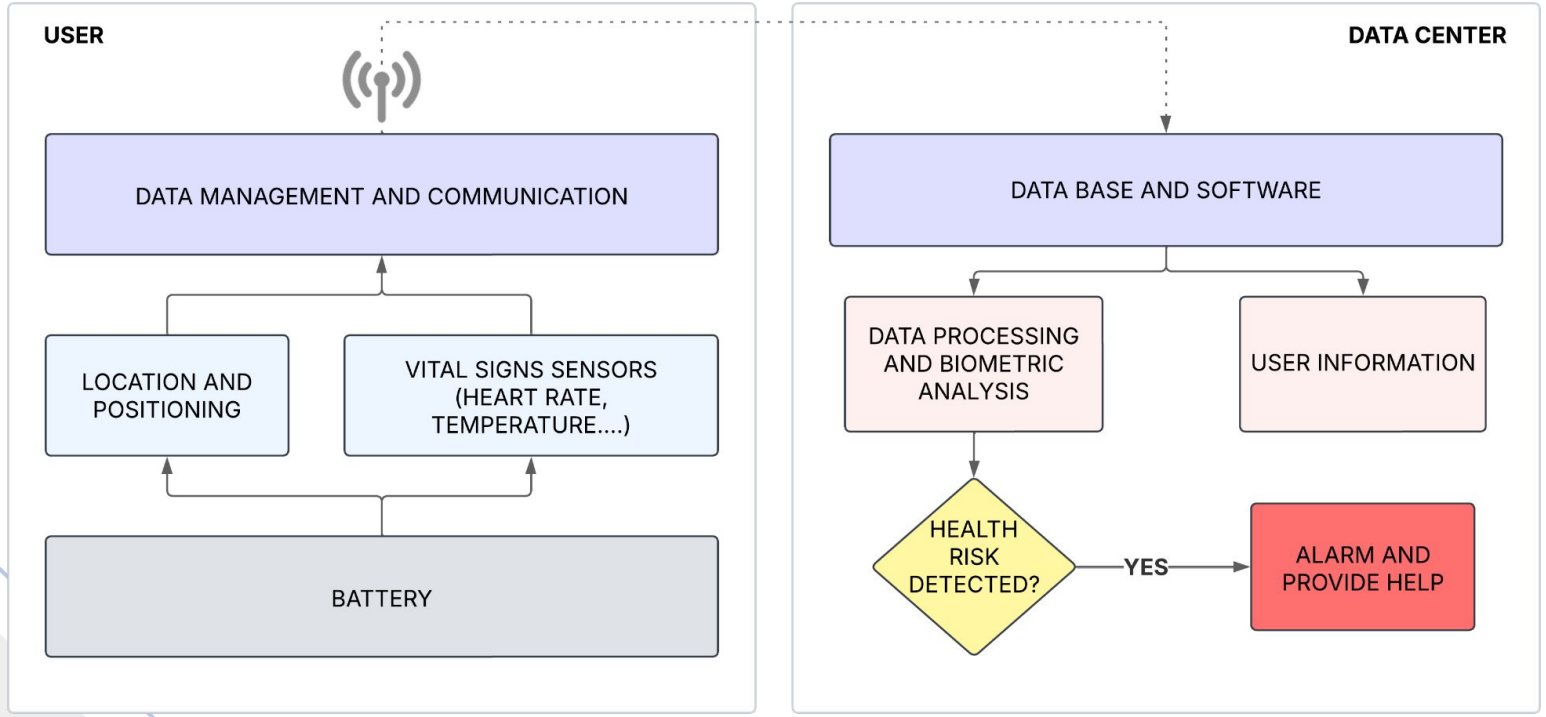
The proposed solution is a wearable biological monitoring system designed to capture, analyse, and transmit real-time physiological data.

The system will consist in a specialized sports bra (similar to the ones used in professional football), equipped with integrated sensors to ensure a complete biological and physiological data analysis.

Main Areas

- Control Systems
- Telecommunication
- Robotics and Sensors
- Power and Batteries
- GPS Location
- Biometric Data Analysis

TECHNOLOGICAL SOLUTION
ARCHITECTURE



Competitors and previous Work

Competitors:

- **Catapult Sports** : Wearables, often integrated into vests or bras, track metrics like heart rate, workload and movement.
- **Zephyr BioHarness** : Chest straps integrated with sensors to monitor heart rate, breathing, posture, and activity in real-time.
- **Hexoskin Smart Clothing** : Shirts equipped with sensors to capture heart rate, breathing rate, and physical activity data.

Previous work - Research Articles:

- [1] **Sports Personnel Health Monitoring Application Based on Biometric Data Collection Model**
- [2] **A Real Time Autonomous Soldier Health Monitoring and Reporting System Using IOT**
- [3] **No Soldiers Left Behind: An IoT-Based Low-Power Military Mobile Health System Design**

Solution Requirements

Biometric Monitoring

The system must collect and analyse real-time physiological data through sensors and send warnings if there is danger foreseen.

Immediate Alerts

The system should provide instant alerts if any biometric readings indicate potential health risks

User Comfort

The wearable device must be lightweight, breathable and comfortable enough for prolonged use

Durability and Battery Life

The system must be highly durable and it should operate for extended periods without failure

Technical Challenges

Electronics and Software

The device must capture all the data through sensors and emit it to the base software, where it is analyzed and displayed

Communication and Latency

We need to ensure the data required is live for immediate action on critical biometric changes

Power efficiency

The device needs extended life battery to last through long periods of time

Comfortability

The suit must be comfortable so that it doesn't distract or affect the concentration of the emergency personnel using it

PARTNERS

Partners are essential to ensure positive development during the project.

- **Family members** who work in healthcare will assist with the acquisition and analysis of biological signals. **André Alves** , a nurse in the emergency department at Santo André Hospital in Leiria, is willing to contribute by providing his expertise and support in this area.

- **Firefighters Regiment** are also a good partner to our project, to give information about some aspects of the prototype and to test it. We are aiming to get in touch with the **Alvalade Firefighters Regiment** .

- Our team also established contact with a **NATO military official** involved in the development of military medical devices, whom we hope to engage in discussions soon.

Testing and Validation Metrics

Biometric Data

Tests to collect and train the software that analyses the biometric data and decides whether there is a risk or not.

Energy Efficiency

Testing battery longevity, ensuring an efficient and low-power data transmission.

Data Transmission

Testing real-time communication. Ensures accurate and secure information delivery.

Global test in real environment

Division of Labor

Francisco Antunes	Pedro Alves	Miguel André
Website development and Event Preparation Business and Partnership Hardware development	**Software Development** Test the prototype Weekly Report in the Blog	**Prototype Design** Image/Video editing Software development Test the prototype

Division of Labor

Rafael Fernandes

Data Transmission

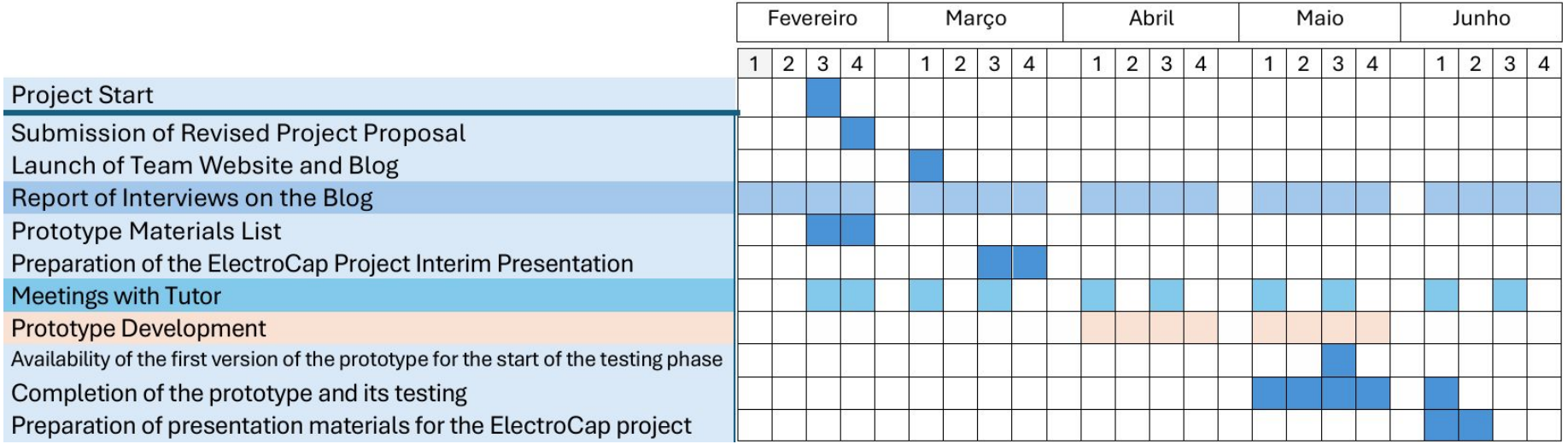
Data Security and Privacy
Marketing
Software Development

Pedro Lopes

Hardware

Logistics
Design Prototype
Energy efficiency

SCHEDULE


Fevereiro
Março
Abril
Maio
Junho
1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4
Project Start
Submission of Revised Project Proposal
Launch of Team Website and Blog
Report of Interviews on the Blog
Prototype Materials List
Preparation of the ElectroCap Project Interim Presentation
Meetings with Tutor
Prototype Development
Availability of the first version of the prototype for the start of the testing phase
Completion of the prototype and its testing
Preparation of presentation materials for the ElectroCap project

REFERÊNCIAS

[1] Xueqing Hu. Sports Personnel Health Monitoring Application Based on Biometric Data Collection Model. 2022. Disponível em https://www.researchgate.net/publication/362570684_Sports_Personnel_Health_Monitoring_Application_Based_on_Biometric_Data_Collection_Model

[2] D V Madhuria ,N V Sai Sri Prasadb , S Moksha Saranyac , Mohan Babu. A Real Time Autonomous Soldier Health Monitoring and Reporting System Using IOT. 2024. Disponível em https://ijrpr.com/uploads/V5ISSUE5/IJRPR28140.pdf

[3] James Jin Kang, Wencheng Yang, Gordana Dermody, Mohammadreza Ghasemian, Sasan Adibi, Paul Haskell-Dowland. No Soldiers Left Behind: An IoT-Based Low-Power Military Mobile Health System Design. 2020. Disponível em https://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=9247977