TÉCNICO LISBOA

NAVGUIDE

Smart Navigation System for Visually Impaired in Supermakets

Imagine walking into a supermarket... but not knowing where anything is.

Problem

Blind and visually impaired individuals often face significant challenges when navigating in supermarkets. The lack of accessible navigation tools leads to difficulties in locating products, resulting in a reliance on assistance and loss of independence.

Currently, in Portuguese supermarkets, there are no specific solutions available for people with this disability.

Target Audience

Blind People

Elderly People

Markets

Competitors

NaviLens

RightHear

Part of the already existing projects are based on RFID technology and not on localization systems like NAVGUIDE. The first system uses color code markers to be detected by a smartphone, whereas the second is based on the smartphones' Bluetooth technology and gives instructions about what surrounds the user.

The NAVGUIDE project marks the difference, because it uses a new technology for precise positioning, focused on the needs of blind people and adaptable to any retail layout.

Our solution

NAVGUIDE was created to address the lack of supermarket solutions for people facing this challenge. It is a smart indoor navigation system designed to guide blind and visually impaired users inside a supermarket, using real-time and high-precision positioning.
The solution is divided into three main areas:

Ultra-Wideband (UWB) Technology

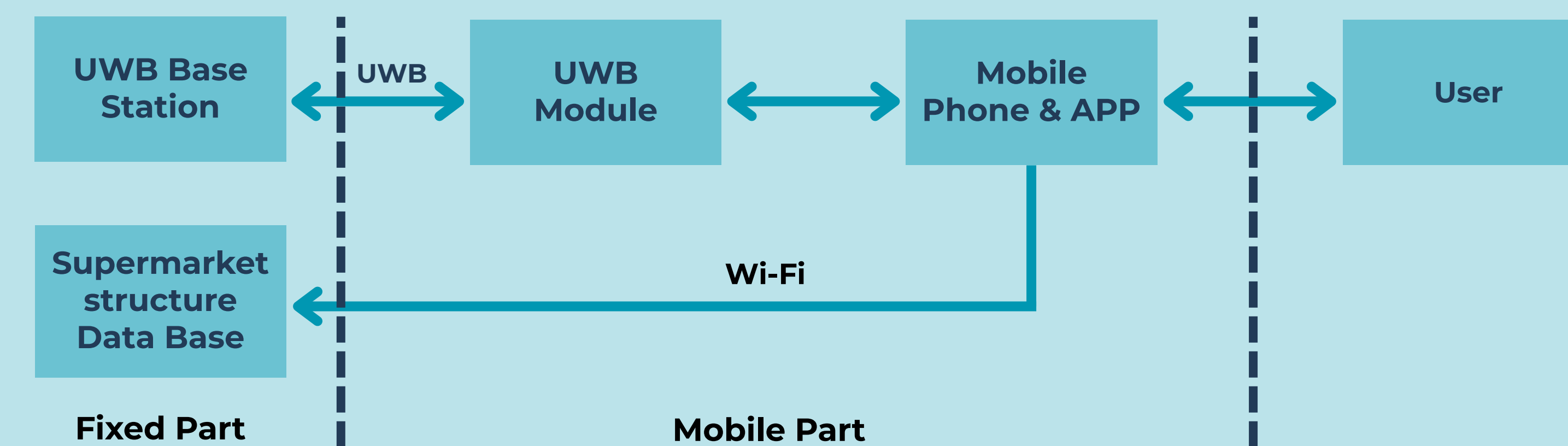Short-range wireless communications that use high frequency radio waves to transmit data.

Mobile Application

Offers voice-guided instructions, helping users navigate the store independently by delivering real-time updates and directions.
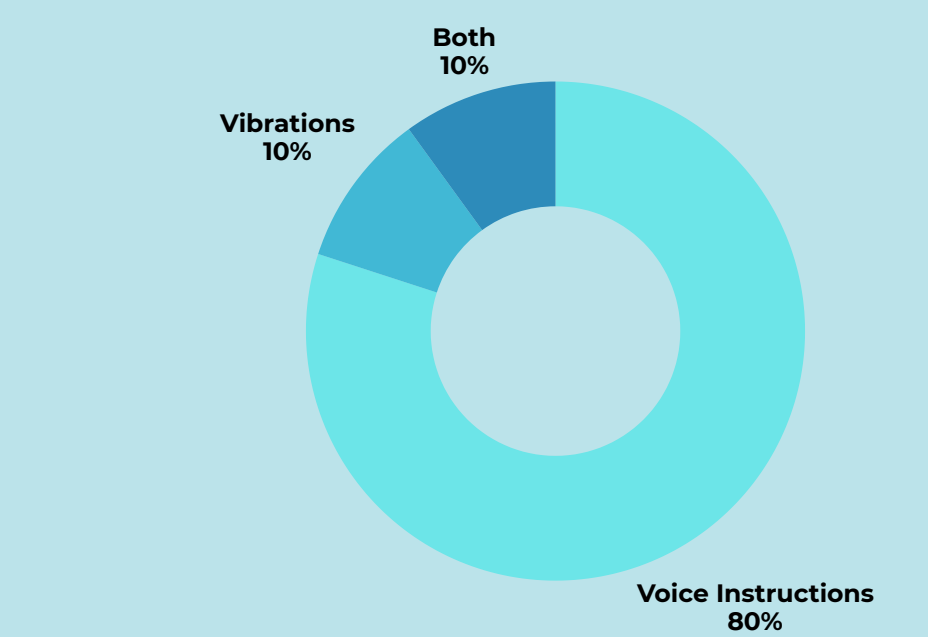
Supermarket Mapping System

Digitally maps the supermarket layout, integrating with the UWB system to identify the user's location and guide them to desired products or areas.
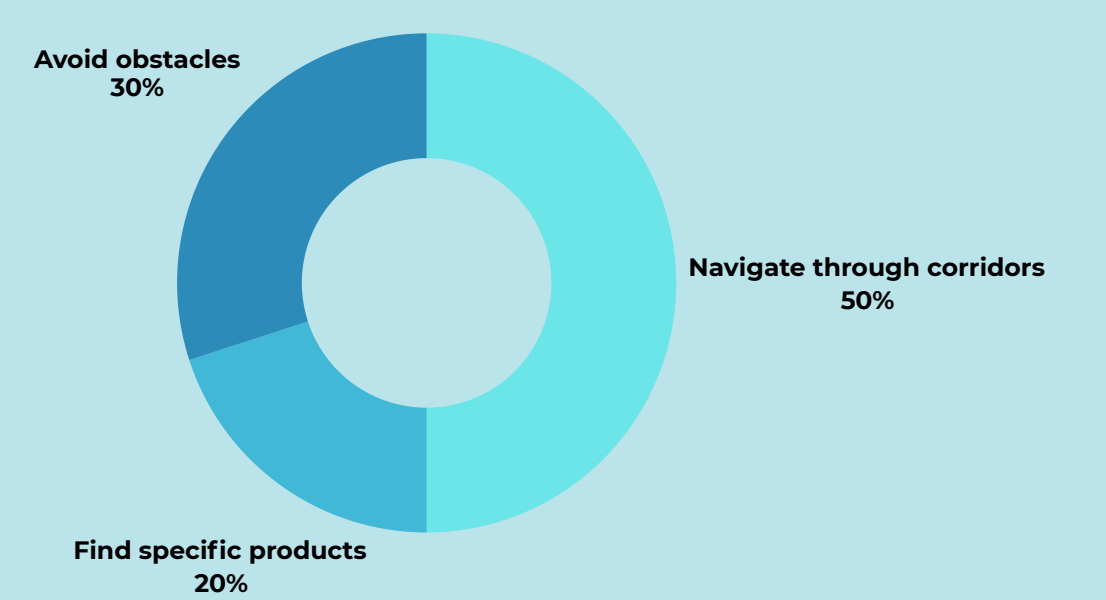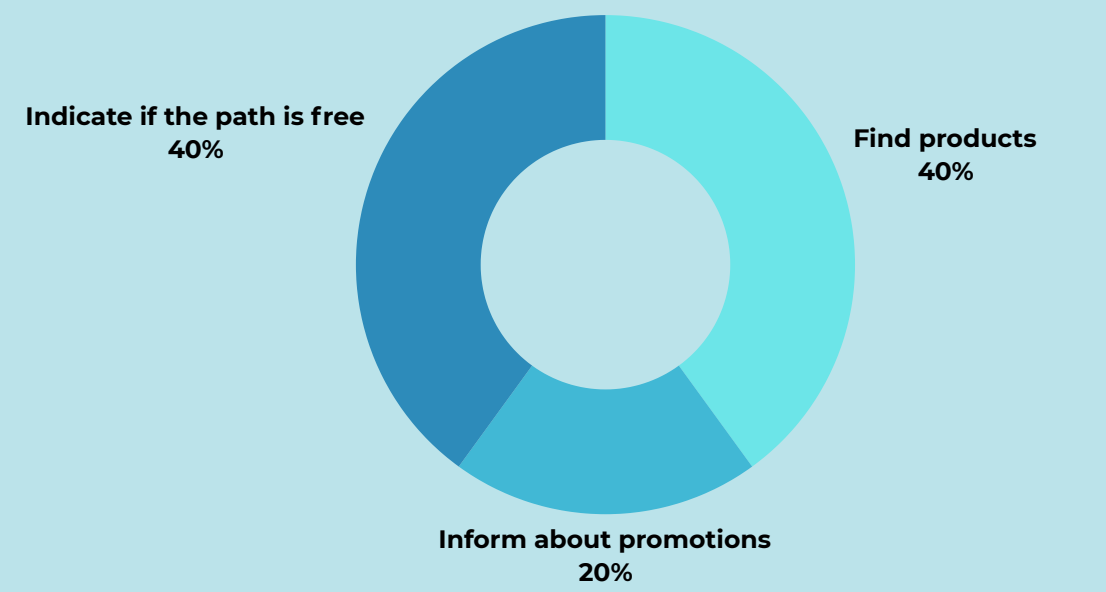
Technical Challenges

- Changing Layouts - Frequent supermarket reconfigurations require constant map updates.
- Physical Barriers - Shelves and crowded spaces may disrupt signal accuracy.
- Instruction Clarity - Misunderstood or unclear directions can hinder navigation.
- Cost Limitations - Balancing affordability with high performance is challenging.
- System Flexibility - The solution must adapt to various layouts and product placements.

Architecture

UWB Base Station — UWB → UWB Module ↔ Mobile Phone & APP ↔ User

Supermarket structure Data Base — Wi-Fi

Fixed Part | **Mobile Part**

Requirements

- **Affordable & Accurate**
The system must be cost-effective and offer precise UWB-based indoor positioning.
- **User-Friendly & Accessible**
It should be intuitive, with clear audio or haptic feedback for all users.

- **Flexible & Compatible**
The solution must integrate easily with existing setups and work across different store sizes and assistive devices.
- **Secure & Private**
User privacy and data protection must be a core priority.

Tests & Metrics

To validate the project, we conducted both lab and real supermarket environment tests. We evaluated the UWB positioning accuracy, navigation success rate, and the users' ability to complete tasks independently. We also perform tests with blind and visually impaired individuals, complemented by satisfaction surveys to gather direct feedback on the system's usability and effectiveness.

Market Research

What kind of instructions do you think would be easiest to follow?
Both 10%
Vibrations 10%
Voice Instructions 80%

What are the biggest challenges that visually impaired people face in a supermarket?
Avoid obstacles 30%
Navigate through corridors 50%
Find specific products 20%

What would you like the prototype to do?
Indicate if the path is free 40%
Find products 40%
Inform about promotions 20%

Partners

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