Instituto Politécnico de Viana do Castelo

Real-time Location Tracking for Electrical Buses - CMVC

António Marques Nº 21674

Nelson Campinho Nº 21751

Orientation:

- Professora Sara Paiva

Graduation in Informatics Engineering | School of Technology and Management | Course Unit: Projeto III | School Year: 2020/2021

Summary

1. Introduction and Objectives

City Hall of Viana do Castelo provides electrical buses, with fixed route and affortable price, to its population. These buses have no fixed stop and their arrival time to certain points may vary depending on traffic situation, climateric conditions and other occurences. To assist the population on the tracking of these buses a mobile application was developed, not only to allow users to gget information about buses' distances and estimated arrival time to the users' location but also to assist visually impaired people to catch these buses and being able to move around the city whilst knowing where they currently are.

1. Introduction and Objectives

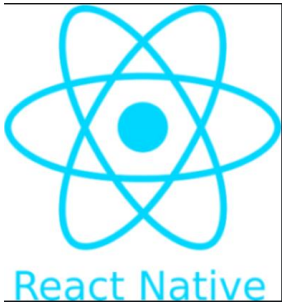
Use Case	Application	System	Description
Getting GPS information for each bus		X	The application can get the operational buses position, in real-time, to give a perception to the user about their positioning.
Talkback/Voice over functionalities		X	The system outputs various types of information for those who are impaired visually.
Information about fixed stops position	X		For those who present visual impairment the application contains information about fixed stops, so it is easier for them to catch the bus
Show bus route	X		By default, the application shows on the map the route the bus makes.
Allow bus selection	X		The user can select a bus icon, that moves constantly on the map simulating the real bus position and can easily track that specific bus. The application outputs a warning when the bus is approaching the specified location.
Calculate bus distance and estimate arrival time		X	The application can calculate the distance and estimate an arrival time using the bus real-time positioning tracking and the user's selected route place.
Allow easy access to selected bus information		X	So that the user does not have to unlock the phone and open the application each time the user wants to see where the selected bus is, the application gives a notification to the user that updates the information about the bus position and estimated time of arrival.

2.Technologies, tools and libraries





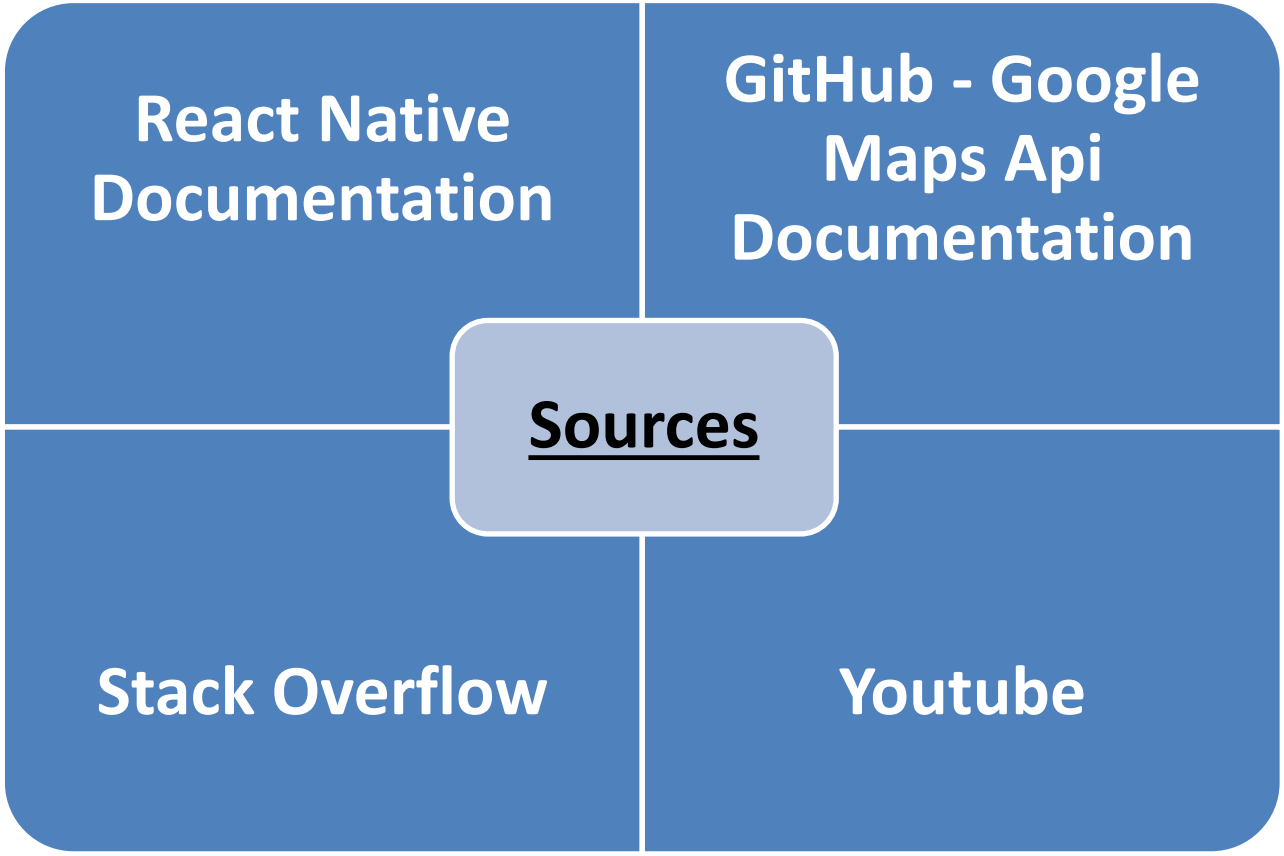






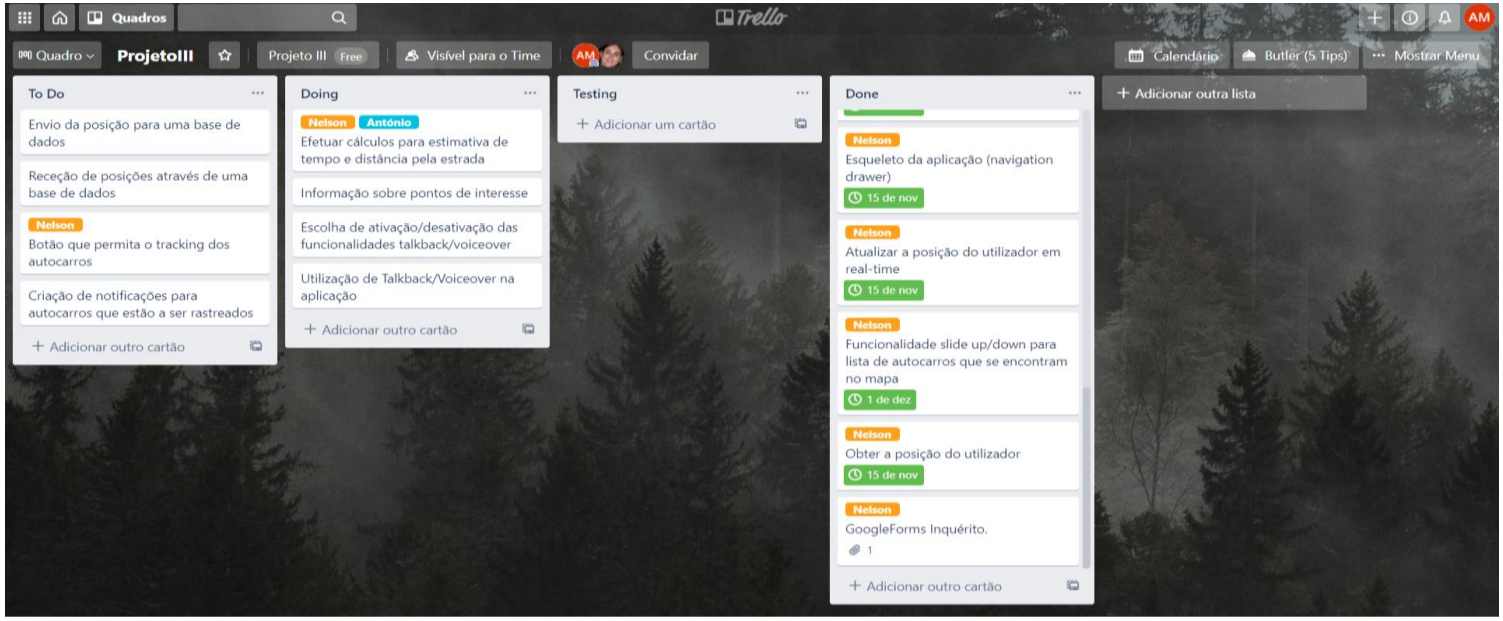



2.1 Methodology



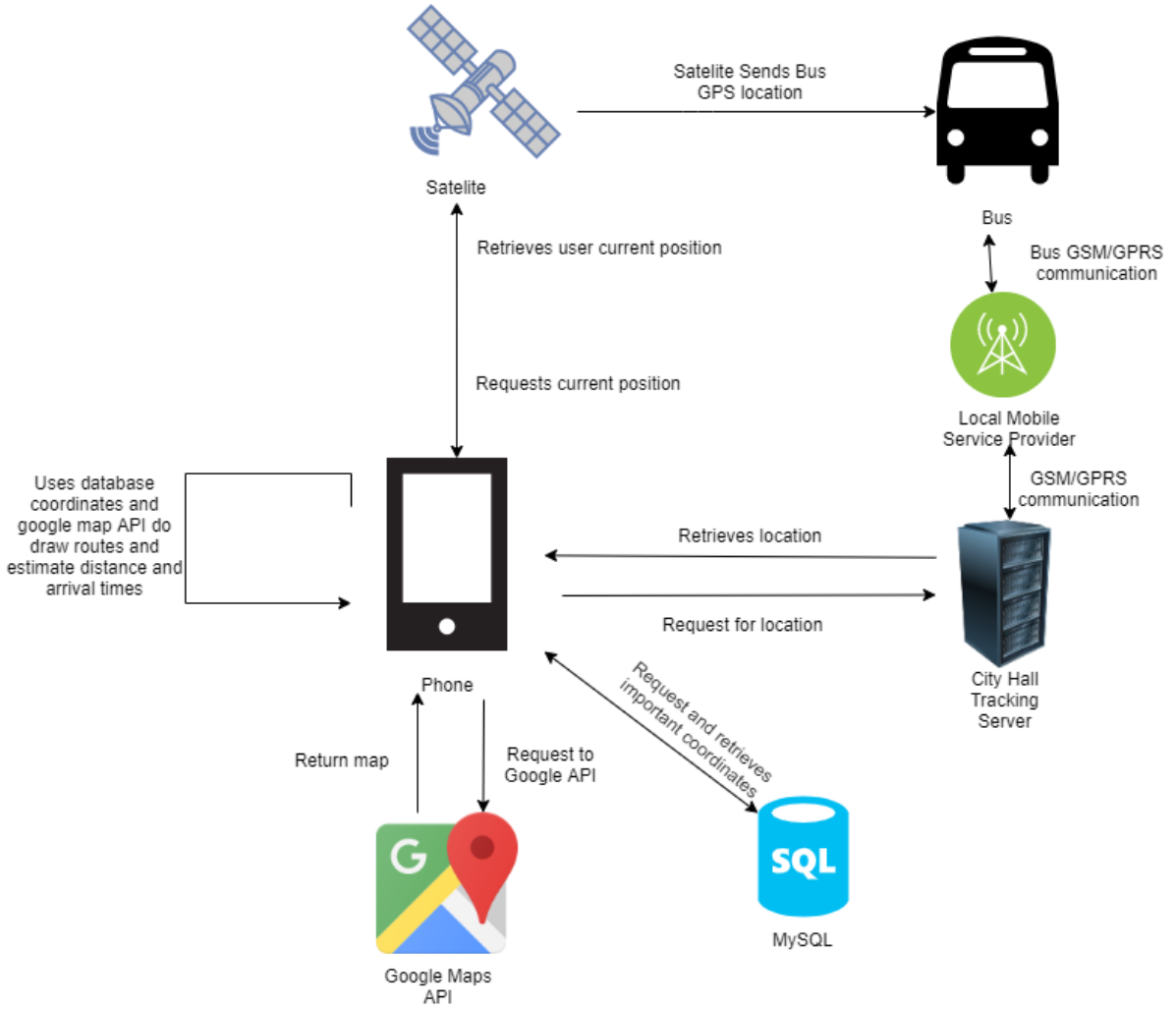
2.2 Project Management

- Project management was done with the assistance of trello, a platform that allows planning projects by stablishing task, schedule dates, assign members to tasks, communication between members and so much more



2.3 Technologies & Architecture

GRADUATION IN INFORMATICS ENGINEERING



Application development:

Api development:

Slim a micro framework for PHP

000webhost

MySQL

NotORM

Modelling:

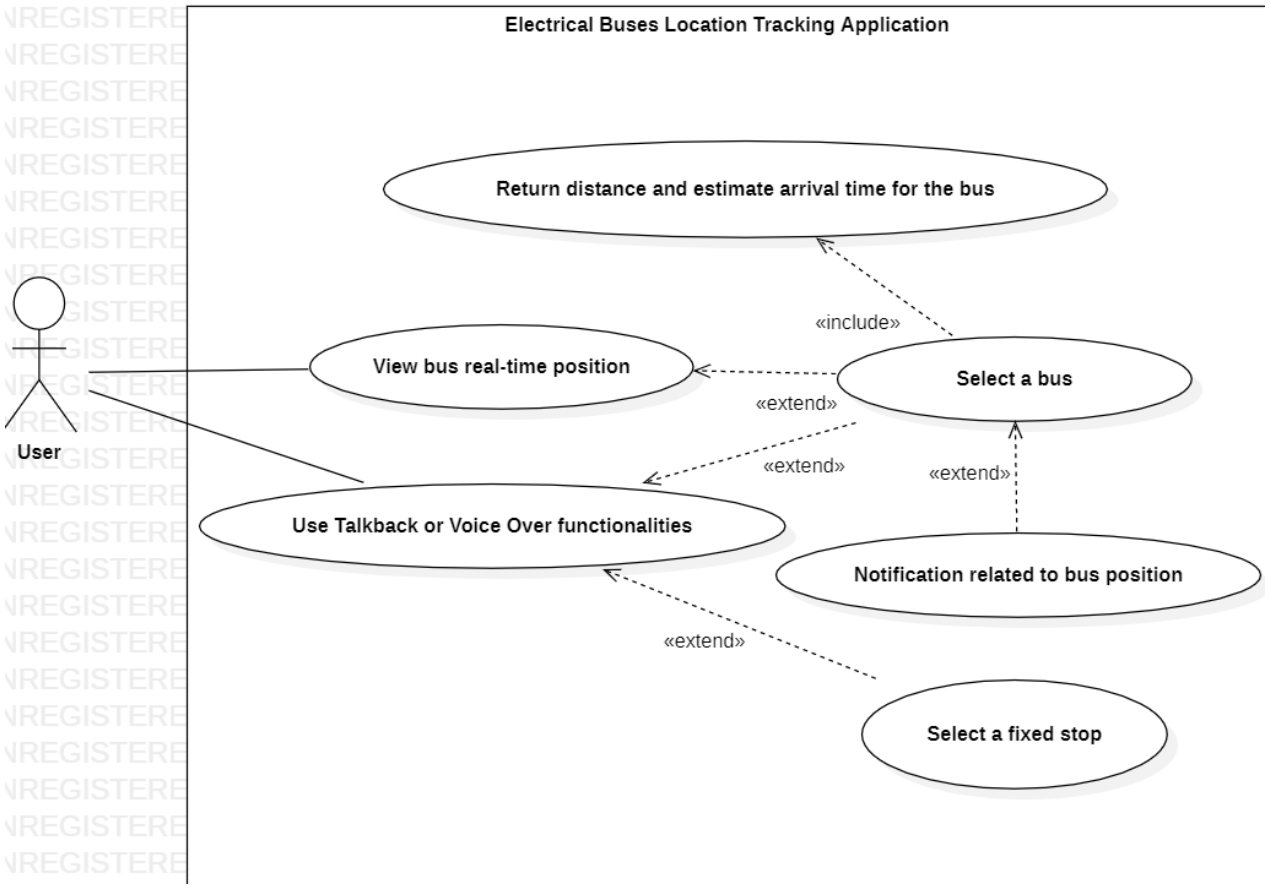
Versioning Control:

Project Task Management

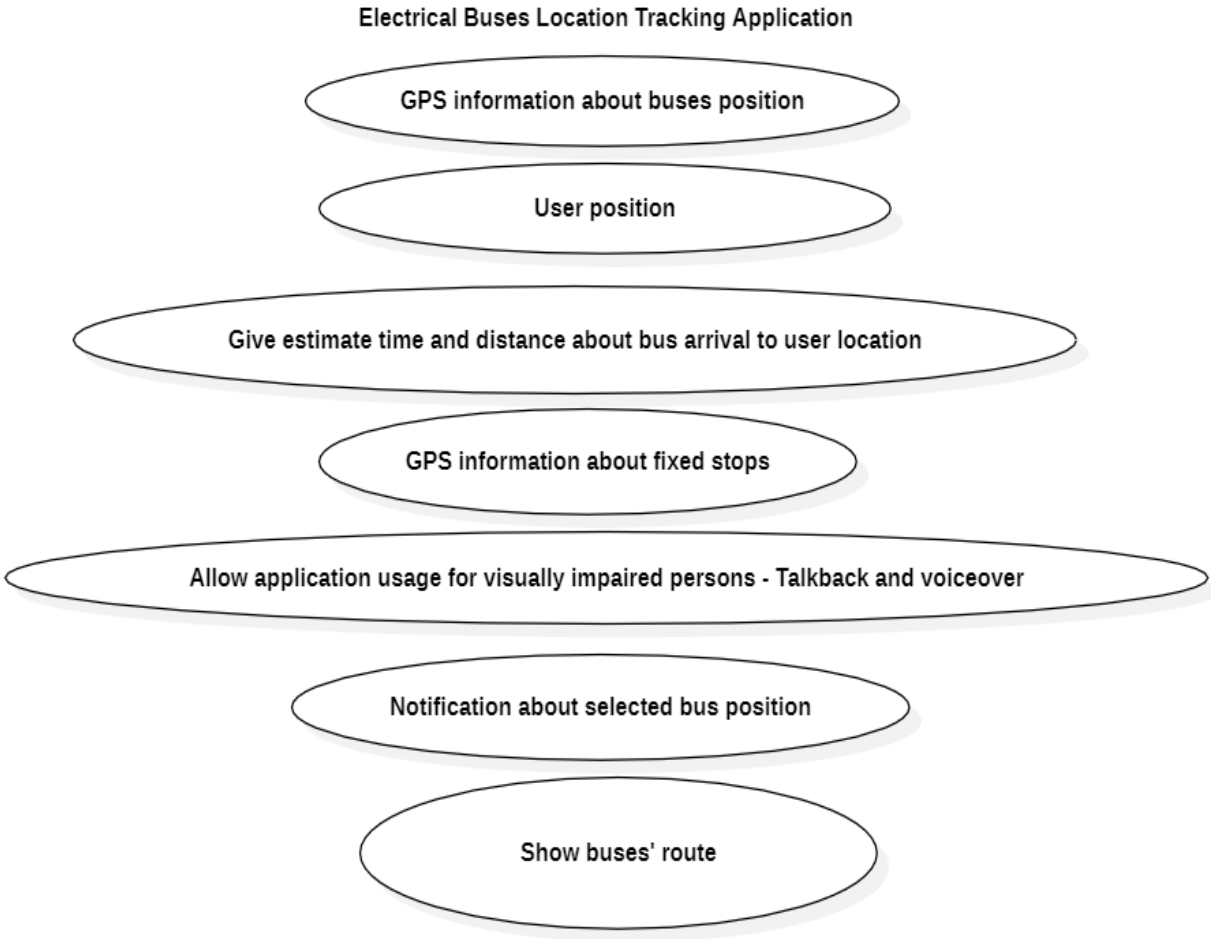
Trello

3. Use Cases

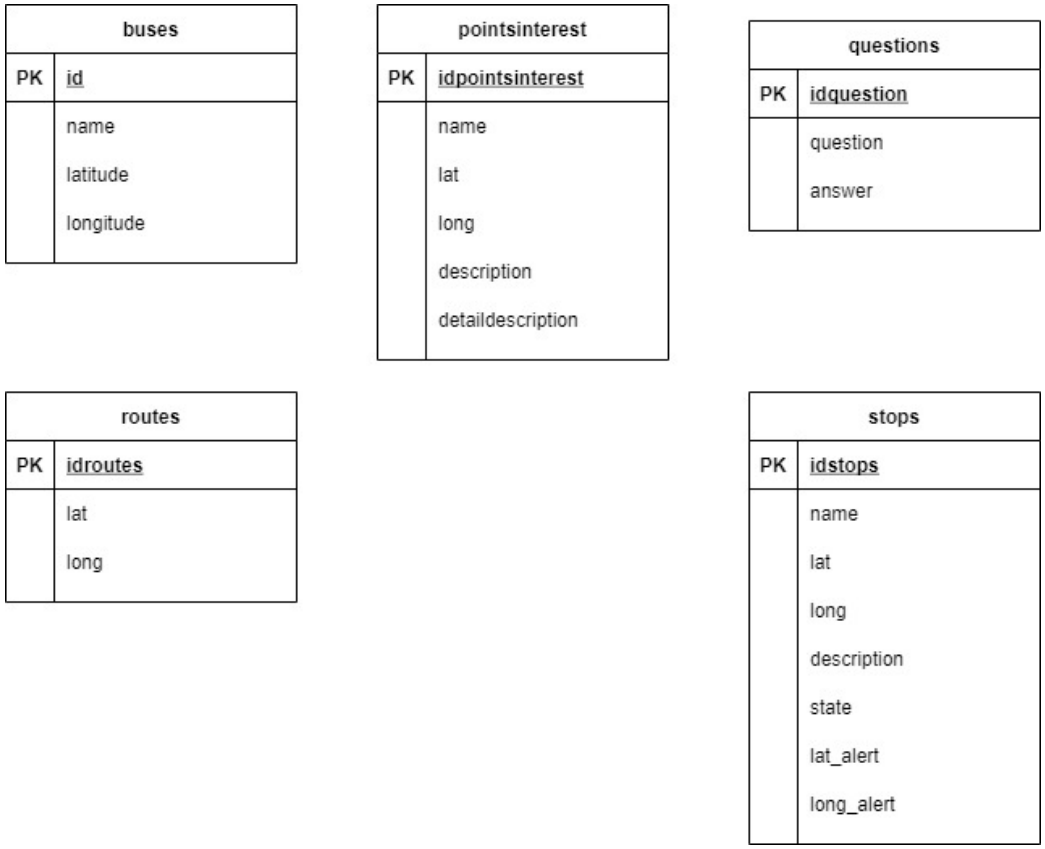
3.1 Users' Use Cases Diagram



3.2. System's Use Cases Diagram



3.3. Database Schema

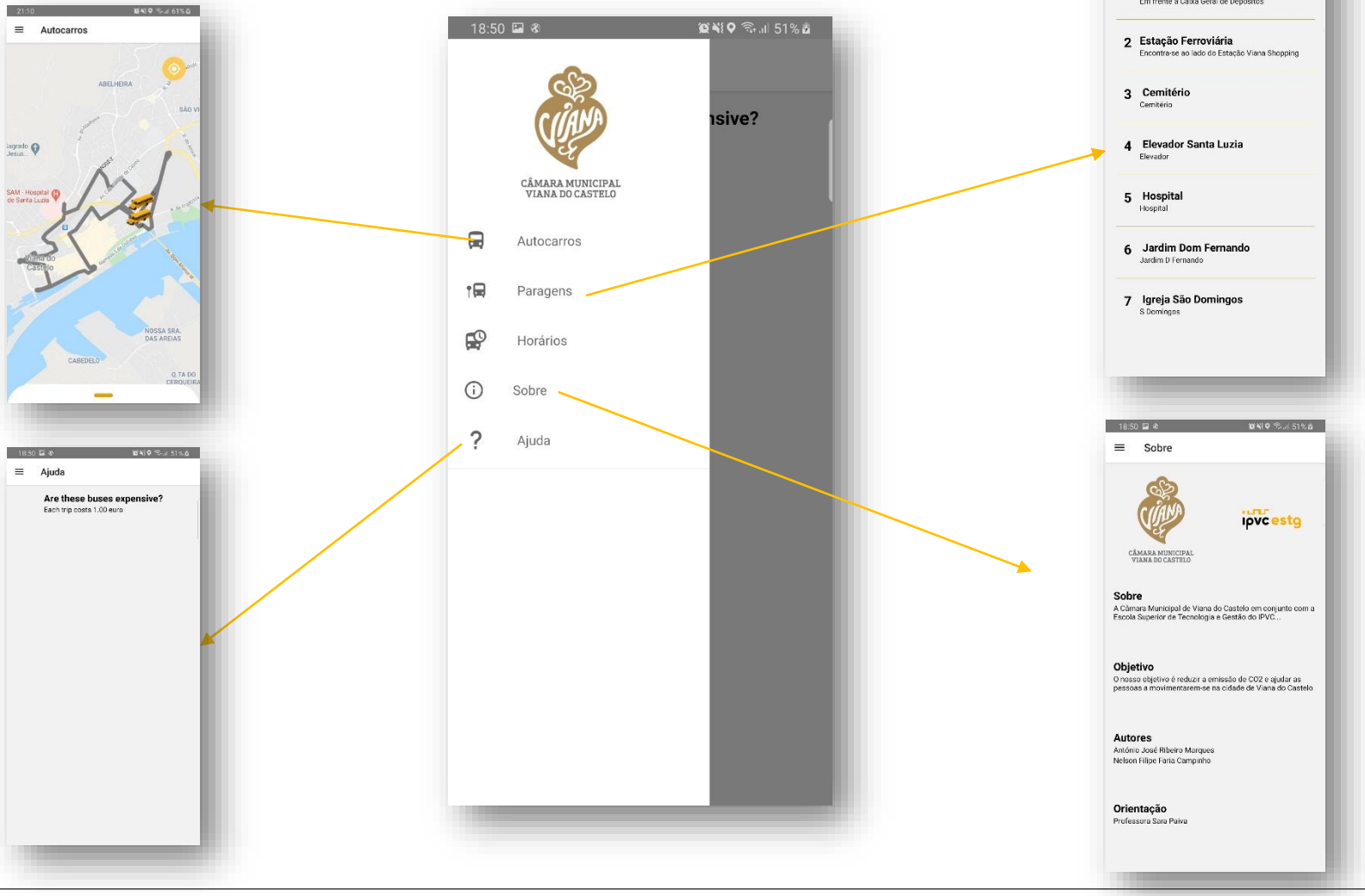


4. Practical Case/Project Developed

APP MAIN PAGE

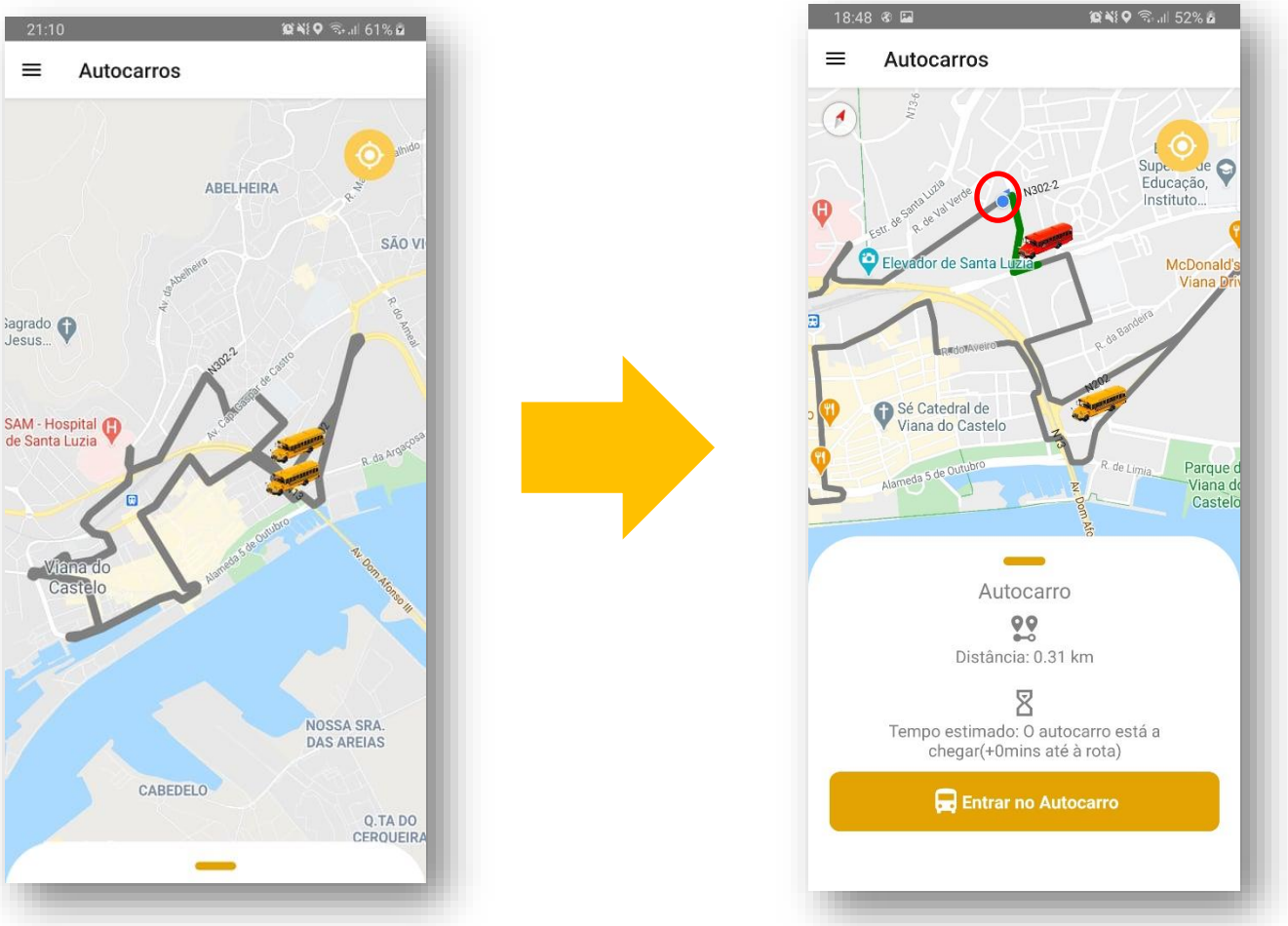
4. Practical Case/Project Developed

NAVIGATION DRAWER



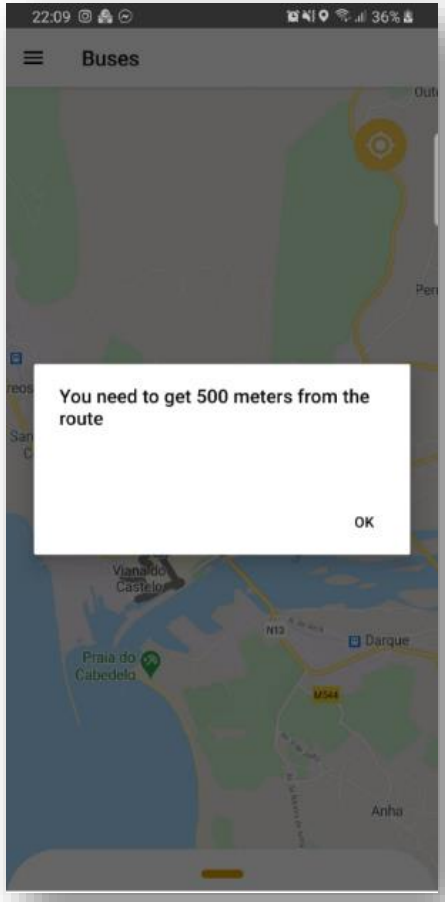
4. Practical Case/Project Developed

BUSES PAGE – USER IN ROUTE



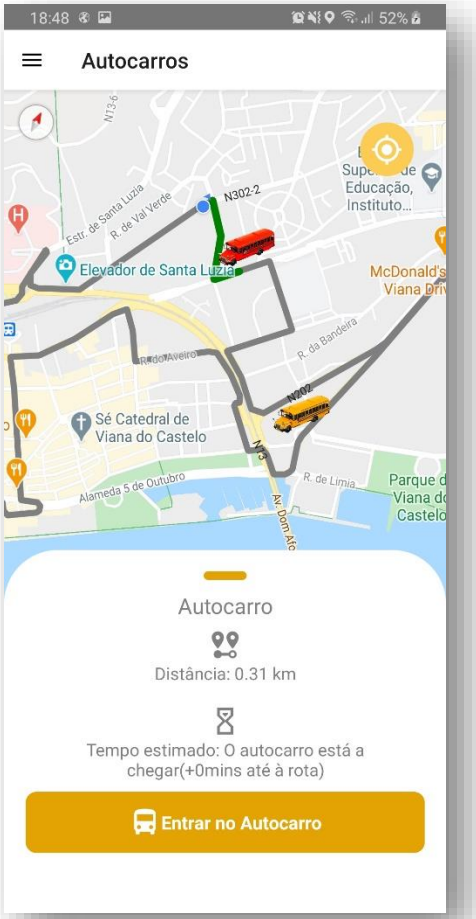
4. Practical Case/Project Developed

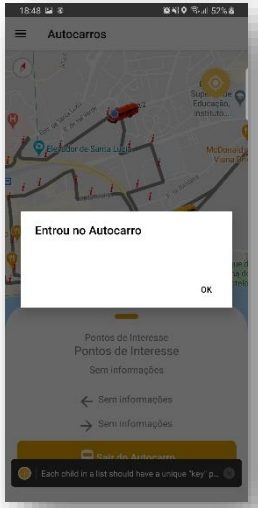
BUSES PAGE – USER OUT OF ROUTE

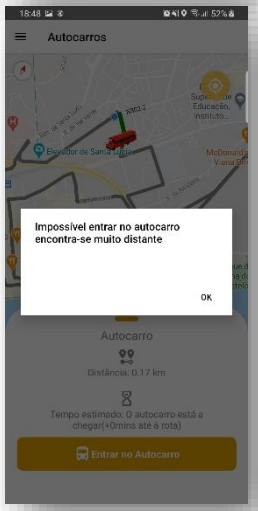


4. Practical Case/Project Developed

BUSES PAGE – ENTER ON BUS

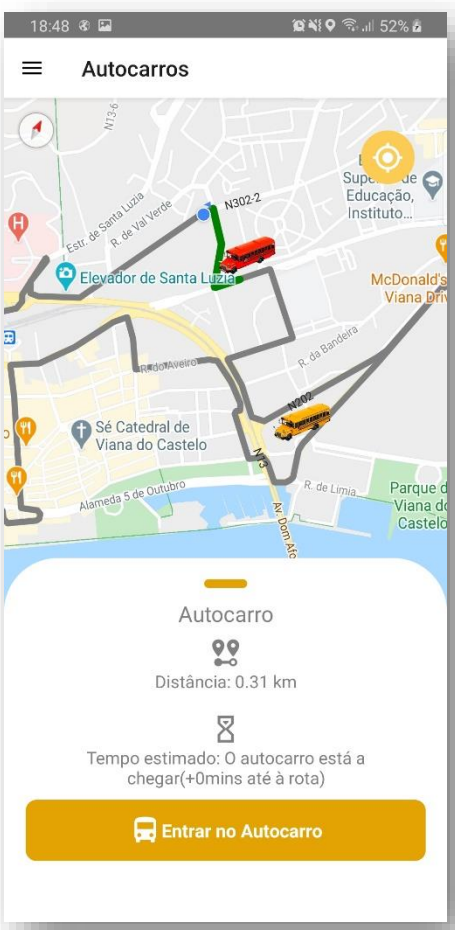






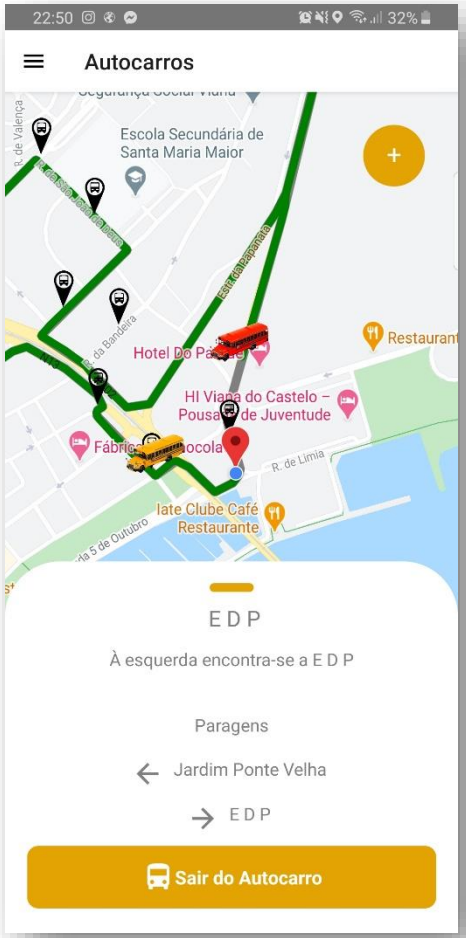
4. Practical Case/Project Developed

BUSES PAGE – ENTER ON BUS (INFORMATION POINTS)



4. Practical Case/Project Developed

BUSES PAGE WITH STOPS TO VISUALLY IMPAIRED PEOPLE



4. Practical Case/Project Developed

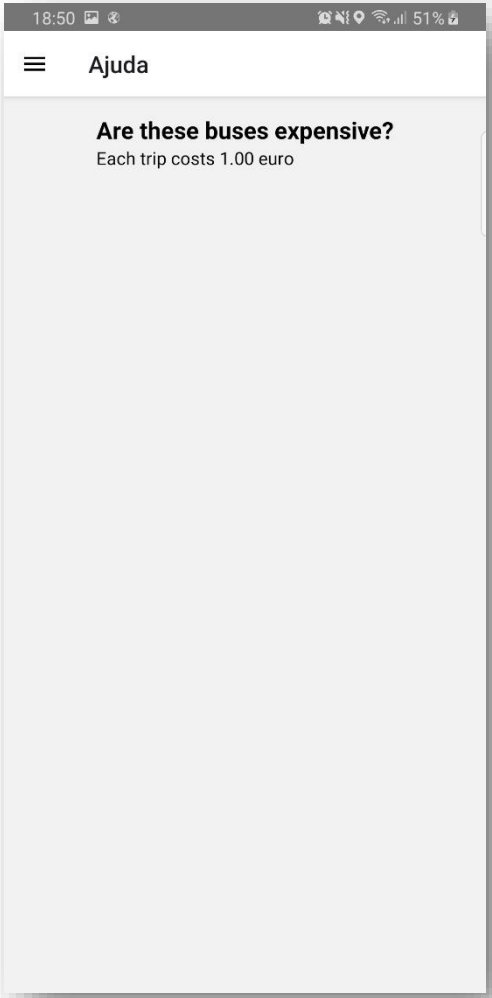
APP STOPS PAGE

4. Practical Case/Project Developed

APP ABOUT PAGE

4. Practical Case/Project Developed

APP HELP PAGE



5. Difficulties & future features

Difficulties:

- Learn React Native
- Planification of Project

Future features:

- Notifications
- Schedules
- Real WebService
- Buy tickets
- Augmented reality
- Registration and usage statistics

6. Conclusion

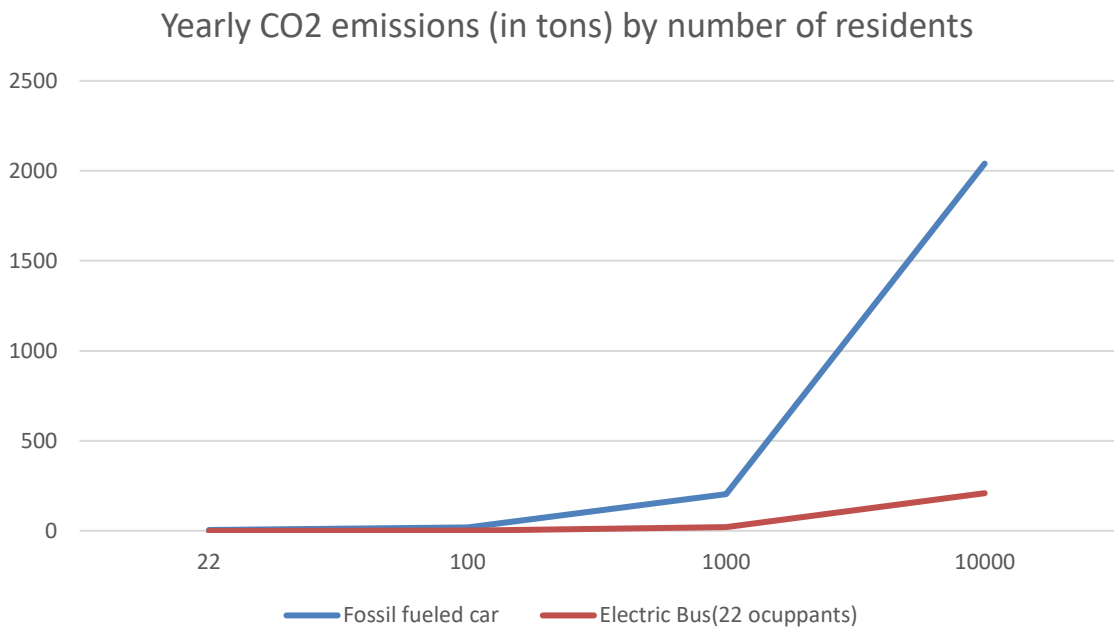
The focus of the application was to provide a tracking application that is inclusive of everyone, people that usually take public transportations to move around the city, tourists that visit Viana do Castelo and visually impaired people to assist them on their daily routines. It is provided to all users an easy-to-use interface to be appealing for the user and easy to learn by its organization.

Developing the application using React Native allowed not only the development of an application natively for both Android and iOS, being available for most people to use the application, but also the incorporation of libraries that allow performing geospacial operations that were required to present relevant information to all user, like distance and estimate arrival time. Those geospacial operations not only assisted on finding the closest point on the route from where the user was standing and thus allowing to perform calculations but also allowed to determine if the user is close enough to the route and enable or disable some features considering that factor.

6. Conclusion

- Creating the app also encouraged the exploring of accessibility features, included by default on React Native, and to learn about of visually impaired people use applications, having to consider different usability rules for these types of users. All of that to make sure that the application is not only pleasant and easy to use but also secure.

It was developed a functional prototype, where some features are local simulations while other features use web host database access to fetch information to implement on the application. The objective met was to provide all utility to the user using a single application.



6. Future Work

- Create notifications who warn users of proximity of bus
- Add bus schedules of the peripheries
- Real WebService with location of buses
- Develop functionality to buy tickets
- Augmented reality
- Registration and usage statistics

7. Bibliography and Web References

- React Native:

https://reactnative.dev/docs/getting-started

- Google Api:

https://developers.google.com/maps/documentation/android-sdk/overview?hl=pt_BR

https://github.com/react-native-maps/react-native-maps

- Google Maps Directions: https://developers.google.com/maps/documentation/directions/overview?hl=pt_BR

https://github.com/bramus/react-native-maps-directions

- Geospacial operations:

https://www.npmjs.com/package/geolib