



Fraunhofer

PORTUGAL



Fig. 1: NaviPorto's welcome screen with Porto city in the background.

NAVIPORTO

PUBLIC TRANSPORT NAVIGATION SYSTEM

NaviPorto is a navigation system that guides users through the public transport network (PTN) integrated seamlessly into their habits.

It is targeted at users that do not know the area of the place they want to go to. At home, the user selects the places he wants to see using a web interface, then at a station, he associates this route with his transportation card using a kiosk.

The system relies on an RFID enabled PTN to provide user location. Information used in route calculation is supplied by public transport services and points of interest are referred by local tourism organisms.

NaviPorto was designed to be cost-effectively deployable on the short term

and open for easy extension. The types of information involved forced the architecture to be very distributed. A fully working demonstrator was developed and runs in our premises.

The Problem

A common problem for tourists is to move inside the city they are visiting, especially using the PTN. Time is usually not abundant and it is important to see the most possible. Regular travellers face a similar problem when going to parts of the city they do not know, making them lose time and money.

Deliver content in an effective way is also a relevant question when creating interactive systems, the end user should be familiar with the technology used and the price accessible to a large audience.

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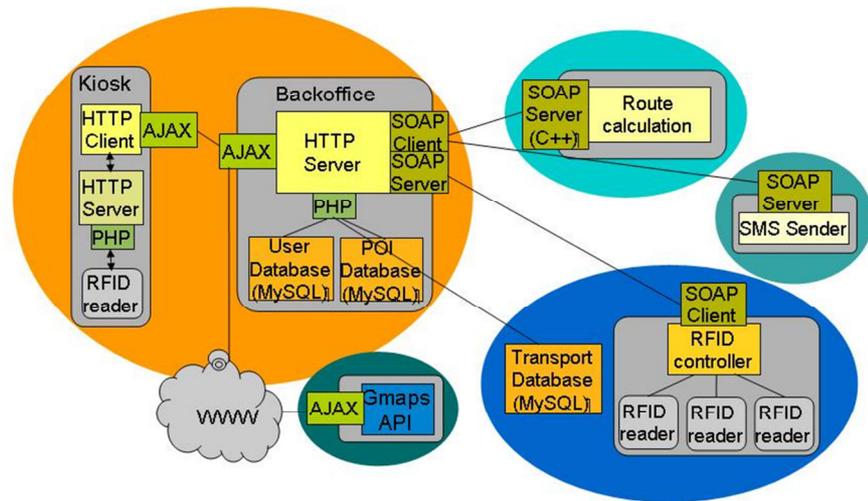


Fig. 2: The architecture diagram of the prototype developed.

Interaction

Based on very simple interactions, it is possible to empower more users. SMS are ubiquitous, cheap and easy to read; so they are great for delivering short content in real time. The web is also very present, and its matureness enables powerful applications. NaviPorto uses the web to enable the user to choose the places to go, from everywhere.

RFID Ticketing

Localization

Users carry RFID transport tickets and validate their trip when entering the transport, providing real-time localization.

RFID

RFID or Radio-frequency identification consists of an integrated circuit and an antenna for transmitting the signal. It is present in many objects and currently in some transport tickets

Localization

Users carry tickets that are passive RFID cards and pass them on the reader at the entrance of the transport to validate their trip. This way the system "knows" where a certain card is at a certain moment. NaviPorto uses this RFID-based location information to find the user in the public transport network (PTN). Location is then used to give the user real-time navigation indications by SMS.

Route Calculation

To have a route passing in multiple places, the calculation method would be based on a problem known to be difficult to solve (like the traveling salesman problem). The number of stations lead to a solution

based on a hierarchical A* algorithm implementation with branch and bound for retrieving the order of visit.

Prototype

A prototype was developed in order to simulate a real environment. In a real scenario, the transport system would provide schedules and the localization using its validation system. A tourism organism would provide the points of interest and their geographic information. A pilot trial can be set up easily and fast.

The Future

The invention of the Global Positioning System (GPS) brought the possibility of having navigation systems inside cars. This invention changed the way people go to places they do not know, and enabled any person to go almost everywhere.

The creation of new localization system like the RFID based networks enabled NaviPorto to explore the combination of tourism and navigation information, creating a valuable system, something that would not have been possible otherwise.