InDoor

a project proposal by

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Project Description in a tweet

InDoor provides a tracking and navigation service to allow people to easily and quickly move around large buildings. Where the GPS fails, there is InDoor.

We are not already registered as a company.

Primary industry of our project:

- ➢ New Ways of Working and Living

Which technology our product uses:

- ➢ AI, Big Data, Machine Learning
- ➢ IoT, Sensors, Electronics

Description of the project

Have you ever been in a situation in which you were in a building but you didn't know the route to follow?
Nowadays it's so easy to find a route to everywhere using applications based on the Global Positioning System (GPS), but this tool works efficiently only outside. In fact, GPS is not accurate enough when people are inside buildings, as the signals scatter or diminish by surrounding structures, such as walls and roofs. Furthermore, according to the *Official U.S. government information about the Global Positioning System and related topics*, GPS typically gives to users an accuracy to within 4.9 m (16 ft.) radius under the open sky. To clarify, imagine drawing a circle around you, with a radius of 4.9 m: the area of the circle is the error that the GPS can make and it even worsens near buildings, bridges and trees.
In addition to the low accuracy, there is also an issue with the acquisition: when a user enables the GPS, the smartphone (or any other device) tries to acquire a satellite fix, a procedure that in many cases, especially inside buildings, can take too long.
It's now clear how existing applications that use GPS cannot solve the problem of routing people indoors. Our solution is InDoor: a high-accuracy system for indoor navigation, based on a mobile application. InDoor makes use of tags and beacons already present in buildings, such as WiFi access points, instead of GPS signals, with the result of a higher accuracy and a fast user experience.
With InDoor, users' smartphones exchange signals with WiFi access points in order to be precisely located indoors; InDoor's application provides a detailed map of the building, with rooms, corridors and floors, so that a user can see his position and eventually be routed to a specific spot inside the whole building.

Think about a big exhibition, such as EXPO, in which there are stands that customers can visit. InDoor can efficiently route people to the desired point of interest of the exhibition, like a specific stand, the nearest toilet, a charging phone area, etc. The system implements indoor routing, routing through different floors (since an exhibition can be located in a multi-floors building), and outdoor routing in the presence of elements of disturbance, with the highest accuracy.

The greatest advantage of InDoor is that it can be useful for many different scenarios: hospitals, shopping centers, supermarkets, monuments, universities, companies, train stations, stadiums.

Description of the technology behind our project

InDoor is a cost wise and high-accuracy solution, based on a mobile application for indoor navigation. It can keep a record of the movements inside buildings using an IPS (Indoor Positioning System). In a nutshell, the IPS technology stems on beacons or tags, for instance, the Wi-Fi hotspots installed in buildings. These devices send signals to dedicated readers, which, in turn, forward them to a server. The data is then processed and the information re-routed to the user.

Specifically, InDoor exploits the WiPS (*i.e.,* Wi-Fi Positioning System) protocol: a geolocation system based on triangulation algorithms of Wi-Fi access points signals to locate the user in a specific point (0.5 meters error) in the map.
InDoor's main feature is simplicity: users, to access the indoor navigation service, only need to load on the app the map of the building or floor where they want to move. This can be done either scanning a QR code posted at the entrance of the building or automatically by the app: having access to the user GPS position, it can suggest the closest building providing our service. Users readily have access to all the necessary information to know where they are and how to reach their destination point. Once the destination is set, the application itself gives the user the path to follow, just like the already existing GPS outdoor technologies.
The application provides two types of accounts, one for the final user and the other for the stakeholder.
Obviously, all the paths and facilities need to be mapped. This first step is done with extreme ease by the stakeholder with their account by randomly moving around the hallways. By connecting to the Wi-Fi access points, the application will be able to identify the access points that the triangulation algorithm will use to compute the routes and locate the user with extreme precision in the building.

For once, an increase in accuracy does not come at a cost: since WiPS protocol is already implemented in the commercial devices, there is no need to buy any kind of new hardware to expand network structure.

Competitive Scenario

The latest research from the Smart City Observatory of the School of Management of Politecnico di Milano reported that the interest in Italy for Smart Cities is growing. Almost one out of three Italian municipalities has started at least one project in the last three years and the figure is set to grow further also thanks to the PNRR (*i.e.* National Recovery and Resilience Plan) which provides for over 10 billion euros in funding dedicated to digitization.
We have identified Italy as the country where our service will be launched for the first time, starting with the smartest cities in Italy (Florence, Milan, Bologna). It will be more likely that buildings frequented by large numbers of people already have a huge number of sensors installed inside them and the large number of Wi-Fi access points will ensure even greater accuracy.

In the worst case scenario, the service will only be adopted by large companies that want to ensure a pleasant navigation inside their buildings. Given the numerous loans granted by the government to improve digital infrastructures, even small and medium-sized enterprises will be able to take full advantage of InDoor service.

Some proposals have already appeared on the market both from big companies - Nokia and Google - and from many other small-to-medium businesses. None of them has conquered the market because they base this service on a “not accessible to everyone” or payment politics.

Nokia has already implemented and released into production an SDK (*i.e.,* Software development kit) for indoor navigation. The company keeps developing this technology for professional use with HAIP (*i.e.,* High Accuracy Indoor Positioning) project. Its goal is the logistics of department store optimization. It seems not interested in a generalized use of this technology.
Google, the navigation giant, seems to be more interested in outdoor navigation and has never seriously invested in a project on indoor navigation easy to access for everyone. In fact, buildings’ stakeholders have to contact the company by email to start the negotiation and this leads to an initial barrier to access the service.

What makes InDoor more competitive with respect to the big companies mentioned and all the other proposals already on the market is our business plan: our app will be free to download and accessible to everyone. The only necessary thing to do for the use of our app is the creation of the building’s map directly by the stakeholders without contacting the InDoor team.
In conclusion, our service is an automatic service, accessible to everyone and it decreases the economic investment needed to start. Not to mention the useful insights that knowing how users and customers move in the buildings can provide.

Business Model

InDoor interacts with both companies or institutions and with the general public.
To the latter we offer our app completely for free, they can download and simply use it when they enter a supported building.
The former has their buildings mapped and the tracking system configured for free, but the data about their customers are given for a fee. It can allow our customers to know their visitors better, and they can use the information from our system to improve the configuration of the areas.
The decision to give the majority of our service for free is to enable a rapid growth of our app user base that is a fundamental part of our system. Then we can leverage the high level of interest and engagement in InDoor to grow our customer base.
The most relevant parts of our business model are:

Customer segments

1. Public and private institutions: they manage infrastructures like museums, theaters, stations, hospitals. They have our mapping and routing services for free, but a payment is needed to have the data about their crowd.

What we offer

1. User app: used by the customers of the organizations we serve, it provides different functionalities like navigation and live position tracking inside the building.
2. Data about the crowd flow: in these days data is an essential part to improve every business. Thanks to an anonymous tracking system, we can offer to the public and private institutions information about how people navigate their buildings allowing them to improve their client experience.

Revenues

1. Data sells: our revenues come only from institutions that want the data about their crowd. We offer them a subscription plan whose price is proportional to the volume of required data.

Cost Structure

1. Platform development: the main cost for us is the platform development and maintenance.
2. Storage: these costs are proportional to the amount of maps and users data that we need to save on our databases.
3. Customer acquisition: these costs are needed to find new institutions that may be interested in using our system. In the first stages of the start-up these costs are higher to acquire new customers.

Roadmap

We have planned the different phases of the realization of our service and for each of the objectives we have a date by which to carry them out.
Below are the details of the different stages:

- **Milestone 1 - by September 2022:**
    - Implementation of the application with basic functionalities including indoor navigation and tracking and analysis of raw data obtained.
    - Identification of the first large building that will be mapped and on which we will test the use of the application.
- **Milestone 2 - by January 2023:**
    - Identification of at least 50 large heterogeneous buildings using the service. The aim is to yield a period full of events (the end of the year) to verify that the service is effective and reliable, that is, that a pleasant navigation is guaranteed even in cases where there are many people.
    - Adding some features to the application in order to increase user engagement. As an example, a typical feature is one that will allow people to meet in the same space quickly and easily.
- **Milestone 3 - by June 2023:**
    - Launch our free downloadable service by app store users and businesses.
    - Hire a management engineer and a marketing and sales officer.
    - Activating a service to resolve any technical problems encountered by users. Feedback from our customers is very important.
    - Analyze data and create usage trends for our users
- **Milestone 4 - by November 2023:**
    - Our service starts to generate revenues.

The initial application design and development costs will be moderate as we will do it ourselves, at least for the initial prototype. We will then hire other people to maintain and continue to improve the working prototype of the service. We estimate the total costs for the first and second phase of 15,000 euros, while the estimated costs for the third and fourth phases are 200,000 euros.