SMART NAVIGATION FOR THE VISUALLY IMPAIRED

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28/03/015

1 Summary

MyGuide is a project aimed to help the visually impaired navigate inside Politecnico di Torino Campus. Our goal is to remove barriers, create solutions and expand possibilities to help users achieve their full potential as Polito students. The GPS system does not provide exact indoor positioning needed to navigate a visually impaired inside Politecnico di Torino. Thus we aim at creating a reliable indoor positioning and navigation system for the visually impaired to be able to maneuver around the Politecnico campus. MyGuide is an easy-to-use system that determines the location of the user and receives a destination (through voice commands from the users) .Then it directs the person accordingly to their destination. The feedback to the user is in the form of audio and/or vibrating walking cane. MyGuide is able to detect obstacles with reasonable accuracy and route the user through hallways in Politecnico. The MyGuide walking cane vibrates to guide the user by avoiding obstacles present in the hallways by vibrating to indicate a possible obstacle. The commands for directions, is done by using audio playback created by the phone.

2 AmI Main Steps

Sensing

MyGuide detects user location using the Bluetooth beacons that will be placed around the Politecnico campus. The obstacles are sensed by using ultrasonic sound sensors under the theory of reflection.

Reasoning

MyGuide takes into account the user's current position and according to the user's demand calculates the best possible route. Along with the best routing algorithm, the cane checks the distance of the reflecting surface from the person. The system performs distributed computation, partly on the android application and another on the arduino. The arduino responds to the environmental changes and helps users maneuver obstacles.

Acting

MyGuide provides routing instructions in the form of voice signals. The cane vibrates to denote the user about the presence of any obstacles nearby.

Interacting

The system interacts to the user, using a mobile phone, specifically the android phone along with the Android Voice Assist. Along with the android audio interactions, the system also vibrates to the obstacles giving users feedback about the environment.

3 AmI Features

Sensitive

The cane is capable of detecting the environment along with the inhabitants of the environment. It also senses the person's current location using the iBeacons.

Responsive

The Mobile Application calculates the beacons to be followed to reach a destination and then constantly checks for the beacons and gives audio feedback for the direction to take. It responds to user needs of navigation and acts by vibrations according to the sensed environment and thus adapts to continuously changing environmental factors: for instance new obstacles, crowded hallways detected by cane

Adaptive

MyGuide is an easy-to-use system that is robust and reliable. The mobile application cannot be transparent, but, the vibration alert in the cane is a good invisible added feature.

Transparent

The new features added to the cane are transparent to the user as they adapt to the original function.

Ubiquitous

Our system is able to be implemented in different buildings and environments (beacons have to be available and a map of the indoor pathways). This is an important feature as our project has the potential to meet other user needs that expand outside politecnico walls. That includes public offices, hospitals, recreational centers, etc.

It is super robust and mobile, it can be installed everywhere to be accessible using an android device. It is intelligent in hearing the user and understanding syntax voice input and proactively responds to environment by giving directions according to needs and by giving vibrational feedback due to environmental changes.

Intelligent

Currently in the test phase, we have no intelligence aspect, because, the basic criteria of navigating a blind person through hallways requires a lot of time and perseverance. To make things work is a difficult task, so, for now we can only suggest intelligent aspects. Like, taking into consideration the crowded corridors and navigating the user from open areas as much as possible.

4 Open Issue

The beacons do not tend to provide a steady reading of the distance. The data keeps fluctuating in every reading, making it difficult to exactly pinpoint the location of the person.