

Problem Statement:

Consider the unique conditions experienced by the blind when entering a foreign environment for the first time. The visually impaired person does not have the advantage of sight necessary to obtain a sense of building layout, detect obstacles, and navigate toward points of interest. This would be the equivalent of a sighted person walking into a dark room and attempting to accomplish the same tasks.

The objective of our efforts will be to produce or improve upon an existing system that provides indoor navigation for the visually impaired. This system should have the ability to guide the visually impaired person throughout the “SmartBuilding”, avoiding obstacles and guiding them to their chosen destination safely. Additionally, the system should be scalable and portable, so that installation in any building is possible.

Project Requirements/Goals:

NOTE: Initial version of system will be based on X and Y coordinates only. This results in the system only having the ability to track on a single floor.

Handheld Device

- Controls usable by a visually impaired person
- Will have audio command output to provide directions to user(s)
- Interface between user(s) and device should be based on voice commands
- Will be small and portable with very basic external controls (which can be operated by feel alone)
- Possibly have the ability to determine which way user(s) is facing (digital compass) without having to use other techniques

Networks

- Device must communicate over a wireless network for tracking and to a central server
- Device must also communicate over an internet connection to the server to retrieve directions

Navigation System

- Path selection should be handled by the software
- Guide along a predetermined path
 - Paths should be created using virtual points/paths on top of map
- Should be able to give explicit details about the path the user(s) is on
 - i.e. “Staircase ahead. There are 15 stairs, followed by a landing, followed by a second set of 15 stairs.”
- Track user(s) using a wireless positioning system
- Must work indoors with good reliability and accuracy
- In the case of an emergency the system should automatically reroute user(s) to the nearest exit

Mapping

- Needs to have a persistent map storage system
 - Maps should be easily convertible into a data structure that contains the paths/points of the building
- Maps need to be obtained from building plans
 - Path/Point creation is constructed from this map

Overall System

- The system should be relatively cheap for building owners
- The entire system should be updatable at any desired moment
- The entire system should be scalable to fit any building
- The system should automatically detect the user(s) entering the building, and inform the device that it has entered a SBS (Smart Building System) enabled area
- The handheld device should be inexpensive and priced similar to a personal computer