Purpose of the Study:
Among the many challenges faced by the visually challenged persons are the constraints of independent mobility and navigation in an unfamiliar indoor environment. Finding the location and path to some desired location including public utilities inside the building can be a daunting task. GPS based navigation that is now getting widely used is not feasible in an indoor environment. Although several attempts have been made at making such indoor navigation systems, none of them have found wide acceptance.

We present the design of a cell-phone based indoor mobility system for blind persons that can help them navigate independently in an unfamiliar building without any external sighted assistance. Our solution requires minimal additional building infrastructure and can be easily retrofitted onto existing buildings. Further, it is easy to use, low-cost and can be attached to the user's waist or cane.
Approach:
To address the above-stated problem of independent navigation of visually impaired individuals in unfamiliar indoor environments, we have developed a portable and self-contained system fabricated using the commercially available infra-red sensor-suite. The system consists of a user module and a network of wall-mounted units regularly spaced at a distance of 5 meters. User module is a waist-worn device comprising of an IR receiver, an accelerometer and a user interface in the form of a mobile phone application. Each wall-mounted unit emits a unique identification tag that is associated with a location on the digital map of the building. The detailed map of the interior of the building is uploaded on the phone application. By pressing keys on his/her mobile unit, the user can obtain directions to any desired location on the map from his/her current position. As the user moves in the building, the waist-worn module updates the position of the user. The navigation information is conveyed to the user acoustically using the text-to-speech engine of the phone application.

The system was installed on multiple floors of a university building and evaluated by the study group in real-life settings. Questionnaire-based interviews were conducted before and after preliminary trials with visually impaired individuals to obtain their feedback.

Results:
During questionnaire based interviews, majority of users expressed that indoor navigation is a day-to-day problem and reported seeking help from persons nearby is difficult (especially in female users). Often, they get lost inside the building which causes them extreme inconvenience as well as a delay in reaching their destination.

During the limited experimental trials, the users successfully navigated on different paths covering multiple floors. Preliminary feedback from users shows that it is easy to learn and can provide a sense of independence to them. Detailed user trials are being planned and their results would be presented in the conference.

Conclusion:
As part of this research, we have demonstrated a potential solution to the problem of independent indoor navigation faced by visually impaired individuals. The developed system has been tested and has received positive and encouraging user feedback.

Our Topic Code:
J: Potential of Technology in Accessibility for All (Information Technology, Accessibility Aids etc.)