

# Novel indoor navigation system for Visually Impaired and blind people

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**Abstract**—Visual impairment or vision loss is the main reason for reduced mobility in humans. Visually Impaired (VI) people require continuous assistance during their movement. Researchers and scientists have put many solutions to assist those people in the activities of their daily living (ADL). The current research delivers a novel indoor navigation system for visually impaired people. The proposed solution is designed for indoor use only (house, office, companies, etc.). It provides the visually impaired person the ability to navigate without any other hardware assistance. The proposed system architecture uses a network of IP cameras installed at the ceiling of each room. A remote processing system analyzes-by computer vision algorithms-photos taken from the environment in order to inform the subject about his location and reacts accordingly to deliver the adequate assistance. A guidance algorithm helps him reach his destination using a simple interactive mobile application installed on his smart phone. The proof of concept prototype was designed with one camera on top of a wooden floor model to simulate the system. Results showed good reliability in indoor navigation and obstacles avoidance.

**Index Terms**—Visually impaired, blind, computer vision, assistance, navigation, obstacle avoidance, mobile application, camera

when the subject does not know his spatial location relatively to the room. Imagine a blind person standing in the middle of a room and wants to go to another room. What step should he take first? How must he be guided in case of disorientation? Walking straight, or turning around to face the door, or moving backward to avoid an obstacle (a chair for example). The cane could help him avoid the obstacle, but how could he know his direction especially when he is away from a wall? These questions any many others need answers from scientists and researchers who strive to provide technical solutions that can answer partially or wholly the problem of mobility of visually impaired and blind subjects. Henceforth, an assistance system is therefore required so that the person could be aware of his position and in which direction he should commence his relocation in order to reach his final destination.

In this context, the current research proposes a novel solution for indoor navigation of visually impaired and blind people. To our knowledge, the proposed approach is a new idea that has not been yet exploited. Our system architecture is simple and easy to operate. It doesn't require extra skills or additional hardware. It is simply composed of a voice