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A haptic feeding GPS navigation solution for visually impaired people

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Abstract

According to the World Health Organization (WHO), it is estimated that 285 million people are visually impaired worldwide and out of which 39 million of people are blind. Further, about 90 percent of the visually impaired people in the world live in low-income settings. Among many difficulties that they encounter in their day-to-day activities, the visually impaired people are often disadvantaged particularly when travelling due their inability to see the obstacles and visual signs of directions that are essential to navigate not only through the unfamiliar terrains but also in the familiar environments. Therefore, the visually impaired people usually use a white cane to detect obstacles on their path whilst get the assistance of the trained guide dogs for navigation. However, when they roam in an unfamiliar environment, they always have to rely on a third party for finding their directions. In this paper, we presents a novel Global Positioning System (GPS) and Google Map Direction Application Programming Interface (API) based navigation solution for the visually impaired people with a simple haptic direction feeding interface as an alternative to the sonification systems available. Our objective of this research is to develop an economically viable haptic feeding GPS navigation system for the visually impaired people in order to help them with their day-to-day activities such as reaching for public services, socializing with people and exploring the world more confidently than ever before.

Keywords: Blind, GPS navigation, Haptic, Visually impaired

Introduction

With the advancement of the Global Positioning System (GPS) technology, development of GPS navigation solutions for the visually impaired people have become an active domain of research in the recent years. They include the Brunel Navigation System for the Blind (Garaj, 2001), BrailleNote GPS (Humanware, 2017), Trekker Breeze (Trekker Breeze, 2017) and BlindSquare (BlindSquare, 2017) to name a few. However, most of the present GPS navigation solutions (Helal et al., 2001; Gill, 1997) for the visually impaired people are based on the auditory perception of visual information. These navigation systems capture data from various sensors and information services, process them and convert the navigational instructions into sounds. As the visually impaired people see the world through their ears due to their lack of vision, these sonification systems not only pose a high risk of interference to a visually impaired traveler's perception of environmental sounds but also attract an unnecessary attention.

In this paper, we presents a novel GPS navigation solution for the visually impaired people, with a haptic feeding system as an alternative to the sonification systems. The proposed solution contains two interconnected main components, a wearable device and a navigational directions providing server. The wearable device consists of a haptic feeding system, a GPS locator, a Global System for Mobile communication (GSM) module, an electronic compass and an embedded processor.