Chapter 7
Voice-Guided Mobile Robot System for Disabled People

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ABSTRACT

Mobility is one of the most important problems for totally and partially disabled people in daily life. Disabled people need some assistive stick or device to avoid obstacles before an accident. This research work proposes to assist disabled people in their daily routines without human guidance. There are four main sections in this paper. Firstly, in the obstacle detection system, five ultrasonic sensors sense the obstacles in the front side, left side, and right side of the user's way on the ground and another ultrasonic sensor senses the overhanging obstacles near the user's head level. Secondly, in an obstacle avoidance system, the servo steering motor is equipped with the front wheel of the stick's base. The wheel with servo motor will turn easily to the left direction or right direction depending on the detecting or sensing of the ultrasonic sensors. Thirdly, in the voice-guided system, there are six recorded human voice messages in the Myanmar language for disabled users in the author's country, Myanmar.

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INTRODUCTION

Vision is a precious gift to human beings. Vision allows people to see and understand the surrounding of the world. Nowadays, there are many different types of devices to assist or help the totally or partially blind people because of the improvement of the modern technologies and research. Those devices are smart phone, laser, ultrasonic sensors, GPS, RFID, and so on. Smart phone allows the visually impaired people to listen and hear to the voice mails, and, even write and send mails. Laser cane transmits invisible laser beam to detect the objects. Ultrasonic sensor is used to sense the distance of the obstacle. GPS system is used to provide the information regarding the location of the blind user to his family andindicate the correct way for the users. RFID is to navigate the blind people but it needs RFID flags along the user's path (Mohajeri et al., 2011).

In the world, the totally blind persons and the partially blind people use or apply the guide dogs, human guides and the traditional mobility aids such as white canes, aluminum sticks, wood sticks and so on to avoid the obstacles. Although a few of blind people use the guide dogs, those guide dogs need the extensive training course and the fully trained dogs are so expensive and then those dogs cannot be fully believed to overcome the obstacles. Those well trained guide dogs can only be used for about five years. The human guide is also expensive for longer durations, and only the rich men can lend those people for their family member or blind person. Most of the blind people use the white cane or aluminum or wood stick in our country .The visually impaired people swing the aluminum or wood stick and the white cane around their feet to detect the existence of the obstacles near their step. Those sticks and cane have limitation because it can only detect the obstacles when those sticks and canes have contact with the disturbance. The white cane and the traditional sticks cannot sense the obstacle more than 1 meter. Those aids cannot warn to the user with voice message where the obstacle is in the user's path until the blind user has touched and hit with the obstacle. Some incidents might lead to serious injury on the blind users. So, the blind people are requiring the advanced stick or device to walk or move safely in their surroundings (Ashiq et al., 2022; Burta et al., 2020; Chaudary et al., 2023; Fanfeng, 2010; Kalpana et al., 2020; Khan et al., 2021; Messaoudi et al., 2022; Mohapatra et al., 2018; Real & Araujo, 2019).

The main aim of this paper is to create and construct the blind stick with human voice messages depending on the ultrasonic sensors. This paper consists of four main sections: (1) obstacle detection system, (2) obstacle avoidance system, (3) voice-guided system, and (4) lighting system. This blind stick has six ultrasonic sensors to sense the obstacle not only left, right and in front of the user on the ground but also over-hanging obstacle at the level of the user's head. Only one servo motor fixed with front wheel is used to avoid the obstacles easily to secure the user's path.