

Real-Time Assistance Prototype – a new Navigation Aid for blind people

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This paper presents a new prototype for being used as a navigation aid for blind people. The system is developed to replace traditional navigation systems such as white cane systems. The system consists of two stereo cameras and a computer for processing the environmental data. The aim of the system is to detect the static and moving objects from the surrounding environment and convert them into acoustical signals. Through stereophonic signals, the user perceives the acoustic image of the environment, the volume of the objects, moving object direction, its distance relative to the user and the free paths between 5m to 15m. The acoustic signals represent short sounds externalized with non-individual Head-Related Transfer Functions generated in an anechoic chamber. Experimental results show that users were able to control and navigate safely both in familiar and unfamiliar environments.

1. INTRODUCTION

According to information from the World Blind Union [1], in other words, there are over 160 million of blind and visually impaired people. It is well known that the loss of vision implies loss of independence, lack of social interaction and human contact which increase the mobility difficulties.

Until now, the first developed ultrasound mobility aid was the Mowat Sonar System. The device transmits ultrasonic beams within a cone of 30° at a maximum distance of 6 feet. Via vibrotactile interface, the system warns about objects present in the environment. The system is based on a box hanging from the user's neck. The first generation object detector device were small portable systems, which allowed blind people to navigate more comfortably. Mowat Sonar System is one of the most popular sonar sensor considered in the literature. Through tactile vibrations, the system informs the user about the nearest obstacles. The sensor vibrates at a rate proportional to the distance between the system and the object. The Mowat Sonar Sensor emits an elliptical ultrasonic cone of 30° high. The system is able to work in two ranges: the first range of 1m and the second range up to 4 m. The Mowat Sonar Obstacle detector has a similar technology to the Mowat Sonar Sensor, except on that it provides pulses of high frequency sound of 40 kHz [5]. The system uses eight levels of vibration similar to major musical scale, which represent different distances in a range of 7 feet, where each distance is represented by a different vibration [6]. The best known Electronic Travel Aid is the Laser Cane. The Laser Cane is a combination of a white cane and laser technology [7], [8]. Via acoustical signals, the Laser Cane informs the user about the obstacle present in the environment between 1.5-4m. The sounds are proportional to the distance.