

Abstract

The sight is one of the most important senses for humans. The lack of sight makes the other senses to be heightened to try to fill this gap. Blind people have very acute sense of hearing which enables them to deal with the environment having more listening skills that people with normal vision and not trained to improve it.

This thesis research work has been carried out in order to develop a system to aid the blind people to the location of obstacles in their usual environment. For this, the system transforms into virtual sounds the objects found in their path by people that cannot see.

To achieve this goal, it trains the blind person to get used to using a device that transforms a real environment in an acoustic-virtual environment. Thus, it is able to detect objects around you so you can wander safely through the real environment.

Since it needed a data entry system as accurate as possible, we chose a 3D-CMOS (Three Dimensional Complementary Metal Oxide Semiconductor) laser system consisting of 1x64 pixels of miniaturized laser and we integrated it into glasses. The information received by the laser is transmitted to a memory Correlated Double Sampling (CDS), in which the distance between the system and the object is calculated using the Time-of-Flight (TOF) method. This type of device is characterized by its high accuracy in the calculation of distances, providing access to obtain less than 1% errors in the device used for this thesis and developed by SIEMENS.

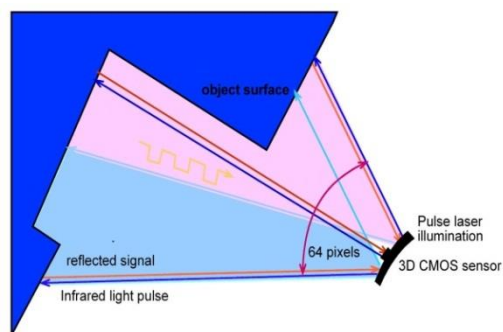


Figure 1 Measurement principle of the Time of Flight (ToF) method.

After obtaining the input parameters, it was needed to transform into virtual sounds the exact location of objects in distance and angle. This was achieved through the Transfer Functions (HRTF) measured in an anechoic room with the aid of a KEMAR robot. These functions get converted into sounds positions taken with the input device by placing them in their actual position. The results presented in this thesis show that it is possible to train a person with visual disabilities to be able to use this system as a reliable tool for locating obstacles in their usual environment.