Ultrasonic Glasses for the Visually Impaired

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Blindness is the third most common disability in the world, around 36 million people are blind (Vos T et al, 2016). Visually impaired population ranges from total blindness to 20/200 visual acuity. This investigation develops a device that allows visually impaired people to move easier and safer. The hypothesis states that using ultrasonic proximity sensors in an embedded system can assist them in feeling space and distance while moving around obstacles. An Arduino is a microcontroller board that processes ultrasonic sensors' data to measure distances from nearby obstacles. It measures how long the ultrasonic waves took to travel to the obstacle and back in microseconds, dividing it by 2 and then multiplied by the speed of sound (0.0343 cm/μs) to calculate how far the object is. When a nearby obstacle is detected, sound and vibration alerts will notify the user. The ultrasonic sensors are mounted onto a pair of glasses using a 3D-printed support. By being on the user's face, it maintains the best position for obstacle detection. Six tests were conducted, which consisted of a random walk around different places with an average 16 obstacles using the ultrasonic glasses. The device's effectiveness was calculated adding all the tests results and dividing the 81 total detected obstacles by the 92 total obstacles. The resulting effectiveness was 88%, so the hypothesis was proven as it was possible to create an ultrasonic device that assists visually impaired people to move around obstacles in an easier way.

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