Improvement of a wearable device to help the mobility of visually impaired people

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Abstract
We improved our previously built wearable device aimed to help the mobility of visually impaired people (WDVI), focusing two points: a) increase of the durability and resilience of the device; b) assessment of new kind of sensor and notification system. We rebuilt the WDVI from the scratch, using a nylon vest base, a specifically designed circuit board, an aluminum box, new sensors, and sound notifications. The new WDVI proved to be a better device, as intended.

Key words: help devices, personal mobility, arduino

Introduction
In a previous project, we created a WDVI based in ultra-sonic sensors, arduino processor, and stepper motors. The set was embedded in a cotton polo shirt (Fig. 1.a) and worked correctly. However, we faced problems of durability of the electric contacts, weight of the motors, and water-caused damages. Now, we completely rebuilt WDVI to address those questions and to improve the notification system.

Results and Discussion
We used a very light nylon vest (Fig. 1.b) to reduce weight, to improve the user comfort, and to avoid water penetration.

We made a circuit board (Fig. 2.a) to hold the components and to fasten the electric contacts, avoiding bad connections. The encapsulation uses an aluminum box that protect the circuits of WDVI, offering additional retention points (Fig. 2.b). The former 2 ultra-sonic sensors were changed by 4 optic sensors (Fig. 2.c), that are water resistant and that provided 2 new coverage points near the wristline. The old notification system used stepper motors to warn the user about obstacles in the way. Although they were efficient, they were heavy and uncomfortable, so we replaced them by a more discreet audio system.

Conclusions
All the proposed objectives were reached. The WDVI was implemented and proven to work correctly during test bench.

Acknowledgement
We thank CNPq for the Jácome’s scholarship, and Unicamp for the equipments and resources.

DOI: 10.19146/pibic-2015-37227