ABSTRACT

Blind people or people with visual impairment usually experience difficulties moving around, but specially during their outdoor movements. So, to facilitate their movements, it is necessary to study the design of a "smart" stick and more specifically a device that will be added on the handle of a “traditional” white stick.

Therefore, the purpose of this study is the design of a “smart” device which should be possible to be attached, on a white stick that blind people use, to help them feel more comfortable and safe. The use of such a smart device on a white stick is expected to increase the detection rates of overhead and ground obstacles.

Initially, a bibliographic review was performed on existing "smart" sticks and the disadvantages and advantages of everyone were identified. Then, a questionnaire was distributed to blind people, in order to understand better their movement difficulties. At the same time, instructors from the Cyprus School of Blind were interviewed, to get some advice from experts, regarding the possible fears and needs that blind people deal with during movement training.

After the study and analysis of all the above information, the research team reached a conclusion on the final idea of the smart stick design. Next, a market research was conducted for the purchase of the sensors and the electronic components that will be used. Also, the mechanical drawings were created using Solidworks 2016 design software.

The bending forces that are applied to the handle were also calculated. A drop test of the smart stick, using the simulation tool of Solidworks 2016, to determine the ultimate stress which the stick can withstand and the calculation of the factor of safety of the design was taken place. Other important parameters completed, were the construction of the electronic circuits and the code programming of the Data Acquisition System (Arduino).

Finally, the parts of the “smart” device were printed using the Da Vinci 1.0 Pro 3 in 1, three-dimension (3D) printer and using experimental methods (Taguchi), some tests were carried out, by placing various obstacles in a room, to measure the performance and identify possible problems of the “smart” stick.

Concluding, we provided some suggestions for optimizing the performance and characteristics of the product.

Keywords: “smart” stick, smart device, blind people, detection of obstacles