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DEVELOPMENT OF A LOW-COST ELECTRONIC SYSTEM TO ASSIST THE LOCOMOTION OF THE VISUALLY IMPAIRED

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ABSTRACT: Technology is linked in various sectors of contemporary society. Through this technological rise, look for new possibilities for promoting accessibility. Given this, the project aims to assist the mobility of the visually impaired in order to offer greater quality and independence, also contributing to the development of innovative alternatives aimed at both accessibility and inclusion of the visually impaired.
Keywords: Accessibility, technology, visually impaired

DESENVOLVIMENTO DE UM SISTEMA ELETRÔNICO DE BAIXO CUSTO PARA AUXILIAR A LOCOMOÇÃO DE DEFICIENTES VISUAIS.

RESUMO: A tecnologia está vinculada nos diversos segmentos da sociedade contemporânea. Mediante a essa ascensão tecnológica, nota-se o surgimento de novas possibilidade para promoção da acessibilidade. Diante disso, o projeto visa auxiliar a locomoção de deficientes visuais a fim de proporcionar maior qualidade e independência, contribuindo também no desenvolvimento de alternativas inovadoras voltada tanto acessibilidade quanto a inclusão de deficientes visuais.
Palavras-chave: Acessibilidade, tecnologia, deficiente visual

INTRODUCTION

Contemporaneity is marked by the rise of information technology (ICT) in social and professional relationships. In view of this, it is clear that technological advances enable new forms of communication between individuals, many of which have the potential to promote inclusion, especially the inclusion of people with disabilities. Although there are advances in the discussion on the subject, there is still much to be done and thought to ensure not only legal rights, but also the improvement of the quality of life of this public.

GOAL

Develop a low-cost electronic system to assist the locomotion of the visually impaired.

Specific objectives

- Develop a low-cost electronic system capable of detecting obstacles at long distances;
- Analyze the main mobility difficulties faced by the visually impaired;
- Propose new innovative ways of promoting accessibility for the visually impaired.

METHODOLOGY

The development of this work is based on two modules: hardware and software. The project began with the creation of the software and then the assembly of the hardware for the electronic system. In the elaboration of the logical part, the programming language "C" was used to create the algorithm (or code) responsible for controlling the entire system.

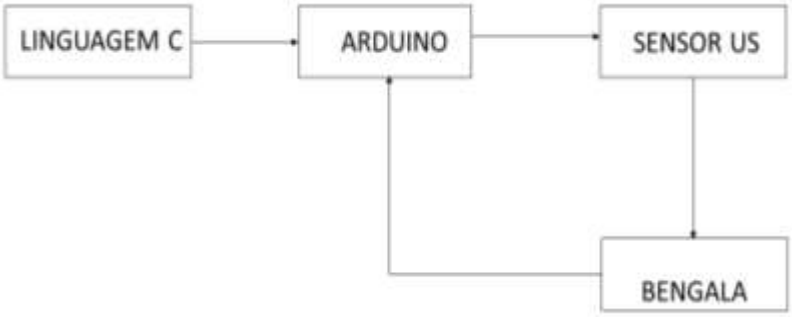
The second phase of the project focused on the construction of the hardware that consists of an Arduino UNO (microcontroller board), a micro motor (vibracall), a buzzer and an ultrasonic sensor (SU) HC-SR04. We chose to use Arduino UNO due to free programming and low cost.

Consequently, the electronic system also has an affordable cost as well as good efficiency. Its operation is similar to the existing sonar in bats, that is, the distance reading is made from the sending and receiving of sound signals. The Trigger pin (located on the SU) sends the sound signal to the obstacle, and then it echoes in the opposite direction where it is picked up by the Echo pin (located on the SU). The time between sending and receiving the sound signal is what makes it possible to obtain the distance from the obstacle.

The calculation to determine the distance is the result of multiplying the duration time of the sound signal that arrives at the Echo (receive) pin by the speed of sound divided by two. This mathematical procedure is implemented during software programming. The system also has a buzzer that emits a sound and a micro motor that generates vibration. Both peripherals aim to alert the visually impaired about possible obstacles on the way.

The system operation is established through communication between the Arduino and the sensor as shown below:

Figure 1. Circuit Diagram



Source: The Author (2019)

RELEVANCE OF THE PROJECT

According to IBGE data, it is estimated that there are about 500,000 blind people in Brazil, and at least 5.5 million visually impaired people. In this perspective, actions are needed to meet the needs of people with visual impairments to support them, and above all, to promote greater independence and autonomy in their day-to-day activities.

In everyday life, the visually impaired go through a series of difficulties to get around. In the path of the visually impaired, many obstacles pose a risk or make it difficult for them to travel, such as: posts, signs, payphones, corners, holes, unevenness in the ground and others; which cannot be easily identified using a conventional cane.

IMPACT OF THE PROJECT/RESEARCH

In Brazil, accessibility issues are not widely discussed, it is observed that not all places have accessibility to meet the needs of the visually impaired and the help of third parties is present in carrying out their daily activities.

Therefore, the present work presents an accessible and low-cost electronic system, capable of detecting obstacles with greater precision and agility than a conventional cane. In other words, the visually impaired will be able to anticipate the obstacles they will encounter on the way. With this, it is possible to safely deviate from the object and allows the visually impaired person to be independent.

SEARCH RESULTS

The prototype of the low-cost locomotion system was obtained in the Physics laboratory of Escola Francisca Pinto dos Santos. The prototype is capable of detecting obstacles more than 3 (three) meters away, instantly signaling to the visually impaired through audible, vibrational signals or through the cell phone application. Through this study, there was an increase in the discussion on the topic of inclusion of disabled people in school.

It was also noted the feasibility of building the cane by hand and using low-cost material such as polyvinyl chloride (PVC) tubes. Finally, it is worth mentioning that the assembly of the system is simple and can be easily performed with a few instructions.

FINAL CONSIDERATIONS

The present work presented numerous challenges, from understanding the needs of a visually impaired person to the functioning of a microcontroller, and how technology can be an ally in solving these people's daily problems. By studying about the visually impaired and learning a little more about accessibility, it was possible to develop a device to serve a part of society that often suffers prejudice due to their physical difference.

Technology has been increasingly improved to make people's lives easier, as well as improve processes that used to take a long time to perform. However, it must be evaluated whether these improvements are designed taking into account the inclusion of all people, as well as the impact that a technological innovation can have on the life of a disabled person.

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