Design and Assistive Technology: contributions for wheelchairs development intelligent

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1   Context

Physical injuries are often accidents, affecting the motor capacities. Spinal cord injury causes bodily changes and symptoms: decrease respiratory capacity as the intercostal muscles begin to show paresis; commits the muscles of the trunk, arms and legs; influences the loss of grip of the fingers; dysfunction of the bladder and bowel activity, which requires the use of diapers and / or probes; bed sores (ulcers); urinary infections, which can cause renal failure; dysfunction of thermal regulation system; impairment of sexuality; depression, among other symptoms.

In this context, motorized wheelchair acts as a resource of Assistive Technology that determines the independence of persons with reduced mobility when appropriate at different levels and needs of users.

In this study, emphasize those with paraplegia, when the injury compromise up the legs, below the waist. The lower the injury site in the cervical spine, the smaller the consequences.

Thus, this study seeks to understand the benefits that wheelchair intelligent brings us to people with spinal cord injury, emphasizing the Arduino system, used to develop a standalone or connected to the computer interaction. This system has a single board and a group of software to program it.

2   Method

From the 1960s, Artificial Intelligence (AI) has been applied in various industries, mainly focused on the preparation area of pro-jects and assessment of industrial

products or processes, due mainly to the development and advances in computing, the growing use of peoples and internet computers, and the expansion of the practical techniques of artificial intelligence (Rezende, 2005).

IA can be understood as human intelligence mediated Mecca-organisms or software, carried out by research computing seeking methods to increase the rational capacity to solve problems.

The Intelligent Wheelchair uses a defined technology as a robotic device developed by motorized wheelchair, of sensory and devices systems, making it an essential tool for getting the SCI port-pain or reduced mobility. This equipment is used in hospitals and households and an important contribution for users that need by providing in their daily activities more security and independence.

The CRIs can be developed with the use of specific hardware and devices. They are essential to those who have limitations in using a conventional chair wheels. Built to provide security and facilitate the mobility of chai-rants, due to semi-automatic or automatic feature.

Neuromuscular signals are activated by sensors that collect on the surface of the skin to muscle contraction. These signals are processed in a computer-touch that has the software that decodes the information by sending commands to the chair.
Mello (1997) says that the technology is considered assistive when it is able to assist the functional performance and reduce disability in daily activities. Differ up for rehabilitative technology used to recover from diminished movements. TA implies the object (equipment), concrete technology (practice) and knowledge required in the development process, research, evaluation and creation of the technology.

It involves various application areas: improvements to everyday activities; alternative communication systems; Device for the use of computers; adjustments in various environments of users; adapting to the needs, customs and limitations (disabilities); mobility and accessibility.

In one project, the human-machine interface depends on your setup. Normally the interface is defined by the amount and variety of system inputs and outputs offered, whose architecture implies different configurations and projects where the interfaces are based. Thus, one can classify the interfaces according to the mode: single mode systems and Multimodal.

The Arduino is a hardware concept arising system and Open Source which appeared in 2005, in Italy, in order to create a device for the control of projects developed at the lowest cost. A physical computing platform (digital systems for creating systems that respond to physical actions), based on an input / output card and programming. The Arduino is what we call physical or embedded computing platform, if a system that

can interact with its environment by means of hardware and software. (MCROBERTS 2011, p. 22).

Can be used in the development of interactive artifacts stand-alone or connects to the computer through programs such as Pure Data, Adobe Flash, Processing, Max / MSP or Super Collider. Arduino can be used to develop independent interactive objects or can be connected to a computer, a network, or even the Internet to retrieve and send data Arduino and act on them. In other words, you can send a set of received data from some sensors for a site, that these data can thus be displayed as a graph. (MCROBERTS 2011, p. 23).

3   Results

The plate Arduino Uno, as shown in Figure 2 does not use the FTDI chip, which leads to USB to serial. Uses an Atmega8U2, a USB to serial converter, enabling the USB chip has your updated firmware, so the Arduino can be displayed on PC as another device such as a mouse or joystick. A free hardware platform, which uses Atmel AVR micro controller single board, which has programming language primarily in C / C ++, to create affordable tools with low cost, flexible and practical.

The hardware and Arduino software is open source, this code form, schemes, projects and others can be used freely, so there are many-clone cards available in the market. The system also provides the use of shields (shells), circuit boards containing other devices such as GPS receivers, Ethernet modules, LCD displays, and others.
To program the Arduino have to use the Arduino IDE, a software to code in language C. The IDE allows you to write a computer program to upload the Arduino and the execution of instructions. Programs written using Arduino are called sketches, which allow cut / paste and find / replace text.

One can also add to firmware, a feature CRI allowing obstacle avoidance. Firmware known as "embedded software", a set of operating instructions with the ability to program them to the electronics hardware.

4   Conclusions

As shown, according to the IBGE (2010) 45.6 million Brazilians have a disability. A significant number of users who require special products.
The aim of this study was to analyze the benefits of Artificial Intelligence and Intelligent Wheelchairs for people with reduced mobility, enabling quality of life and independence.

The CRI are extremely useful, particularly for quadriplegics users when no movement below the neck, as they allow no possibility of performing movements by commands, by means of synthesized voice, or easy expression.

We affirm the Arduino contribution to the improvement of assistive technologies, enabling the development of independent interactive objects, or connected to a computer.

Numerous deficiencies lead people to common situations: inactivity and exclusion. The design can and should be a mediator for accessibility, reducing the limitations of users, and ensuring usability without restrictions.

Such a statement requires multidisciplinary efforts by science contribution to research and development of accessible and universal products.

This study sought to emphasize one of the features that can enhance the ability to walk, the chair of smart wheels, which contributes significantly to those with reduced mobility.

Accessibility is a condition that depends on ergonomics, design and other important areas. Thus, it is a scientific process (requiring various areas of knowledge) and social (dependence on public and corporate policies).

5   References

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