Agilavan.E et al. International Journal of Recent Research Aspects ISSN: 2349-7688, Vol. 4, Issue 4, Dec 2017, pp. 190-193

A novel intelligent wheelchair control approach based on lip movement

Agilavan.E [1], Harisraj.A.R [2], Mohan Babu.A [3], Malathi.M [4]

[1,2,3] Final Medical Electronics Engineering, [4] AP/Medical Electronics Engineering

[1,2,3,4] Sengunthar College of Engineering

Abstract- **Intelligent wheelchair plays a more and more important role in modern society, and the harmonious human-wheelchair interaction becomes one of the pop research subjects. In this paper, a novel intelligent wheelchair based on lip movement recognition approach is researched. By comparing the location of the lips with a fixed rectangular window, the lip gesture commands are determined and the intelligent wheelchair movement such as turn left, turn right, forward, backward are determined correspondingly. Experiments show that this approach can achieve the purpose of controlling the intelligent wheelchair by lip movement.**

I. INTRODUCTION

While restorative treatments for spinal cord injury , invasive brain–machine interfaces are not available outside research labs, some technologies can be used by people with tetraplegia to interact with the world. Interaction must be focused in the brain and muscles that users can control. The selection of anassistive human–computer interface requires maximizing the flow of information and minimizing the effort (physical and mental) to use it

Current alternatives include noninvasive brain–computer in-terfaces (BCI), eye tracking, electromyography (EMG), sip-and-puff, voice commands, chin control, head control, mouth joystick, and tongue control.

Noninvasive BCI using electroencephalography (EEG) has two main types : synchronous and asynchronous. A syn-chronous system , using P300 to control a power wheelchair, requires 5 s, on average, to produce a highly reliable command, too slow for a continuous control as required from a computer pointing device (more information about EEG transfer rates can be found in and). On the other hand, an asynchronous system using sensorimotor rhythms shows the possibility to con-trol a computer cursor but it will need more research to overcome the strong performance variability .In general, eye tracking can be made based on image pro-cessing or electro-oculography which uses electrodes to monitor the eye movement. Any eye tracking sys-tem demands much user attention and errors can occur due to the mismatch of selecting a command and the eye already changing the position. For a pointing device, this could be acceptable, but to control a power wheelchair, maintaining the eyes position can be very tiring and false commands are not acceptable.

Another possibility is EMG, which uses electrodes to monitor facial muscles to control a computer pointing device. An analysis of an EMG interface according to Fitts' law is shown in [16]; this interface provides discrete direction movements (horizontal and vertical separately) not diagonal.

Sip-and-puff is an option for people with tetraplegia mainly to control power wheelchairs , but this is usually difficult to operate and usually works only with four discrete directions.

Voice commands can be useful to access some computer and smartphone applications, but they are not adequate to direct control pointing devices. Some research studies use voice com-mands to control power wheelchairs A way to im-prove the precision of the voice recognition system in noisy en-vironments is lip-reading (speech reading), an image processing technology to identify speech from lip images .

Chin control is one of the best options currently available for people with tetraplegia; this consists of a power wheelchair joy-stick adapted to be controlled by the chin . Some systems provide connection with computer as a pointing device A great advantage of the joystick is the possibility of soft and free movements in any direction. Chin control (also appli-cable to head control and mouth joystick1 depend on neck movements; the body must be fixed and the head must be able to move freely. Power wheelchairs provide this condi-tion, but vibration during the drive and body spasms (common in spastic tetraplegia) can generate false commands. Outside the wheelchair, the user has no control, due to the dependence of the apparatus on the wheelchair structure.

The advantage of using tongue control is that the tongue is not controlled by the spinal cord; instead, it is con-trolled by the hypoglossal nerve directly connected to the brain. One inconvenience of this type of interface is the hygienic is-sue, because people with tetraplegia depend on someone to put a tongue piercing; for, it is also necessary an intraoral system. Another restriction is that it allows only few discrete directions. The tongue drive system (TDS) allows four direc-tions (and two selection commands). Inductive tongue control system allows eight directions (and 10 sensors for other commands).

The tongue and the mouth occupy a significant amount of motor cortex, comparable with the hands and the fingers.

II. HARDWARE

Hardware system is constructed with power supply unit, Microcontroller –ATMega 8A which is High Performance,Low Power AVR, Advanced RISC Architecture and High Endurance Non-volatile Memory segments.

Sensor- The LM35 thus has an advantage over linear temperature sensors calibrated in ° Kelvin, as the user is not required to subtract a large constant voltage from its output to obtain convenient Centigrade scaling. The LM35 does not require any external calibration or trimming to provide typical accuracies of ±¼°C at room temperature and ±¾°C over a full -55 to +150°C temperature range.

Flex Sensor- A flex sensor or bend sensor is a sensor that measures the amount of deflection or bending.This flex sensor is a variable resistor like no other. The resistance of the flex sensor increases as the body of the component bends. Sensors like these were used in the Nintendo Power Glove. They can also be used as door sensors, robot whisker sensors, or a primary component in creating sentient stuffed animals. Usually, the sensor is stuck to the surface, and resistance of sensor element is varied by bending the surface. Since the resistance is directly proportional to the amount of bend it is used as goniometer, and often called flexible potentiometer.

Mechanical actuator- An actuator is a component of a machine that is responsible for moving and controlling a mechanism or system, for example by opening a valve. In simple terms, it is a "mover".

An actuator requires a control signal and a source of energy. The control signal is relatively low energy and may be electric voltage or current, pneumatic or hydraulic pressure, or even human power. Its main energy source may be an electric current, hydraulic fluid pressure, or pneumatic pressure. When it receives a control signal, an actuator responds by converting the signal's energy into mechanical motion. An actuator is the mechanism by which a control system acts upon an environment. The control system can be simple (a fixed mechanical or electronic system), software-based (e.g. a printer driver, robot control system), a human, or any other input.[1].

Voice play board: This is no ordinary keyboard. Packed with human-like accurate google speech-recognition it will increase your typing speed by 5 times or even more(no marketing Hype).With its advanced recognition facilities you can voice type punctuations, custom words, that to in more than 120 languages(120 voice languages). Unlike other apps this app makes voice typing much more simpler and efficient by integrating essential features like capitalise word, adding punctuations, text editing and correction all within voice typing. According to the description inside the game's boxtop, the game takes place in an ancient pharaoh's tomb, which has a three-level pathway scattered with jewels. Using a single die, and directed by a voice - presumably that of the pharaoh's mummy - the players (called "Explorers" in the instructions) travel up and around the steps surrounding a sarcophogus collecting jewels, in an attempt to be the first to arrive at the mummy that lies inside the sarcophogus to receive the "great jewel," that also comes with the evil cobra "spell." The game uses sound to direct players and control the strategy of play. The sound is produced by a record player concealed inside the mummy's sarcophagus on the playing board. When an Explorer lands on certain areas of the board, they must move a lever which starts the record. The ominous voice speaks out one of 40 recorded messages, telling the Explorer what they must do, e.g., "Avoid the paralyzing touch of the slimy snails of Arro. Return at once to your temple," or "Listen to the lost souls whispering in eternal darkness. Take one jewel," etc. In the television commercial which promoted the game, the message was, "Look out--the unholy snakes of Amon reach from below! Move up one level."[citation needed] Some messages may help the player, whereas others may be harmful to the progress of the Explorer. Players have no way of knowing which message they will hear.

Once an Explorer acquires the "great jewel" and the "cobra's spell," the record is the turned over. Still controlled by the mummy's voice, Explorers, in a scramble to avoid the Explorer that is attempting to get rid of the spell, try to get out of the pharaoh's tomb with the highest value of jewels to win the game.

III. SOFTWARE

Platform - AVR STUDIO -Flash, EEPROM, and SRAM are all integrated onto a single chip, removing the need for external memory in most applications. Some devices have a parallel external bus option to allow adding additional data memory or memory-mapped devices. Almost all devices (except the smallest TinyAVR chips) have serial interfaces, which can be used to connect larger serial EEPROMs or flash chips.

In System Programmer - ProgISP 172- The Atmel Dragon is an inexpensive tool which connects to a PC via USB. The Dragon can program all AVRs via JTAG, HVP, PDI, or ICSP. The Dragon also allows debugging of all AVRs via JTAG, PDI, or DebugWire; a previous limitation to devices with 32 kB or less program memory has been removed in AVRstudio 4.18. The Dragon has a small prototype area which can accommodate an 8, 28, or 40-pin AVR, including connections to power and programming pins. There is no area for any additional circuitry, although this can be provided by a third-party product called the "Dragon Rider".

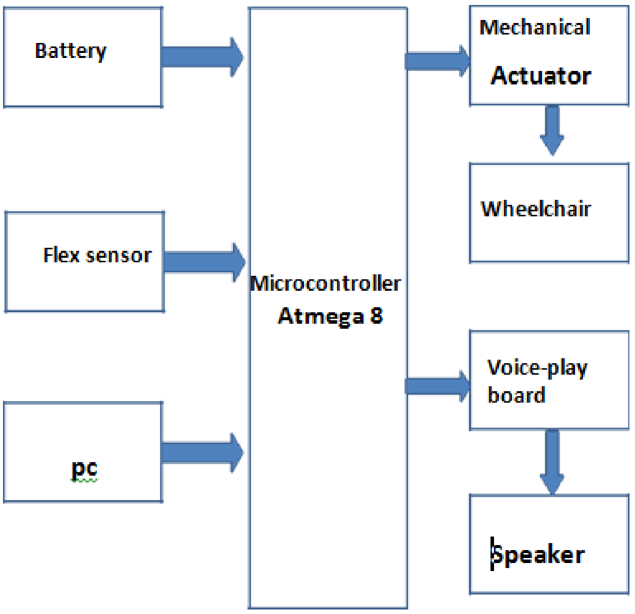
JTAGICE mkI

The JTAG In Circuit Emulator (JTAGICE) debugging tool supports on-chip debugging (OCD) of AVRs with a JTAG interface. The original JTAGICE mkI uses an RS-232 interface to a PC, and can only program AVR's with a JTAG interface. The JTAGICE mkI is no longer in production, however it has been replaced by the JTAGICE mkII.
Compiler – Win AVR- Micro Vision must be instructed to generate a HEX file upon program compilation. A HEX file is a standard file format for storing executable code that is to be loaded onto the microcontroller. In the “Project Workspace” pane at the left, right–click on “Target 1” and

select "Options for 'Target 1' ".Under the "Output" tab of the resulting options dialog, ensure that both the "Create Executable" and "Create HEX File" options are checked. Then click "OK".

Next, a file must be added to the project that will contain the project code. To do this, expand the "Target 1" heading, right–click on the "Source Group 1" folder, and select "Add files…" Create a new blank file (the file name should end in ".asm"), select it, and click "Add." The new file should now appear in the "Project Workspace" pane under the "Source Group 1" folder. Double-click on the newly created file to open it in the editor. All code for this lab will go in this file. To compile the program, first save all source files by clicking on the "Save All" button, and then click on the "Rebuild All Target Files" to compile the program as shown in the figure below.

BLOCK DIAGRAM



IV. APPLICATION INSTRUCTION

Health monitoring applications of wearable systems most often employ multiple sensors that are typically integrated into a sensor network either limited to body-worn sensors or integrating body-worn sensors and ambient sensors. In the early days of body-worn sensor networks (often referred to as "body sensor networks"), the integration of wearable sensors was achieved by running "wires" in pockets created in garments for this purpose to connect body-worn sensors. An example of this technology is the MIThril system. Such systems by design were not suitable for long-term health monitoring. Recently developed wearable systems integrate individual sensors into the sensor network by relying on modern wireless communication technology. During the last decade, we have witnessed tremendous progress in this field and the development of numerous communication standards for low-power wireless communication. These standards have been developed keeping in mind three main requirements: 1) low cost, 2) small size of the transmitters and receivers, and 3) low power consumption. With the development of IEEE 802.15.4/ZigBee and Bluetooth, tethered systems have become obsolete. The recently developed IEEE 802.15.4a standard based on Ultra-wide-band (UWB) impulse radio opens the door for low-power, low-cost but high data rate sensor network applications with the possibility of highly accurate location estimation.

Most monitoring applications require that data gathered using sensor networks be transmitted to a remote site such as a hospital server for clinical analysis. This can be achieved by transmitting data from the sensor network to an information gateway such as a mobile phone or personal computer. By now most developed countries have achieved almost universal broadband connectivity. For in-home monitoring, sensor data can be aggregated using a personal computer and transmitted to the remote site over the Internet. Also, the availability of mobile telecommunication standards such as 4 G means that pervasive continuous health monitoring is possible when the patient is outside the home environment.

Mobile phone technology has had a major impact on the development of remote monitoring systems based on wearable sensors. Monitoring applications relying on mobile phones such as the one shown in Figure44 are becoming commonplace. Smart phones are broadly available. The global smart phone market is growing at an annual rate of 35% with an estimated 220 million units shipped in 2010. Smart phones are preferable to traditional data loggers because they provide a virtually "ready to use" platform to log data as well as to transmit data to a remote site. Besides being used as information gateways, mobile devices can also function as information processing units. The availability of significant computing power in pocket-sized devices makes it possible to envision ubiquitous health monitoring and intervention applications.

V. ADVANTAGES

Data Accuracy: Wearables enable convenient tracking of your data, health, and exercise habits for your overall well-being. This is bound to result in a healthier you, but many health insurance companies are also starting to offer added benefits for those who wear fitness trackers and health monitors. Moreover, employees with higher-risk roles, such as firefighters, mining, oil & gas employees, and others are now able to wear devices that can detect oncoming dangers, such as heart attacks or falls, and immediately send this data to an outside manager or technical specialist for assistance.

Efficiency:Wearable are set to make our lives safer and more efficient. For example – staff in packaging warehouses can now wear wearables that will assist in streamlining their packaging duties and tracking goods that are being transported, or wear GPS tags that can automatically tell them the most efficient route. Or, imagine that pacemakers, detectors, and other medical wearable devices can simply be connected through the internet to alter proper response teams when an accident or something dangerous has occurred.

CONCLUSION

Automated wheelchair can be used to help handicapped people, especially those who are not able to move.The intelligent wheelchair helps the severely disabled people to lead their life in an uncomplicated way.The reviewed technology for student Healthcare and the personal experience of the authors tell a story of mixed opportunities and fragmentation. Worldwide university laboratories are now researching and making prototypes of sensors, both passive and semi-active that can be interrogated from a distance compatible with the interaction with a network infrastructure. On the other side, only few products are commercially available for large-scale applications. A very focused effort is, therefore, needed to manage the conversion from experiments to the real use and mass production within a so potentially fast growing market. The overcoming of the slowing factors demands a coordinated activity of the featured community to stimulate interest in potential final users and, in parallel, to boost the evolution of readers, software, and devices toward a more inter connected perspective. The low cost of the assembly of this intelligent robotic wheelchair is really a boon for the general public

REFERENCE

1. Hossain:"Wheel Therapy Chair: A smart system for disabled person with therapy facility",IEEE trasncation on Mamunur Rahman, Swarup Chakraborty, Azad communication engineering,vol 33,no4 december2017.

2. Preeti Srivastava, Dr.S. Chatterjee, Ritula Thakur:" A Novel Head Gesture Recognition Based Control for Intelligent Wheelchairs" , International Journal of Research in Electrical & Electronics Engineering Volume 2, Issue 2, April-June, 2014, pp. 10-17.Aleksandar Pajkanovic, Branko Dokic: "Wheelchair Control by Head Motion", Serbian Journal of Electrical Engineering ,Vol. 10, No. 1, February 2016, 135-151

3. S.Shaheen & A.Umamakeswari:" Intelligent Wheelchair For People With Disabilities", International Journal of Engineering and Technology (IJET), 5(1), pp.391-397,2015.

4. S.P. Levine, D.A. Bell, L.A. Jaros, R.C. Simpson, Y. Koren & J. Borenstein: "The NavChair assistive wheelchair navigation system", IEEE Transactions on Rehabilitation Engineering, 7(4) pp.443-451,2015.

5. Manju Davy, R.Deepa :" Hardware Implementation Based On Head Movement Using Accelerometer Sensor" , Int. Journal of Applied Sciences and Engineering Research, Vol. 3, Issue 1, 2014.