UNPARALYZE: CONTROL THE WORLD WITH YOUR EYES

RAHUL SETHUMADHAVAN, THANDASSERY ABHIRAMI RAMANAN, SONA M S, DIVYA
VINAYAN, DR. VISHNU RAJAN

Sahrdya College of Engineering and Technology, India

ABSTRACT

With the present day environment, and with the work pressure the individual is carrying, it becomes highly impossible to take care of a family member, who is affected with paralysis (quadriplegia- affects both arms and both legs and sometimes the entire area from the neck down. The function of the heart, lungs, and other organs might also be affected.).The patients usually have problem in speaking .They get skin injuries, pressure sores, blood clots in the legs. The most common causes of paralysis include: Stroke Spinal cord injury, Head injury, Multiple sclerosis. Some other causes include Peripheral neuropathy, Toxins/poisons, ALS (Lou Gehrig's disease).In Unparalyze, patient's intentional eye blink and eye movements are captured, recorded and processed to convert this into commands for performing various tasks by the patient. The conclusive purpose is to render patients a certain independency thus allowing them to do important actions without any supervision. Unparalyze helps the patients to consume medicine, water and food. It provides access to fan, light, and TV and AC remote control. There is provision for emergency phone call. By sensing various body parameters, bed positions can be adjusted by raising it a few degrees. This helps to reduce bed sores. All these can be programmed. The product is developed with the intention to help the paralyzed people for helping them with their vital functions and remove them from the entitlement of disability. We are efficiently using hardware and software components to create an effective system. The Unparalyze is now designed to be controlled solely through eye movement and thus help persons with quadriplegia do fulfil their needs in the bed itself.

KEYWORDS: Atmega 328, Servo Motors, LCD Display

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1.INTRODUCTION

Background

Modern day living is a multifaceted compendium of evolving technology and social media. Nowadays everyone is very busy due to the lifestyle changes occurred in this century. Research has found that a sedentary lifestyle increases a person's risk for a wide range of physical and mental health problems such as obesity, high cholesterol, diabetes, cardiovascular disease and depression. According to the study, there are nearly 1 in 50 people living with paralysis- approximately 5.4 million people.[1].In most of the cases ,people get paralysis as the result of an accident or a medical condition that affects the way muscles and nerves function. The most common causes of paralysis include Stroke, Spinal cord injury.

Identification of Problem

With the present day environment, and with the work pressure the individual is carrying, it becomes highly impossible to take care of a family member, who is affected with paralysis (quadriplegia- affects both arms and both legs and sometimes the entire area from the neck down. The function of the heart, lungs, and other organs

might also be affected.).The patients usually have problem in speaking .They get skin injuries, pressure sores, blood clots in the legs. The most common causes of paralysis include: Stroke Spinal cord injury, Head injury, Multiple sclerosis. Some other causes include Peripheral neuropathy, Toxins/poisons, ALS (Lou Gehrig's disease).

Existing Solutions to the Identified Problems with Limitation

Tongue motion bases operation of support system for paralysed people, in this, a wheelchair based on tongue motion, where 6 different signals are obtained noninvasively and without placing any artificial materials inside the oral cavity .Measurement of bioelectric potential (BEP) outside the mouth is taken & tongue motions are detected .tongue is one of the capable parts for the motions which won't be easily affected by spinal cord damage.

Smart wheelchair based on eye –tracking which is designed for paralyzed people .Webcam is installed on eyeglass. The coordinate of eyeball movement is then wirelessly transmitted to wheelchair controlled module to control the movement of wheelchair. The wheelchair- controlled module is two dimensional rotating stages that installed to the joystick of the electrical wheelchair to replace the manual control of the wheelchair.

An EOG-based Electric Wheelchair system for patients suffering from Quadriplegia here the electric wheelchair is also designed using the EOG system, which is portable, wireless and user friendly which can be worn by the patient to control the wheelchair. the patients intentional eye blinks are converted into signals then it is further processed to processed in Arduino platform and converted to command signals to control the movement of the wheelchair in four various directions (i.e. left, right, front and back) from four different EOG signals (i.e. left, right, up and down eye movements) along with start and finish commands from intentional eye blink signals.

Brief Description on Our Novel Solution to the Identified Problem

In Unparalyze, patient's intentional eye blink and eye movements are captured, recorded and processed to convert this into commands for performing various tasks by the patient. The conclusive purpose is to render patients a certain independency thus allowing them to do important actions without any supervision. Unparalyze helps the patients to consume medicine, water and food. It provides access to fan, light. By sensing various body parameters, bed positions can be adjusted by raising it a few degrees. This helps to reduce bed sores. The unparalyse is developed with the intention to help the paralyzed people for helping them with their vital functions and remove them from the entitlement of disability. We are efficiently using hardware and software components to create an effective system. The Unparalyze is now designed to be controlled solely through eye movement and thus help persons with paralysis to fulfil their needs in the bed itself.We have designed an eye movement tracking based electric bed system for patients suffering paralysis or similar conditions where they are not able to walk, talk and move fingers.

2.LITERATURE REVIEW

Eye Monitored Wheelchair Control -[1] We realize that an individual having Quadriplegia can somewhat move his eyes and tilt his head. The camera is catching the sign over that course and sending it towards the controller which is place on wheelchair.

Eye Controlled Camera Based Wheelchair Using Raspberry pi - We are presenting the structure usage models of autonomous Eye control electric wheelchair. The Eye control framework will make their life simple, free and increasingly helpful [2].

Iris Movement based Wheel Chair Control using Raspberry pi - Quadriplegia is a form of Paralysis in which you can only move your eyes. In Quadriplegia, Paralysis is of the extreme level in which a person can only move his eyes. Eye Movement based Electronic Wheelchair System using MATLAB [3] came into existence.

Control of Wheelchair Dummy for Differently Abled Patients via Iris movement using Image Processing in MATLAB - real time solution to enable differently abled people navigate their wheelchair independently through movement of eyes. It is envisioned that robots will play a major role in our future society and economy [4].

Design and Development of an EOG-based System to Control Electric Wheelchair for People Suffering from Quadriplegia or Quadriparesis - [6] In this research, we have designed and developed an EOG-based Electric Wheelchair system for patients suffering from Quadriplegia.

3. DESIGN AND DEVELOPMENT

3.1 Hardware Description

Our project consists of the following components: Microcontroller, LCD Display, Relay, Servo Motor, TTL Module, Webcam, Transformer. Arduino UNO uses ATMEGA 328 as its microcontroller IC. This is the IC to which the program that has to be executed is uploaded to. The 16 x 2 LCD display

Power supply unit, External Crystal Oscillator and a reset circuitry is the basic circuit of the microcontroller. A voltage regulator is used to regulate the voltage to a fixed voltage of 5 volts. In a normal case, 7805 voltage regulator is used for this purpose.

Crystal oscillator that is provided with the microcontroller is of 16MHz and 22pF capacitors are being used with the microcontroller as a decoupling capacitor for decreasing the noise.

The reset circuitry that has been used here consists of a switch and a resistor. In normal case, a HIGH signal is present in the mCLR pin and when the switch is pressed a LOW signal is passed, the microcontroller gets reset and as there is a resistor provided in the circuit the Vcc and the ground will never get short while the microcontroller is resetting. The

microcontroller consist of an ADC module and this ADC module is used to convert the ADC reading from the sensor to a digital value. The ADC that is provided with the microcontroller is of 10-bit resolution.

The measurement of current is done with the help of current transformer, a bridge rectifier and a filter. The voltage is sensed using a step-down transformer, a bridge rectifier, filter and a voltage regulator. The output is coupled to the ADC pin of the microcontroller.

A relay performs the similar job, it reduces the voltage to 5v. Relay also works as a switch. It does not pass current until a specified voltage is reached.

Servo motors are those type of motors that rotates at a certain angle. Normal DC motors rotate continuously, the Stepper motor rotates only at a certain angle like 90 degree, 180 degrees, 270 degrees and 360 degrees. The stepper motor can rotate at any angle, at a certain speed, it will consume a certain power. In our project, TTL Module is used to give the commands of the number of eyeblinks and give it to the microcontroller. It uses Serial Communication. It communicates with the microcontroller serially. Webcam is an input device where it takes the pictures of the eyeblinks and gives it to the Arduino through the TTL module. Transformers are those devices which either increase the voltage or decrease the voltage. These device changes the voltage using mutual induction method.

4.METHODOLOGY

Working Principle

The working of our project is like when a paralyzed person intentionally blinks his eye the camera placed in front of the patient recognizes the blink and communicates serially with the microcontroller and the microcontroller accepts the message and processes the command. The command will either be to raise the bed or give the food to the patient or give water etc. For this to happen the patient should close the eye for a certain period of time. If it recognizes the blink, then the command that is associated with the time of the blink, the command is executed.

Software Used

For this project, there are two software's that are used. They are

- Arduino Nightly Software
- MATLAB Software

Arduino Nightly Software is used to program the light, Fan, the motors for food, medicine, water, and bed. It is used to program the Arduino boards like Arduino UNO, Arduino MEGA, Arduino NANO etc. It is simple to program and it is economical.

MATLAB software is used to program the webcam in order to detect the eyeblinks of the patient so that it can communicate with the microcontroller. MATLAB is a software that is used to solve matrix problems. Images that are captured through the webcam are in form of matrix and programming through MATLAB solves this issue. MATLAB programming is simple and economical.

5.DISCUSSION AND CONCLUSIONS

In this section the results of the study are presented and discussed with reference to the aim of the study, which was to

design and implement an eye blinking device for paralyzed persons. The project mainly provides a medium of communication for the one whose brain is active but their body isn't. With the help of this device the patient is able to satisfy their basic requirements merely by blinking their eyes. The controller used in this project is atmega328 and also lcd is interfaced to display the status. Different patterns for eye blinking is generated and those are detected and through serial communication given to Arduino UNO. Image processing based data signal sent to the receive the data and then send to the control signal. Servo motors are placed beside the bed so that based on commands given by the patient it will be working and for each servo motors there are separate power supply. Power supply need 1A current and the power is given from the transformer.

In atmega328, the maximum crystal frequency is 16Mhz so the capacitor value will be 220f and no polarity. Here we mainly focused basic requirements like food, water, light, fan. For controlling fan and light we require relay but direct switching option is not available in microcontroller since it is providing 5v so we need 12V for that we need a transistor. In transistor 5v from the microcontroller will be given to the base of the transistor and there by relay will be turn on or off.

Programming is done in MATLAB Software. Eye patterns are captured by the camera and based on the blinking pattern corresponding requirement will work and certain threshold values are already given insider to have more accuracy in capturing the pattern. The problem we faced in this project was at certain instants eye was not detected while opening or closing and it was adjusted by changing the threshold values. By increasing the threshold value we can detect whether eye is open and by decreasing whether it is closer. Initially face detection is done then image detection. So to detect face we created face detector.

This project was designed for Quadriplegia affected peoples. The application of this is to satisfy the basic requirements of the patient by the various eye blinking pattern. With a little practice the patients will be able to use this device. The purpose of this project is to eliminate the necessity of the assistance required by the disabled person and also it provides great opportunity for the disabled to feel an independent accessible life

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