

Self-Dependent Tool for Quadriplegic Patient using Home Automation

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Abstract: To develop a self-dependent tool by providing home automation to the quadriplegic patient control electric devices by considering patient's blow or breath and eye movement as input. By taking into consideration the fact that in all the cases of paralyzed patient only eye and breathing were the active parts in patient's body. Using patient's breath or by making him blow through the pressure sensor, fan and motor is controlled and using eye movement (left ,right, open and close) patient can send a message to any person that he needs a doctor or food and controls switching on and off of the light. The advancement in home mechanization is pushing ahead towards the future in making the perfect brilliant homes environment. Alternatively, Utilizing breathe and eye movement detection. The control and checking framework for home appliances from Graphical User Interface (GUI) utilizing breathe and eye movement identification of dependent patient that utilization an information source and being control remotely. There will be a GSM used to send a message to the attender or nurse that patient may need food or doctor in case of emergency. The control signal is given by MATLAB by tracking the eye movement of the patient.

Keywords: Home automation, GUI, GSM, MATLAB.

Introduction

Stroke/Paralysis of human body is a condition in which the muscle loses its ability to work in a part of the body. This makes part stable. The below figure shows survey causes of paralysis. The initial research of -Christopher and Dana Reeve Foundation and Directed through University of New Mexico's Center for Development, Disability Muscle in itself is not in charge of loss of motion. Muscles are controlled by the sensory system (nerves, spinal line, and brain) which forms messages to and from the mind and different parts of the body. Many AC devices are connected to the computer network using Bluetooth network. Here a device acts as master and the rest of the devices will behave as the slaves via picante network.

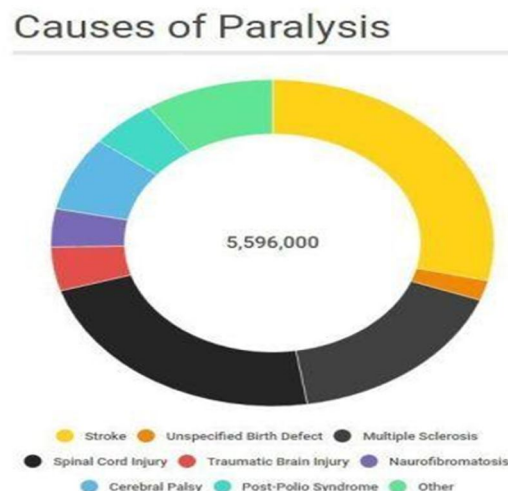


Fig. 1, survey showing causes of paralysis

The below figure shows the survey of spinal cord injury causes.

Causes of Spinal Cord Injuries

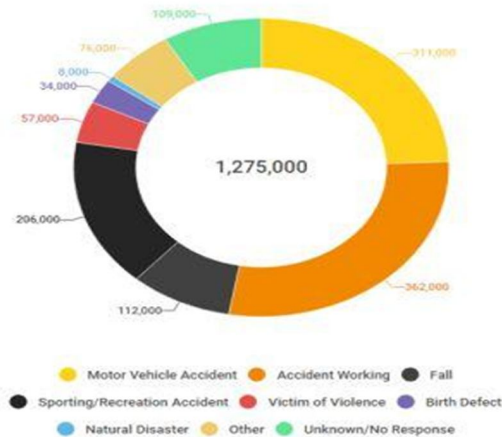


Fig. 2, Survey Showing Causes of Spinal Cord Injury

The piconet has 3 bits of addressing space. Therefore the maximum number of systems can be connected will be 8. This idea of connecting and controlling through one device to several devices is adopted for my project [1]. ATMEGA168 and Bluetooth module both synchronized with smart phone application working on SYMBIAN-OS. This implementation may require less cost but may not give any customization for patients for adding applications or electric devices. This is the only limitation. It gave the idea for this project of linking devices to a switching panel which is operated by a micro-controller [2]. that GPRS can be used as a way to manage and check electric devices which contains four main system including control server and subsystems located at home through web. The concept of mapping home devices from web which can give a clear configuration for controlling devices is adopted for this project development [3]. H. Kanma, N. Wakabayashi created a modular system which uses infrared sensor to monitor and operate the electric devices but it limited because of its low distance range. The design of tool according to patient's need is adopted for this project [4].

Description technology-background

Methodology

It consists of two sections .one is controlled using LPC2148 and the other is controlled using MATLAB. The patient is made to blow through the pressure sensor and depending on the threshold which is more than a human breathing pressure.

There will be less heat in the cavity so no temperature sensor is required. This pressure is converted to the digital voltage using Analog to digital converter. Which can be used to switch the fan and drive the motor? Then using eye movement detection we can control the switching of light and sending of the messages via GSM. By viola johne's technique in MATLAB the eye movements left, right, close and open conditions are defined as follows:

- I. Left movement for the sending message to other person that paralyzed patient needs food.
- II. Right movement for sending the message as paralyzed patient needs a doctor.
- III. Open eyes as input to the switching on light.
- IV. Closed eyes to switch off the lights.

Working of pressure sensor

The basic Definition -Pressure-P is characterized as Force-F per Region-A, liquid applies on its environment. For instance, pressure-P, is a component of power, force and region

$$\text{Pressure} = \text{Force} / \text{Area}$$

Pressure (P) estimation shall be indicated as either standing or active. The P in situation wherever null movement is happening is included to as P. the below figure shows the dimension of the head pressure.

Breath/Pressure-sensor

Owing to the immense assortment situation, reaches & resources for which Pressure(P) ought to be gauged at hand are a wide series of sorts of Breath-sensor outlines.

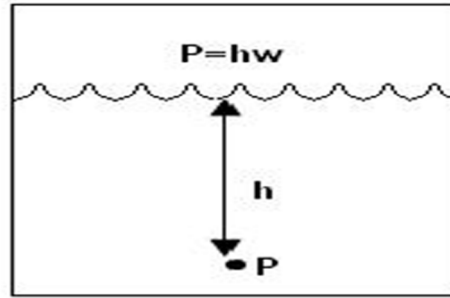


Fig.3. Dimension of head –pressure

Detecting eye Movement

Human-face is identified just in the event that it is seen through the whole course. These finders are built from fundamental picture and Haar like elements appeared.

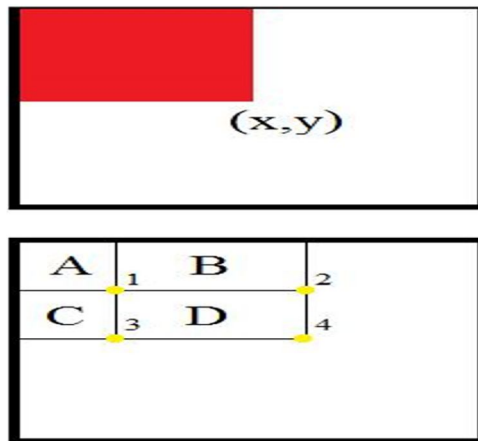


Fig.4. Integral image construction of Viola-Jones

Preliminary pace of above calculation is tends to alter over info picture keen on a essential picture. It should be finished through building every pixel-value equivalent toward whole entirety of every single one pixel-value exceeding & via one side of the fretful pixel value. Thus, aggregating pixel-values within quadrangle can be there figured utilizing just 4 values. Viola-Jones strategy Human-Face identifier in examines sub-window utilizing highlights. Above elements comprise more than 2 rect-angles. Solitary final-resultant is produced via each element worth, it computed while deducting the complete white rectangle(s) from the entirety of dark-rectangle(s). Diverse sorts of components are appeared in above picture.



Fig.5. Viola-Jones Haar features

Sum of the rectangle ABCD= D-(B+C) + A

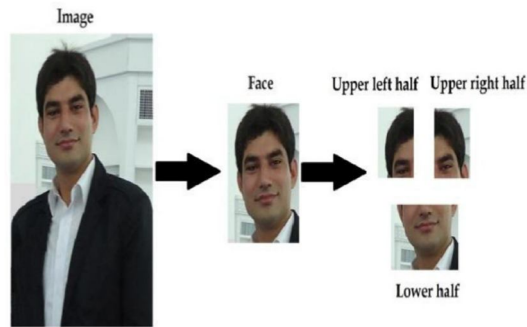


Fig.6, Face and eye detection

Hardware and software description

Transmitter

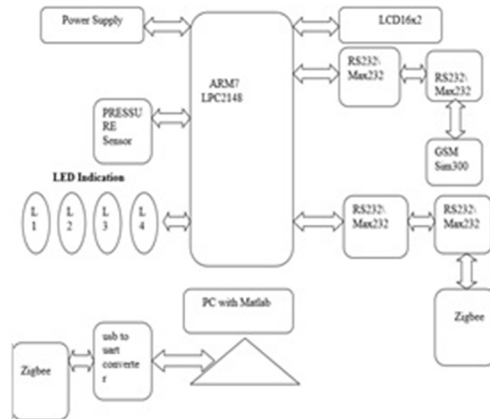


Fig.7. Transmitter

Receiver

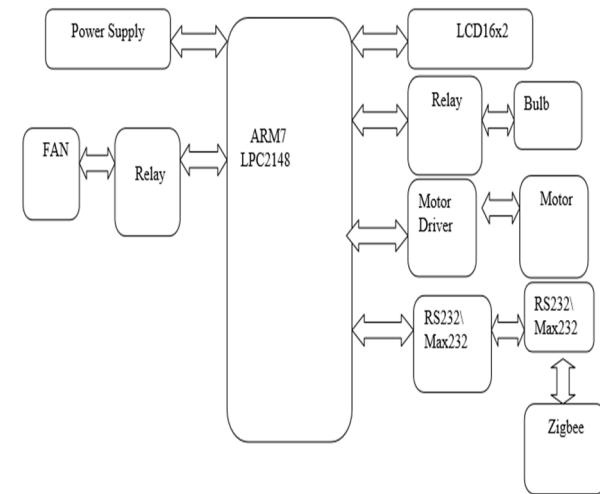


Fig.8, Receiver

The MATLAB design can be structured into many small sub-parts each of which is described below

Initialization of variables and setting up serial communication: MATLAB 2013 can easily be configured to serially transmitting data on the Port mentioned in the code. Firstly we disable the entire serial. The communication is set to have no flow control and parity check is disabled. After setting up the serial communication to enable the data link between MATLAB and LPC2148, we reset the variables needed in the course of the program to their initial valuables. 12

Image Capture and Eye Detection: an Image Processing Toolbox, which we have used majorly in this section of the Software Design. We use a Microsoft LifeCam HD-5000 web camera which is connected via a USB cable to the Computer on which the MATLAB script is running. The video signals are streamed constantly on MATLAB by the camera using the video processing toolbox available. The function 'imaqhwinfo' is used to recognize all video capture adaptors. Identifying the correct device and then using it to stream the video signal is the next step. The requirement of our design was to continuously look at different frames, based on which determine motion. It is practically impossible to do a lot of processing on a per frame basis. Hence sampling is done at each 25th frame and are kept and processed. Viola-Jones algorithm [5] says that a face can be detected by looking for rectangle. And then the large rectangle is comprised of numerous such littler rectangles, which are fundamentally feature points on a human face. 13 The 'cascadeobjectdetector' [6] on MATLAB, utilized this algorithm to extract and detect the eyes of the person.

Image Processing: Initially, all we do is monitor if any eye feature points have been detected or not. If not set a flag and display it on the debug screen. To increase the detection accuracy, we wanted to neglect all other points on the screen except the actual eye of the person. The reason being, if anyone except quadriplegic person comes in front of the camera, the person should not affect the system. The assumption is that the device-Camera is kept at constant distance, relative to which the left and the right eye approximate positions can be estimated. Using this, we try to distinguish and store left and right eyes in different matrices. This helps getting a clear discrimination between both the eyes, helping in easy movement detection.

Movement Detection

The movement detection is done an exceptionally fundamental rule. We take in the element focuses for both right eye and save it. Thereafter take the difference in pixels of the RIGHT eye position in the current snapshot from the previous snapshot. We define the threshold for the basic movement of the eye required to be qualified as a valid attempt. In each snapshot the difference is evaluated, and if this difference above the threshold in any 14 direction left or right, the flags indicating left movement or right movement are set. If development are set. On the off chance that the distinction is not over the edge, the flag which says that no movement has occurred is set.

Result and analysis

The framework has been executed, tried effectively and accomplished solid transmission of information to the remote site. Obtained information show at each hub and sent to ace processor that gather the procured data and send to remote area utilizing zigbee innovation.

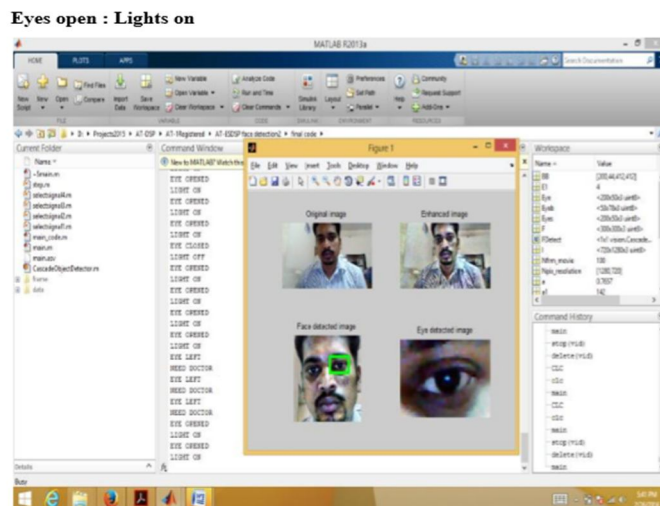


Fig.8. Eyes open

Conclusion

Coordination of pressure sensor and MATLAB innovation to manage the machines shall enhance the quality of life of entire client assemblies particularly to the crippled and aged individuals to attain well-being and agreeable. Joined wire with remote frameworks usage can be the most reasonable to plan a brilliant home-framework as compared to traditional. Disabled person can control devices and use it for his day to day activities, being independent for small activities and matlab for switching of light and sending the message to attender inn case of emergency. The innovation utilized could be actualized as a part of a wide assortment of utilizations that require the utilization of sensors and machines. This anticipate effectively composed a framework that speaks with a cell phone, for example, a PDA or portable PC by means of ZIGBEE to control apparatuses yet has numerous conceivable applications that could profit by this work.

In Future development, the utilization of eyeball sensor and utilize it for voice modulation, can be developed further to implement a car automation for disabled patients.

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