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RESEARCH ARTICLE

AUTONOMOUS EYE.

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Abstract

A powered wheel chair is a mobility-aided device for persons with moderate or severe physical disabilities. In order to take care of people with different disabilities, various kinds of interfaces have been developed for powered wheelchair control; such as joystick control, head control, chin control and sip-puff control. Many people with disabilities do not have the ability to control powered wheel chair using the above mentioned interfaces. In this project work, we propose and implement an eye controlled wheelchair system in which the control of the wheelchair is done as per the movement of eye. For this purpose, we use the optical-type eye tracking system to control powered wheel chair. User's eye movement are translated to screen position using the optical type eye tracking system. When user looks at appropriate direction, then computer input system will detect the direction, based on the coordinate position of pupil i.e., when user moves his eyes balls up (move forward), left (move left), right (move right), down (move backward) and in all other cases wheel chair will stop. The image captured by a camera after being processed it is fed to the microprocessor. The microprocessor will take a USB output from the laptop and convert the data into signals that will be sent to the wheelchair wheels for movement. Also, the object detection sensors will be connected to our microprocessor to provide necessary feedback for proper operation of the wheelchair system. In the case of the wheelchair, the front two wheels will be used for steering left and right and rear wheels provide the forward movement. All four wheels will be connected to our microprocessor that will send signals to control the wheels and thus the overall movement.

Introduction:-

The Wheelchair is dependent system used by elderly and physical disable persons. Here introducing the design implementation models of totally independent Eye control electric wheelchair. As per requirement of the disabilities, different kind of automatic systems are available in market such as voice control or joystick control system. Sometime for totally paralysis person may be have very difficult to use that type of systems. Here the Eye control system provides the independence to make their life easy and more convenient. And also they save the huge amount

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of energy or external man power. Camera captured the image in real time and analysis the image as input to set the commands for interface the motor driver IC. The motor driver circuit is used to perform the different operation such as left, right, forward and stop.

Several application and algorithms are used to find out accurate pupil location detection and tracking of that. One of them is Haar cascade like features detection algorithm used to detects single or multiple face and detection of both eye. To detect the exact Eye pupil and locate its center point is the ultimate goal of this system. For automatically finding out Eye pupil and tracking eye pupil, many computer vision library of Image processing techniques like object detection, Motion detection, Image color conversion, Edge detection, Pattern matching etc. are used.

This is efficient as well as cost effective system. Here real time video image capturing based on Face, Eye and Eye Pupil detection with minimum delay of time is used. The system includes multistage that mainly track the Eye pupil center. An Eye tracking technique is used, which capture the image and detects the presence of human face. After detecting the face, it detects area of the eye location on the face detected image, and performs several operation of basic image processing like colour image to grey conversion, filtering, threshold, pattern matching, noise reduction and circle detection on it.

Literature Survey:-

In paper [1], The main aim of this paper is to develop an efficient interface to track the iris movement and to use this information to control the direction of robotic vehicle. This paper gives information about morphological operations to detect eyeball movement and how we can use it to move a robot in direction of the line of sight of the user. Through a web camera, the photographs of either the left or the right eye is continuously captured. Send this information to the robotic vehicle through a wireless link. The robotic vehicle receives the digital data and performs some operation on it. According to the digital data the robotic vehicle controls its direction.

In Paper [2] , deals control and navigation of the wheelchair for elderly and disabled based on kinematic model iris motion and image processing. A navigation system, based on iris movement and image processing, was real-time implemented in MATLAB. This navigation system identifies the user's eye movement in three directions: forward, left and right. Stop of the wheelchair is done by eye closing. Using a LabView platform, a graphic user interface has been designed and implemented, allowing user to control wheelchair movements. The whole set of information in the image processing includes eye detection, direction finding and validating it by averaging 10 frames.

In Paper [3], An Eye Controlled System which enables the movement of the patient's wheelchair depending on the movements of eyeball. The person sitting on the automated Wheel Chair with a camera mounted on it, is able to move in a direction just by looking in that direction by making eye movements. The captured camera signals are then send to PC and controlled MATLAB, which will then be send to the Arduino circuit which in turn will control motors and allow the wheelchair to move in a particular direction. It is easier and simple to handle, and User friendly .It has Poor gaze direction accuracy and costly.

This is a paper [4], implements a Smart Phone controlled Robot that uses ATMEGA328 Microcontroller. In this paper, a robot is designed that can be controlled using an application running on an android phone. It sends control command via Bluetooth which has certain features like controlling the speed of the motor, sensing and sharing the information with phone about the direction and distance of the robot from the nearest obstacle. The data received by the Blue-tooth module from Android smart phone is fed as input to the controller. Thereby, the controller acts accordingly on the DC motors to move in the entire robot in all the four directions using the Android phone. The robot is small in size so can be used for spying and it can be used in the borders for disposing hidden land mines.

The paper [5], implements a non-periodic signal digitalization using ATMega microcontroller. Sampling and quantization are accomplished but ATMega328 micro processor. A microprocessor ATMega328P, which was released by company of Atmel, was used to meet this requirement. ATMega328P is an eight bite processor with eight analogue input pins, fourteen digital input/output pins of it six pins have also PWM analogue output pins. Internal memory of microprocessor is 32KB Flash, 2KB SRAM an 1KBEEPROM. Clock frequency is 16MHz.

This paper [6] , Develops a Bluetooth Electronic Scale for Water Intake using Arduino. The hardware part of the system mainly includes Arduino board UNO and development environments. Arduino is anopen-source development of I/O interface control panel. There is a similar java, C language development environment, so that

users can use the Arduino language and other software to make interactive works. Many switches or sensors, LED, stepper motors, etc. There are many amazing interactive work can be developed through the Arduino. Arduino UNO R3 is the latest of a 2012 easy-to-open source controller, compared with the Arduino UNO and has not major changes in hardware. The biggest difference is that the USB-connected in series circuit, instead of a piece of ATMega16U2 microcontroller, costs will has increased, the software portion as before, there is not big changes.

This paper [7],aims in implementing a mobile robot system, which is capable of performing various tasks for the physically disabled. To avoid collision with unexpected obstacles, the mobile robot uses ultrasonic range finders for detection and mapping. This paper describes some features of a mobile nursing robot system, which is produced as an aid for bedridden who acquire constant assistance for the most elementary needs. The obstacle is detected with the ultrasonic rays being reflected is being sensed by the sensors. The amount of reflected sound energy depends strongly on the surface structure of the obstacle. It is accurate and make the disabled person independent but Ultrasonic is expensive.

In this paper [8], proposes a novel approach to obstacle detection and collision avoidance using ultrasonic sensors in indoor environment. For an intelligent quad-copter, detecting obstacles to avoid collisions is very important. If a robot can be made to avoid colliding with objects in the environment, then other higher-level capabilities can safely be incorporated into the system. A custom designed 'cap' with sensors fitted in, interfaced with the copter through Arduino Development Board has been used to make the quad-copter intelligent through feedback and correction. In this cap, four slots are created for fitting the ultrasonic sensors. As four sensors are used here, best results were obtained by placing them at an angular separation of 90°. These ultrasonic sensors are controlled using an Arduino development board. The sensors are placed one on each of the four faces of cap. A custom made shield has been used to create a common power supply for all the sensors. Arduino, along with the shield is glued inside the cap so that the wires or the modules don't dangle ensuring that the connections are not disturbed.

In thi paper [9] , presents both simple and complex obstacle detection using an ultrasonic sensor ring with overlapped beam pattern. It is assumed that a set of ultrasonic sensors of the same type are arranged along a circle of non-zero radius at regular spacings with their beams overlapped. To assess the positional uncertainty of an overlapped ultrasonic sensor ring in obstacle detection, the obstacle distances of three adjacent ultrasonic sensors are compared. First, the positional uncertainty for single obstacle detection can be determined based on the combination of ultrasonic sensors detecting an obstacle. Second, the positional uncertainty for multiple obstacle detection can be determined based on the inequality relationship among three adjacent obstacle distances. Third, the positional uncertainty for omnidirectional obstacle detection can be determined by overlapping all the uncertainty arcs obtained for every three consecutive ultrasonic sensors.

In paper [10] , Eye Ball Tracking System is a device which is intended to assist patients that cannot perform any voluntary tasks related to daily life. Patients who only can control their eyes can still communicate with the real-world using the assistive devices like one proposed in this paper. This device provides a human computer interface in order to take decisions based on their eye movement. A real time data stream is captured via webcam that transfers data serially to MATLAB. Then a sequential image processing scheme segments the iris of the eye and calculates the centroid, thereby generating control signal with the help of a reference axis. The control signals are then used to manipulate the position of a motorized platform via USB microcontroller interface. The data processing is done in a simplest way and low cost.

In this paper [11], it presents an effective albeit simple technique to perform mouse cursor movement by first detecting the user's eyes, and then calculating the position on screen at which the user is looking. The idea of our paper is to use a series of steps for image processing, and then use a certain algorithm to convert screen coordinates to world coordinates. Once pupil detection is done, we get the coordinates of the pupil in the image. Our algorithm uses a concept of distance of these coordinates from the midpoint of the screen to calculate the actual coordinates of the position on screen the user is looking at. These are then passed to a function in MATLAB to move the cursor. The captured image is converted to a grayscale image. The grayscale image then undergoes K-Means clustering after which it is converted to a binary image. This binary image undergoes further transformation, at the end of which we get a rectangular region containing the eyes of the user. Once these coordinates are calculated, a formula is applied factoring in the distance of the face from the screen, and the average radius of an eye. The output of this is the actual coordinates to which the cursor is moved.

The paper [12] is to, implements an Eye Movement Based Electronic Wheel Chair For Physically Challenged Persons. The main objective of segmentation is to remove non useful information, namely the pupil segment and the part outside the iris (sclera, eyelids, skin). Daugman proposes an integrodifferential operator to find both the pupil and the iris contour. The algorithm will perform the iris recognition in two phases. The algorithm used in the first phase, uses the knowledge that a pupil is a very dark blob of certain minimum size in the picture, and The second algorithm takes the information of the pupil canter and tries to find direction in which the eye looks. The input image given to the MATLAB for processing will produce an output image with the coordinates of iris and pupil. The input image given to the MATLAB for processing will produce an output image with the coordinates of iris and pupil.

In this paper[13], mainly aims in describing the method of using Radio Frequency transmission as wheelchair user interface. Human-machine interface can be considered as an essential element in robotic wheelchair control mode. The purpose of this pap er is to examine the functionality and efficiency of the manual control mode with the implementation of low cost RF Transmitter and Receiver modules for wireless transmission. A User's Controller Panel as well as a model of robotic wheelchair has been designed and developed to provide the testing of robotic wheelchair locomotion control via wireless data transfer. By using C programming algorithm, PIC16F877 has been used as the Microcontroller unit for robotic wheelchair while PIC16F88 as the Microcontroller unit for User's controller panel. The results prove that low cost RF modules have the feasibility to be used for simple-one way wireless data transfer with the capability of transmitting several basic instructions to the robotic wheelchair.

In Paper[14] ,] implements a Mobile Robot Control over a Radio Frequency Communications Link. the operation of the robot was to be quite simple; it was to be able to move forward and backward and turn left or right. Keeping these commands separate simplified distance calculations, and with the use of optical encoders attached to the wheels, this data was easily gathered. The direction beading was measured with the use of a digital compass that output the direction in a binary number.The user controls robot movement in one of two ways. The first possibility is a real-time instruction that tells the robot to execute a particular command until another is given. Essentially, the operation is similar to that of a remote controlled car. The other possibility is a list of commands to be executed in a particular order. The data contained in this list includes the direction in which the robot is to go, the length at which the robot is to execute the command, and the speed at which the command is to be executed.

In Paper [15] , implements RF Module Based – Speed Check and Seatbelt Detection System. This system will have to part 1)Transmitter and 2) Receiver System. Transmitter part will be on the Road Side at Speed Sign Board. The role of the transmitter is to transmit the maximum allowable speed limit of that road to receiver. Receiver part will be on the vehicle embedded with the system. Role of the receiver would be to compare received Speed Limit Data (received from transmitter) with current speed of the vehicle. It will generate a signal in case of over-speeding and after 10 seconds the engine will stop.

Proposed system:-

A powered wheel chair is a mobility-aided device for persons with moderate or severe physical disabilities or chronic diseases as well as the elderly. In this project work, we propose and implement an eye controlled wheelchair system in which the control of the wheelchair is done as per the movement of eye. For this purpose, we use the optical-type eye tracking system to control powered wheel chair. User's eye movement are translated to screen position using the optical type eye tracking system.

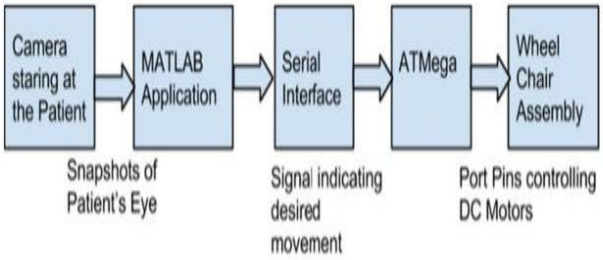

Fig:- Overall Block Diagram

We capture the image using the camera, and after perfect capturing of image, it is send to the MATLAB software in the PC where segmentation of image is done and processing of finding the pupil and its direction is found out.Image

Capturing is to capture a sequence of iris images from the subject using a specially designed camera. The image is then changed from RGB to gray level for further processing. The final output of the MATLAB is then transmitted through the RF Modem Transmitter as Analog Data.

Conclusion:-

Our project, Autonomous Eye consist of a wheelchair, the motion of which is controlled by the eye movements of the user. The aim of implementing an autonomous eye is to help physically disabled persons to make their life independent. A sequence of images of the eye will be captured and it is processed in MATLAB to obtain the direction of movement of the wheelchair. There the system used the ultrasonic sensor for obstacle detection. Low cost RF transmitter and receiver are capable of handling some basic wireless communication such as sending basic instruction to MCU of the robotic wheelchair.

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