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Eye Directive Wheelchair

SUBMITTED BY:

SIVA SAKTHIVEL P
sivasakthivelp.21ece@kongu.edu

SASIKALA J
sasikalaj.21ece@kongu.edu

SELVALINGESH VS
selvalingeshvs.21ece@kongu.edu

Abstract-- The Eye-Directive Wheelchair is a mobility aid for individuals with moderate/severe physical disabilities or chronic illnesses, as well as the elderly. There are a variety of wheelchair interfaces on the market, but they are still underutilized due to the skill, strength, and mental power required to operate them. The proposed model is a possible alternative. This model uses an optical eye tracking system to control a power wheelchair. The user's eye movements are translated into screen positions using an optical eye-tracking system without direct contact. When the user looks at the proper angle, the computer input system sends commands to the software based on the angle of rotation of the pupil. H. When the user moves the eyeball left (move left), right (move right), or straight (move forward). Otherwise the wheelchair will stop. Obstacle detection sensors are also connected to her Arduino to provide the necessary feedback for proper wheelchair operation and to ensure user safety. Wheelchair mounted motors support differential steering to avoid jerky movements. The wheelchair is also equipped with joystick controls that allow safe movement when the eye is tired and a safety stop button that allows the user to stop the wheelchair at will.

Keywords: Eye directive wheelchair, Arduino, Sensor.

Introduction

The wheelchair model design shown here is a fully equipped flexible power wheelchair for paralyzed and mobility impaired patients who drive the wheelchair without postural strain. Gaze movement is performed autonomously () and the carriage is steered to the eye position accordingly (). It is an eco-friendly and cost-effective wheelchair that consumes less energy and can be manufactured with minimal resources. The system is designed with physical disabilities in mind and does not physically affect the patient. Obstacle and ground clearance measurements are taken to ensure patient safety. Obstacle audio warning deployed. Alternatively, the was fitted with a joystick to control the wheelchair.

Design And Specifications

In the Image Capturing Module, images are captured using a wireless connection camera and are sent to the base station (computer/laptop). Further processing. In Microprocessor Interfacing, the electrical digital output from the base station is used for routing wheelchair motors. The microprocessor also takes care of those obstacles and user inputs. Wireless camera: The user's eye is captured by a pinhole
a wireless camera that transmits images to a base station wirelessly.

Computer Base Station: Images received from the camera

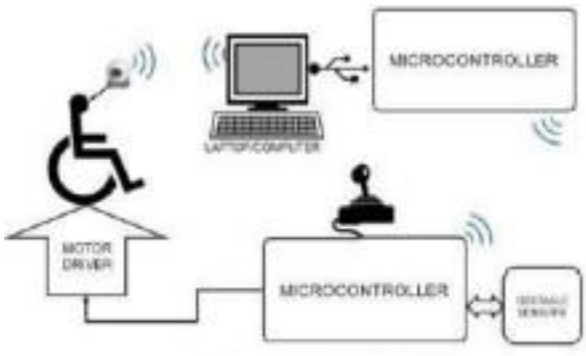

Fig.1 Block Diagram

are processed using an open-source computer vision library, and eye movements are transmitted to the chair via XBee communication.

Microcontrollers: These are used to maintain the communication protocol of the wireless link and also take time on the receiving end to deal with obstacles and manual user input. Motor Driver: Provides the high current required to drive the motor.

Image Capturing Device

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Images are captured using a wireless pinhole camera, as shown in Figure 2. Provides effective surveillance protection. It has a range of 150 feet and delivers real-time, lag-free, full motion color video.

Fig.2 Image Capturing Camera

Microcontroller

The microcontroller used in this model is an Arduino. The Arduino is a single-board microcontroller aimed at building more accessible and interactive objects or environments. The 's hardware consists of an open source hardware board around an 8-bit Atmel AVR microcontroller or a 32-bit Atmel ARM. The system uses two microcontrollers. A Broadcasting microcontroller is connected to the processor unit. This microcontroller converts the information received from the processing unit into signals and transmits them wirelessly to the receiving microcontroller attached to the wheelchair. The receiving microcontroller receives the signal over the air from the sending microcontroller and in response the starts moving in the desired direction. This his microcontroller is attached to the wheelchair and connected to the motor his driver. It is also connected to the object sensor, joystick control and emergency stop button. This microcontroller can initiate movement, change direction, and stop the system while receiving commands from his attachment above.

Fig.3 ARDUINO

Obstacle Sensor

The wheelchair is equipped with four ultrasonic sensors to prevent collisions and damage to the user. Three sensors track the forward, left and right directions. The ultrasonic sensor uses electromechanical energy conversion to measure the distance from the sensor to the target object. When an obstacle is detected within 100- 230cm of her in the wheelchair, the Arduino will play a sound to avoid the obstacle and ensure safe passage of the wheelchair. However, if the obstacle is still within 30cm of her in his wheelchair, Arduino will send a command to stop the motor her driver, ensuring that the system stops. A fourth sensor is used for ground clearance. Ground clearance measures the height between the sensor and a flat surface (ground). The 's Arduino will send stop command to the motor he controller when there is a sudden step or tilt..

Battery

The system uses lithium-ion batteries to power the wheelchair mounted components. The battery contains 30 Li-ion cells of 3.7 V 1.5 Ah. The batteries are connected in a 6x5 fashion. That is, 5 sets of batteries with 6 cells connected in series in parallel. The battery therefore provides a total output of 22.2 V with a capacity of 7.5 Ah. Motorized manual wheelchairs promote independence for users who move from one place to another without the need for help from others. The original ball bearing wheels have been removed and a MS material coupling adapted to the motor shaft and configured to match the inner diameter of the bike. The coupler holes match the rod and the shaft is also locked to prevent slippage.

Working

A series of images captured by the camera are sent to base station (computer/laptop). Images are processed using the Open Source Computer Vision Library (OpenCV) and converted to .xml files. OpenCV processing returns the length and width of the detected object (pupil).

The length and width of each quadrant are specified in the Open CV algorithm. The position helps calibrate the quadrant the pupil is in and helps find the direction the eye is pointing. This process essentially divides the image into three quadrants (left, right, center). If the pupil position is in the right quadrant, the carriage will move to the left. If in the left quadrant, the wheelchair will move to the right. If the object is in the middle, the wheelchair will go straight.

Modes Of Operation

The wheelchair can operate either in the eye (image) directed mode or joystick mode. The modes can be switched by long pressing the joystick button.

a) Mode I:

Eye Focus Mode: User eye movements form the basis of the entire system. Eye movements are continuously monitored by a wireless camera. The camera is mounted in front of your eyes, so the focus stays on your eye movements. These images are sent to the processing unit. H. A computer or laptop. Each

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individual image is processed and the required information is generated from the image. The processor unit has a USB output to the Arduino. Information about eye movements is sent to an Arduino transmitter connected to a computer. Broadcast your arduino and send that information wirelessly to a receiver (a wheelchair-mounted arduino). Upon receiving the , her Arduino in the wheelchair is connected to the motor his controller. After receiving the appropriate command, her Arduino on the receiving end will move in the desired direction. The engine on display has a differential steering mechanism that ensures quick turns. The system works with four ultrasonic sensors to prevent left, right and front collisions. The fourth sensor is for ground clearance.

a) Mode II:

Joystick mode: Joystick mechanism has also been provided as an additional feature to ensure movement in case of tired vision. A stop button is provided on the wheelchair which will cease the working at the very instance it is pressed.

Conclusion

The system works with 70-90% accuracy. The goal of this project is to make a small contribution to society by outlining system ideas that can actually improve the lives of millions of people around the world. The direction the pupil is looking is determined by determining the user's particular gaze range. Pupil recognition also works with lighting. If the lighting doesn't cover her entire eye, it's because the light spreads into the pupil. If the light hits the pupil and the illumination spreads into the pupil and covers the entire covered pupil, it is ignored. Since it's a pixel, if you're at a light point, the operator sees the other position as the iris position, leaving you with the largest undecidable edge transition. This works even if the photo was taken in a dark environment.

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