

Recent Trends in Wheelchair to Assist the Physically Challenged



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Abstract: In this paper a survey of autonomous wheelchair has been proposed for physically handicapped people, which serves their crucial role for maneuvering by simply moving their neck. To fulfill this objective, this paper involves Arduino board programmed for processing & controlling the wheelchair. Micro switches are used here to sense the neck movements from the disabled person and which further send this to Arduino for taking necessary action to move the wheelchair accordingly. GPS module is integrated with the Arduino to locate the physically disabled person in case of emergencies. In addition to this, GSM module is been used for sending crucial information regarding the physically disabled person's health issues if any, like body temperature, to further send this to his/her contact person/assigned care-taker. In some special case of physically challenged person who is not able to move any of his/her body part except fingers, this paper gives the better perspective to make a movement of the wheelchair by simply controlling it by virtue of an android app installed on the wheelchair. An android app is developed to serve as inputs for processing and controlling the DC motors for the desired maneuverings.

Index Terms: Android app, Limit switch, Temperature sensor, DC Motor Driver

I. INTRODUCTION

With the enormous increment in the quantity of more seasoned individuals and individuals with physical troubles, there are critical applications for the route help of insightful wheelchairs. Because of cardiovascular and weariness based conditions, mishaps, oldness, or illnesses like cerebral paralysis and spinal string wounds, the extent of debilitated individuals is ascending and now speaking to 1 billion people, which speak to 15% of the worldwide populace [1]. We perceive numerous sorts of physical incapacities. They happen under various perspectives like ataxia, spasticity, or engine brokenness, which cause an absence of muscle coordination, automatic developments, a deferral in achieving engine abilities, shaking, tremor, and the failure to control the developments particularly exact ones like composition. These

will clearly cause an absence of autonomous portability, confidence, and wellbeing that requires the utilization of versatile gear, for example, a manual wheelchair and electric wheelchair or the assistance of a parental figure to do their day by day life exercises. The electric wheelchairs were somewhat of a route to an answer. Be that as it may, many moving challenges happen with individuals experiencing furthest point debilitations. They don't have the ability to appropriately control their electric wheelchairs. The present innovation is quick moving towards computerization which limits the requirement for human intercession. Those motorization cum-human administrators with the guide of hardware require solid work while mechanization significantly diminishes the requirement for human tactile as well as mental prerequisites also. Along these lines, the present day mechanized frameworks have less manual tasks, greater adaptability, unwavering quality, and high precision. Because of this interest, each field favors robotized control frameworks. Particularly in the field of hardware mechanized frameworks as they are giving solid execution. Different techniques have been proposed for permitting impaired people, including a quadriplegic to control a mechanized wheelchair. There are different proposed philosophies as of late which include eye development, hand motion, cerebrum based controlled frameworks, EEG based framework and so on [2]. The hand gesture based system used the transfer of hand gesture information commands to move the wheelchair, the voice controlled system used voice recognition sensor to drive the wheel chair however the issues with the existing system are:

- Unable to adapt to external conditions.
- Less identification accuracy.
- Classification techniques employed are complex.
- Time consuming and costly.

To conquer every one of these situations, Nowadays the inclination is towards the head development identification, for example, an assistive innovation, video chatting, and computer-generated reality have expanded the extent of research intending to give strong and successful systems of ongoing head development discovery and following. The field of constant head development recognition has gotten much consideration from scientists. There is a wide range of ways to deal with head development location. This paper has taken advantage of technology to implement interesting cheaper neck equipment and android app based wheelchair to assist the physically challenged. To fulfill this objective, this project involves Arduino mega 2560 board programmed for processing & controlling the wheelchair.

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The Arduino Mega 2560 is a microcontroller board based on the ATmega2560 [3]. A microcontroller is basically a small-scale computer with generalized (and programmable) inputs and outputs. Similarly In our project the Arduino mega 2560 is programmed using the C programming language. Programmers work in the virtual world and on the other hand machinery works in the physical world therefore we make use of microcontroller based Arduino Mega 2560 to connect the virtual world to the physical world so that the inputs and outputs can be manipulated by and can manipulate the rest of wheelchair system. The Arduino Mega 2560 the brain of our system decides whether the wheelchair has to go in forward direction, reverse, left or right effortlessly. Micro micro switches SPDT Very precise in terms of accuracy detect the position of the neck of the wheelchair's user; the sensors then produce an electrical output signal which further sends this to Arduino for taking necessary action to move the wheelchair accordingly.

Emergencies and disasters can strike without warning therefore it is important that people with disabilities be located in case Emergencies as fast as possible. This Eases loneliness in them, reduce heart disease risk, emotional, depression, mental exhaustion and greater other risk for certain illnesses, therefore in this project we use a Global Positioning System (GPS) module integrated with the Arduino to locate the physically disabled person in case of emergencies anytime & anywhere .with this free, precise, reliable system we can easily reach out the physically disabled person. In addition to this, GSM 800c module is been used for sending crucial information regarding the physically disabled person's health issues if any, like body temperature by the help of LM35 temperature sensor , to further send this to his/her contact person/assigned care-taker. In some special case of physically challenged person who is not able to move any of his/her body part except fingers, this project gives the better assistance alternative means to move the wheelchair by simply controlling it by virtue of an android app installed on the wheelchair. This proposed system is useful for those who are not able to impel a manual wheelchair or who may need to employ a wheelchair for short distances effortlessly. It may also be used not just by people with conventional mobility impairments, but also by people with cardiovascular and fatigue based conditions.

II. LITERATURE SURVEY

1. Introduction

With the large increase of older people and people with physical difficulties, there are significant applications of intelligent wheelchairs. Due to fatigue based conditions, accidents, elderliness, etc the proportion of disabled people is rising up. The research and analysis of motorized wheelchairs dates back in time with several scientists and researchers evaluate various methods that have been proposed for improving their lives style to great extent. The systems developed are highly competitive in replacing the old traditional systems. The various methodologies involve various systems like joystick, eye movement, voice based controlled system, hand gesture, brain based controlled systems, etc.

2. Voice Recognition Based Wheelchair

In this system a voice recognition module is used to recognize the user's voice which comes from either a speaker dependent or speaker independent and the wheelchair is moved with the help of voice commands. A microcontroller generates codes in its output according to the input thus it interfaces between motors and voice recognition system. Using this module dc motors are controlled corresponding to the voice command. For example if patient says forward wheelchair must move forward and similarly, other commands such as left, right, etc. can be given. Voice signals are given to the microphone which converts the voice signal in to electrical signal and the output of the microphone is given to the voice recognition module [3].

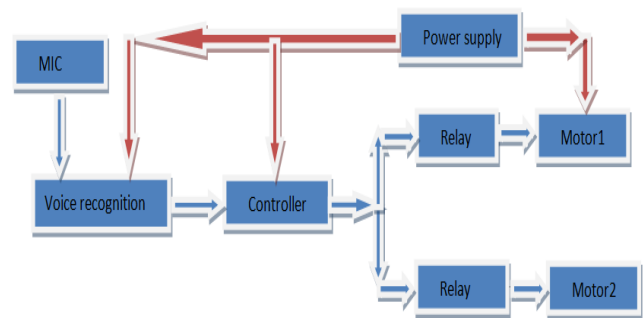


Fig.1 Voice controlled wheelchair

Disadvantages

- The drawback of this design is that in this system the wheelchair will not work properly in noisy environment.
- Different accent is also a problem in using this type of wheelchair.

3. Eye Ball controlled Wheelchairs

Eye sensing wheelchair works on the principle that wheelchair is driven by the movement of the eye. It can be used in some critical cases in which the person is unable to move the parts of the body even unable to speak. Images are captured using camera which is either a head-mounted or mounted on the wheelchair focusing on the person eye and images are sent to the base station (computer/ laptop) for further processing. The microprocessor generates electric digital output from the base station to direct the motors of the wheelchair. The different commands for the wheelchair are such as If eye move towards left wheelchair must move towards left and similarly if eye move towards right it must move towards right and so on [4]. The system's functional block diagram is illustrated in Fig.2

Disadvantages

- with this system is as the operator is not free to visualize the adjacent surroundings when the system is active
- eyes have some oblique movements for which the wheelchair is not satisfactorily responding for the movement in particular direction

- as the wheel chair requires eye-ball movement as input to the controller for its working, a lot of strain is created to the eyes. Uses more electricity Provides no exercise
- The operator would not actually be seeing where he is going while focusing eyes on camera module.

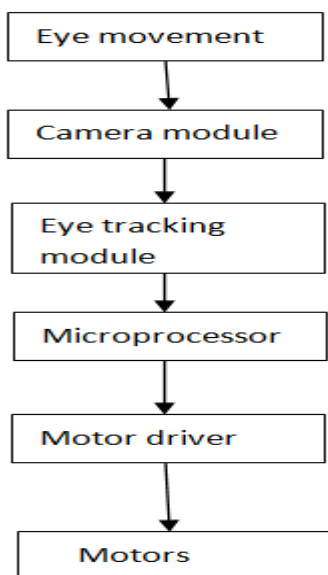


Fig 2 Eye ball controlled wheelchair

4. Finger Movement Wheelchair

In this system, the wheelchair can be constrained by a blend of three fingers. One finger controls the speed of the wheelchair while the other two fingers control the headings of the wheelchair. There is the adaptability that we can utilize just two fingers rather than three to control the heading while at the same time letting the framework to control the speed consequently. To follow the development of fingers, the flex-sensors are utilized. The finger development following framework rotates around a flex sensor. The flex sensor is essentially a resistive strip whose obstruction is straightforwardly relative to twisting. The flex sensor is worn on the finger and the twisting of the finger, thus, twists the resistive strip in this way expanding the obstruction of the strip. This difference in opposition is utilized in the age of order signals [5].

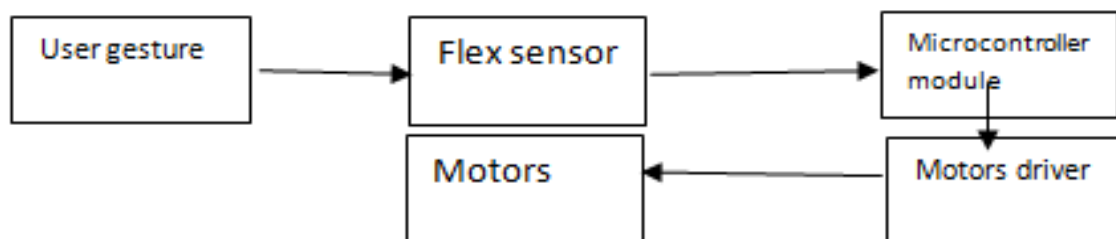


Fig 3 Finger movement-controlled wheelchair

5. Hand Gesture Controlled Wheelchair

This type of wheelchair is guided by the motion of the sensor attached on the hand. Accelerometer is used to drive the motors in the desired direction by detecting the orientation of the hand and corresponding signals are sent to the controller.

This wheelchair can be constrained by straightforward hand motions. It utilizes a sensor which controls the wheelchair by distinguishing the hand motions made by the client and translates the movement expected by the client and moves appropriately [6].

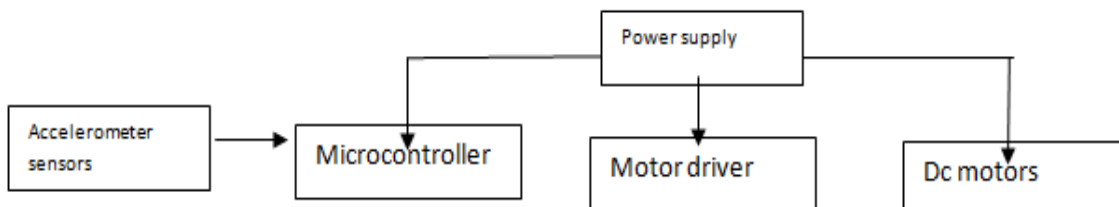


Fig 3 Hand Gesture Controlled Wheelchair

Disadvantages

As the wheelchair’s direction is changed with hand movements the system has disadvantage over paralyzed patients and people that cannot move their hands.

6. Joysticks Wheelchair

In the joystick-based wheelchair it is being controlled by a joystick. This joystick can be mounted on any hand of wheel chair and the mechanized wheels can be controlled based on the development of the joystick.



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On the off chance that the joystick is pushed toward the correct side, the wheel turns towards rights, etc. The differential control technique is utilized to alter the course of the wheelchair i.e., to turn left, the left engine is either stop or go in reverse and the engine associated with the correct wheel pushes ahead. The joystick-based wheelchair is of two-dimensional simple sorts.

The simple information can be perused by the microcontroller on its simple pins. Any adjustment in voltage prompts the movement of the wheelchair. The engine is DC equipped engines. These are associated with the microcontroller utilizing an engine driver [7].

Disadvantages

- It has major disadvantage over paralyzed patients, who cannot move their hands.
- Joystick based wheelchair may not be suitable for some disabled people and also for those who are amputees

III. CONCLUSION AND FUTURE SCOPE

This paper shows the trends of neck equipment an android control wheelchair system for physically disabled and elderly people. It is tested and works satisfactorily with minimum assistance of the user. The system is successfully implemented to move the wheelchair left, right, forward, backward or stay in same position. In addition to this, adds some additional feature like obstacle sensing, GPS module to locate the user in case of emergencies, GSM module has been used for sending crucial information regarding the physically disabled person's health issues if any like body temperature. This intelligent control work is to help the needy persons by providing alternative methods to operate the equipment either by neck equipment or through android app, there by serving many disabilities and elderly. In the future work, presently our wheelchair is moving with a constant speed. The speed cannot be varied by users or patients desire. So two types of modifications can be done in that which are by PWM pins in the Arduino code or by providing variable voltage to the motors of the wheelchair. Controlling of speed is to provide a speed control to ensure smooth progressive acceleration and the effectiveness of the neck equipment control can be advance improved by implement MEMS sensors for best comfort ability.

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