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Voice Control Wheelchair with Panic Alarm

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A B S T R A C T

Aside from that, the development of this project may be done at a low cost. However, certain changes are needed to make this system more dependable. The wheelchair's design might be enhanced by including wireless communication. We can immediately improve the lives of disabled persons in the community by establishing this system. Finally, we believe that this type of device will help to advance wheelchair technology. The intelligent wheelchair's motor drive and control system has been shown.

The voice-controlled intelligent wheelchair based on a microcontroller would be more convenient for handicapped individuals. By avoiding collisions with walls, immovable objects, furniture, and other people, the device can also improve the safety of users who use standard joystick-controlled powered wheelchairs.

I. Introduction

People with arm and hand impairments find it difficult to utilize a standard wheelchair since their hands are incapable of operating it and cannot move it in any direction. As a result, a voice-operated wheelchair is designed to overcome such people's difficulties and enable them to manage the wheelchair. The wheelchair will be controlled by voice instructions using the input provided. The Arduino will handle all of the user's desired directives. Each direction's instructions are written in the form of a program in the Arduino itself. The unilateral mic, which will be positioned according to the user's comfort, will provide spoken commands to the wheelchair. The HC05 Bluetooth module will do speech recognition. Arduino then receives the output from this module. The Arduino's pre-written algorithms assist Arduino in converting these vocal commands into significant output, and the wheelchair will move appropriately. People will gain independence by using a wheelchair control system. The wheelchair control system makes use of speech recognition technology to trigger and control all of its motions. The technology allows users to operate the wheelchair by just speaking into the wheelchair's microphone. The fundamental movement functions are forward and reverse motion, left and right turns, and stops. The spoken words are sent to the speech recognition processor via a flexible microphone that can be bent to the user's specifications. Many physically handicapped people are unable to move any limbs below the neck. As a result, manual and even joystick-controlled wheelchairs are out of the question for these individuals. As a result, the development of voice-activated wheelchairs will answer the question of quadriplegic patients' movement and make them independent of mobility.

In our project, we have both voice command and switch control. In this case, we utilized Arduino as a programming device. Where c has used programming to better the project. The major goal of this project is to Wheel Chair System Project for the main aim of creating a smart system so that we may reap numerous benefits from a single project. These are utilizing voice command or switching for wheelchair control, which sick patients or elderly people can easily operate; the goal is to build a contemporary one primarily for sick patients or the elderly. There are numerous advantages to such a system, including the following: it reduces human efforts, it is beneficial to physically disabled people who are unable to operate home appliances with their hands, it will help to save energy to some extent because some people are too lazy to go and switch off the appliances manually, it is simple to use for those who have tried it and do not need to operate the home appliance manually by hand, and it reduces risk. The suggested system has several drawbacks as well, such as the fact that it requires an additional supply to operate the model and that the module only recognizes the inserted voice and button. This type minimizes the amount of physical effort required to acquire and identify the command for controlling the mobility of a wheelchair. The given commands can be used to control the wheelchair's speed and direction. Thus, all that is required to ride the wheelchair is a trained voice.

1.1 Working

Recently, the number of older people and physically handicapped persons who use a wheelchair has been increasing. However, only two types of wheelchairs have come into wide use, hand operating and operating the joystick. The former type needs muscular strength for the operation, and the latter type needs skill. Therefore, there is a problem that it is difficult for the old and the handicapped person to use these interfaces. The interface of a wheelchair,

[1] voice.

[2] the direction of the face.

[3] eye gaze.

[4] electromyography (EMG) signals from the neck and the arm muscles.

[5] EMG signal from the face muscles.

[6] wireless tongue-palate contact pressure sensor.

[7] an eye-control method based on electrooculography (EOG).

[8], electroencephalography (EEG)

Using these methods, it becomes easy to physically a handicapped person to operate a wheelchair. Though a person moves his face and the direction of his eyes unconsciously, unnaturalness causes him to use these movements as the interface consciously. Operation by EMG or EOG, or EEG signal needs skill, and a mental burden is forced on the user to use a contact-type sensor to measure these signals. On the other hand, voice is a natural communication way, and voice is one of the easy interfaces.

1.2 Voice command and wheelchair reaction

We set voice commands to control the wheelchair. The voice commands consist of nine reaction commands and five verification commands. The reaction commands consist of five basic reaction commands and four short-moving reaction commands, which move short distances. The details of voice commands and their respective reaction are shown in the table

Two commands, "mini" and "Hikari", are the 90 degrees of rotational movement in a fixed place without any forward or backward movement. When these commands are input during running, the system turns 90 degrees and moves forward after turn. Thus, five basic reaction commands achieve seven reactions (modes). In our system, though the short moving reactions, such as forward running about 30cm and right rotating about 30 degrees, are decided in experience, these reactions are possible to change to the user's needs.

After the voice command is input, the recognition process is carried out, and the recognition result is shown on the display of the laptop. At this time, to avoid a negative reaction to the misrecognition, the user must input a verification command to check the result.

When the acceptance word ("OK" or "yes") is input, the system considers the recognition result as correct, and it reacts to the given movement. Oppositely, when the rejection word ("torikeshi" or "no" or "cancel") is input or has no voice for a while, the system considers the recognition result as incorrect.

The system in this paper does not refer to button control. The laptop is the main computer of this system, and the recognition process is executed here. The control signal is sent to PIC from the laptop, and PIC generates the motor control signal to drive the wheelchair. We use a grammar-based recognition parser named "Julian". This is open-source software and is developed by Kyoto University, Nara Institute of Science and Technology, and so on. Julian is another version of Julius that performs grammar-based recognition. Julius is an open-source large vocabulary continuous speech recognition engine.

Julian can perform speech recognition based on written grammar. Grammar describes possible syntax or patterns of words on a specific task. When a speech input is given, Julian searches for the most likely word sequence under the constraint of the given grammar. Furthermore, in our system, the forward running speed is set at 1.8 km/h, and the backward speed is set at 1.4 km/h.

1.3 Recognition experiment

To evaluate the recognition performance of Julian, we experiment speech recognition test with 15 students. The target words are nine reaction commands and five verification commands, as shown in Table 1. This experiment is carried on in a laboratory room. There were some voices of other people in the recording environment in the circumference. As a result, we obtained successful recognition rates of 98.3% for the reaction command and 97.0% for the verification command, respectively.

1.4 Stopping experiment

The action of this system executes until the next command is given. For example, a wheelchair goes straight until the stop or turn command is input. Then, we tested the following three experiments to verify the operation of our system. The overview of these experiments is shown in the figure.

2. Illustrations

2.1 MECHANISM

The next experiment was carried out with the three persons. A running place was in the room on campus. We presume the course at which the start point is near the door and the destination point is one of the seats. The distance between the desks was about 160cm. The width of the wheelchair was about 55cm. So, this experiment is a running experiment in a narrow running course. To evaluate the performance of our system, we experiment not only with voice operation but also with the key operation of the laptop. The experimental running time, the running distance and the number of reactions are shown in Table 3. The running scenes of C are shown in the figure.

2.2 HISTORY OF WHEELCHAIR

Earlier, a wheelchair, used by disabled people to move around while sitting in it, was propelled manually either by others or by the disabled person himself. Nowadays, they are available by a little automated. Here is a brief explanation of the wheelchair history used by people with illnesses, injuries or disabilities. The usage of the wheelchair can be observed in the European continent from around the times of the German Renaissance. A drawing dated 1595 of the Spain King, King Philips I1, shows him in a wheelchair with feet and armrests. England recorded the usage of wheelchairs from the 1670s. However, it was not able to be self-propelled. In 1783, Englishman John Dawson built the first wheelchair that was self-propelled by pushing the wheels. With the invention of Self-propulsion push rims, the modern wheelchair began to take shape in 1881. In 1900 the wooden spiked wheels were replaced by the wire spiked wheels. The first motorized wheelchair was invented in 1918. The wheelchair with voice activation had used by a Norwegian law student when he used it to attend classes without an attendant help.

2.3 TYPES OF DISABILITY

A report on disability by World Health Organization (WHO) states that around 15 per cent of the world's population is living with some kind of disability. Out of which, about 2-4 per cent had difficulties in functioning. United Nations Development Program (UNDP) estimated that around 80 per cent of disabled people live in developing countries. In India, the census 2011, which collected data for eight disabilities, states that 20.5 per cent of the disabilities lie in the movement. The restriction in movement due to disability lead to low self-esteem, stress, isolation, fear of abandoning, etc. Arthritis patients and Multiple sclerosis patients suffer from severe disabilities by which they cannot move the joystick mounted on wheelchairs. The purpose of the proposed wheelchair is to provide a multi-control operated wheelchair at a lower cost. Fig.1 depicts the statistics of the disabled population by type of disability according to the 2011 census.

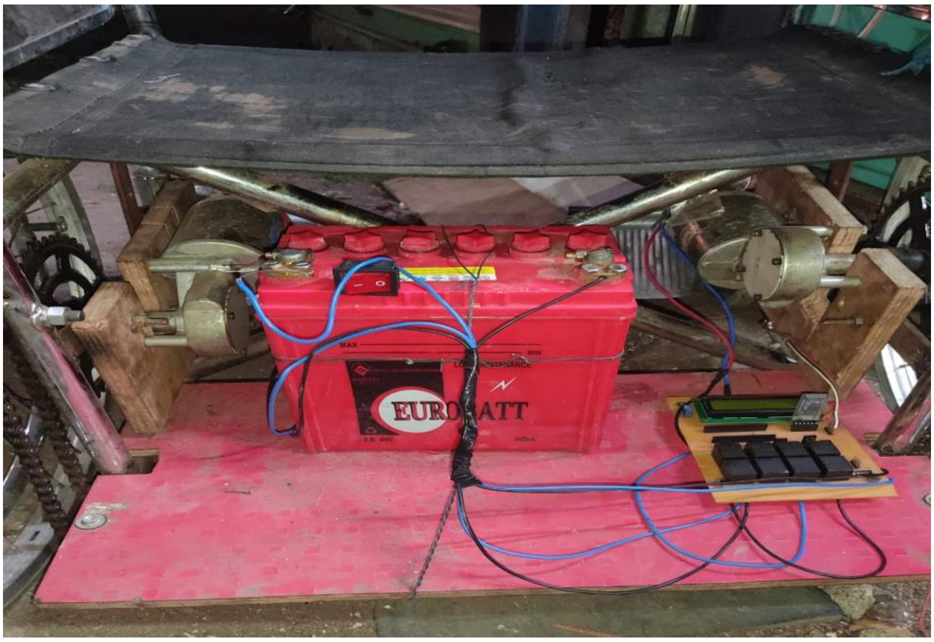

Fig. 1 - (a) WheelChair

Conclusion

Our proposed smart wheelchair provides a safe and reliable system with the presence of a line follower and obstacle detector. It provides an easily accessible variety of functionalities. In this paper, we developed a wheelchair system that includes ultrasonic and infrared sensors to automatically track the paths provided and also detects the obstacles in between the track along with a little intelligence of taking proper care to avoid accidental mishaps, where we got the desired results. Thus, disabled persons can be self-reliable, safe and independent with the help of this easily controllable wheelchair. Further improvement to the above-implemented system can be made by providing additional sensors to make the system more user-friendly and avoid accidents by self-learning. Also, security can be incorporated for accessing with the help of biometric authentication or including more control commands to pass through different types of doorways.

Future Scope

Physically challenged persons, who are suffering from different physical disabilities, face many challenging problems in their day-to-day life for commutating from one place to another, and even sometimes they need to have to be dependent on another person to move from one place to another. There have been many significant efforts over the past few years to develop smart wheelchair platforms that could enable the person to ease of operation without any ambiguity. The main aim of our paper is to develop a smart wheelchair to make life easier for physically challenged persons. This voice-controlled smart wheelchair comes with enhanced features like electric power, voice control, line follower with obstacle avoidance etc. The smart wheelchair control unit consists of the integration of an AVR microcontrollerATmega328 with Bluetooth module, GSM module SIM900, ultrasonic and infrared sensors, temperature sensor LM35 and a motor driving circuit for controlling the motor's speed

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