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Study on a Voice Actuated Miniature Model of Wheelchair for Handicapped Person

Renuka Wadekar[1,2], Prof. Ashish A. Jadhav[3], Prof. M. M. Pawar[4]

Lecturer, Dept. of ENTC, SVERI's COE (Poly), Pandharpur, India[1]

PG Students, Dept. of ENTC, SVERI's COE, Pandharpur, India[2]

Assistant Professor, Dept. of ENTC, SVERI's COE, Pandharpur, India[3]

Associate Professor, Dept. of ENTC, SVERI's COE, Pandharpur, India[4]

ABSTRACT: This article presents a study of the wide spread prevalence of lost limbs and sensing system which is major concern in present day due to accidents. To assist people paralyzed from waist down and impairments in hands as well as adults unable or very difficult to walk, the proposed voice actuated wheelchair model uses voice control for navigation in familiar environments. The voice of the person is detected by voice capture module and compared with predefined voices loaded in system. By storing a single letter in voice recognition kit for each direction control, the recognition time is reduced drastically and thus quick reach to destination is obtained. As per the voice, the system instructs to immediately move wheelchair with detected voice. The system is also equipped with obstacle avoidance technique a, where the person may not be able to provide proper voices at right time.

KEYWORDS: Voice Actuated Wheelchair; Voice recognition; voice control system; wheelchair control module; voice detection.

I. INTRODUCTION

There are many people with both lower and upper extremity impairments and severe motor disabilities. For them, it is difficult or impossible to drive a conventional wheelchair. A wide range of supportive devices and modern equipment has been developed to help improve their quality of life.

A voice controlled wheelchair can provide easy access for physical disabled person who cannot control their movements especially the hands. It enables a physical disabled person to move around independently using speech recognition controlled wheelchair.

Voice recognition has been an active research area for a long time because it is the initial important step in many different applications, such as Health care, Automatic wheelchairs, automated phone systems, Google Voice, Car Bluetooth.

Various methods of operation have been developed to accommodate such users. A common approach is to utilize eye tracking, blink detection and gaze direction estimation. These approaches use a camera placed in front of the user to operate an electric wheelchair. Another approach is a voice and gesture based system has been developed to control a wheelchair using voice commands and moment of hand. Another described the system which is driven by the voice commands and touch sensors.

This article is motivated by the possible issues with voice controlled wheelchair such as recognition of voice commands to control wheelchair direction with users safety where every automation engineer can showcase his/her creative and technical skills.

II. RELATED WORK

Anoop.K.J et.al [1], worked on Voice Controlled Wheel Chair Incorporated with Home Automation that describes the design of a voice controlled wheelchair and home appliances using embedded system. This system is incorporating both wheel chair control through voice and the home automation which provides reliability, safety and comfort.

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Jayesh K. Kokate and A. M. Agarkar [2], demonstrated the voice operated wheel chair for handicapped person in which Voice command input is taken from android mobile and converted into the text and this text is given to Microcontroller via Bluetooth module to control the operation of DC motors.

R. Puviarasi et.al [3], proposed a Low Cost Self-assistive Voice Controlled Technology for Disabled People describes the design of an innovative and low cost self-assistive technology that is used to facilitate the control of a wheelchair and home appliances by using advanced voice commands of the disabled people.

Ms. S. D. Suryawanshi et.al [4], reported the powered wheelchair depends on the motor control and drive system which consists of ARM Processor LPC2138 and DC Motor. Once the voice recognition system recognizes the voice commands in comparison to the pre-stored memory, the respective coded digital signals would be sent to ARM Processor which then controls the wheelchair accordingly. Also for the purpose of demonstration of wheelchair movement using eye motion, a wheelchair model is designed in this project

This paper, Ruíz-Serrano et.al [5], proposes the development of a speech control system to drive a wheelchair as an alternative for patients with severe disabilities.

K. SUDHEER et.al [6], published a paper on A voice and gesture based system has been developed to control a wheelchair using voice commands and moment of hand i.e. MEMS sensor is connected to hand. In the speech recognition module, hidden Markov models are used as the main method in recognizing voice commands. The MEMS sensor senses the angle of the hand.

Users with severe motor impairment may find it difficult to operate a wheelchair when they are in tight space (e.g., passing doorway) or when avoiding obstacles since they cannot command the wheelchair by means of a conventional joystick. Here we, Mohd Razali et.al [7], propose a framework that can assist users to overcome such circumstances using a hierarchical semi-autonomous control strategy.

Qadri, M.T. [8] proposed a novel method to process analog voice signal. The theme is implemented for the parallelized persons by voice activated wheelchair. It also generates different desired analog signals according to the spoken words which further amplified and converted into digital. These digital signals are used to operate the motor.

Nishimori, M. et.al [9] worked ona voice controlled wheelchair. The user can control the wheelchair by voice commands, such as "susume (run forward)" in Japanese. A grammar-based recognition parser named "Julian" is used in the system.

G. Pacnik et.al [10], worked on Voice Operated Intelligent Wheelchair – VOIC in which development of the intelligent wheelchair lab prototype is shown. VOIC is designed for physically disabled person, who cannot control their movements and control the wheelchair with the joystick. Voice recognition begins with input signal sampling, word isolation, LPC kestrel analysis, coefficient dimension reduction and trajectory recognition using fixed point approach with neural networks. Wheelchair control system is divided into system for sensors data acquisition and system for wheelchair steering.

As interest in robotics continues to grow, robots are increasingly being integrated into everyday life. The results of this integration are end-users possessing less and less technical knowledge of the technology. For example, consider the application of mobile robots in the health care industry, where the intended end users are patients themselves. In this case, the need for simplified, reliable, and user-friendly robot designs is of almost importance. So this project reduces the mystery of robotics to average user [11].

The DTMF technology is associated with digital telephony and provides two selected O/P frequencies (One high band and one low band). The DTMF technique consist of 16 common alphanumeric characters (0-9, A-D, *, #) on the telephone. Each characters is uniquely referenced by selecting one of the four low band frequencies associated with the matrix rows, coupled with selecting one of the four high band frequencies associated with the matrix columns [12].

Where wl and wh are the low and high frequencies of the sine waves being used, A and B are the amplitude of the signals and φ is the initial phase shifts [17].

In the article the underwater research vehicle is controlled by a mobile (with 4G support) which makes a video call to the mobile phone (with 4G support) attached to the vehicle. In the course of a video call if any button is pressed a tone corresponding to the button pressed is heard at the other end of the call. This tone is called DTMF tone [11]. The vehicle perceives this DTMF tone with the help of phone stacked in the vehicle. The processing of received DTMF tone is done by microcontroller with the help of DTMF decoder. The decoder decodes the DTMF tone into its equivalent binary digit and this binary number us sent to the microcontroller. The microcontroller is pre-programmed to take a decision for any given input. Any mobile which makes a video call to the mobile phone stacked in the underwater research vehicle will acts as remote. So, this is a simple robotic project which even does not require the construction of receiver and transmitter kits, but has an innovated application of cell phone, 3G and robust control [13].

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III. PROBLEM STATEMENT

The proposed design is to overcome the disadvantage of voice controlled wheelchair. The current voice controlled wheelchair cannot respond to the voice command immediately due to processing time required in voice recognition system, resulting in uncontrolled movements of wheelchair which represents a significant burden for the patient who paralyzed from waist down and even can't move their legs. The aim of this project is to design and implement a wheelchair for handicapped person which is controlled with the voice command from handicapped person.

IV. OBJECTIVES

The main goal of this system is to design and implement a wheelchair for handicapped person which is controlled with the voice command from handicapped person. The long term objectives of this proposed system are;

- To design and simulate a voice actuated miniature model of wheelchair with the help of simulation software.
- To recognize voice command by Voice Recognition system for the control of the wheel chair
- To design a voice control system using microcontroller.
- To interface Voice Recognition circuit with voice control system to control a proposed model of wheelchair.
- To build a wheelchair control module to move in response to the disabled person's voice.

V. METHODOLOGY

A. *Block Diagram:*

The overview of Block diagram of proposed system is as shown in following figure.

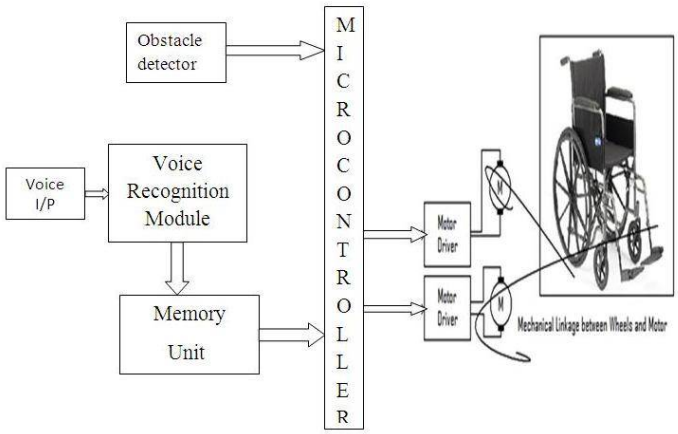

Fig.1. Block Diagram of a Voice Actuated Miniature Model of Wheelchair for Handicapped Person.

The brief introduction of proposed system will be as follows:

B. *Voice Input*

Spell voice input for further processing is the first step of voice recognition. As the proposed system for voice recognition is based on voice of person with physically challenged person to move inside the home without any difficulty.

C. *Voice Recognition system*

Firstly voice recognition module means a system for computer analysis of the human voice, especially for the purposes of interpreting words and phrases or identifying an individual voice. Here we have to use a voice recognition module to detect and convert detected voice command into binary signal.

Types of voice recognition systems:

- Speaker dependent system - The voice recognition requires training before it can be used, which requires you to read a series of words and phrases.
- Speaker independent system - The voice recognition software recognizes most users' voices with no training.

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- Discrete speech recognition - The user must pause between each word so that the speech recognition can identify each separate word.
- Continuous speech recognition - The voice recognition can understand a normal rate of speaking.
- Natural language - The speech recognition not only can understand the voice but also return answers to questions or other queries that are being asked.

D. *Obstacle detection*

A sensor is an electronic instrument which is used to sense certain characteristics of its surroundings by either emitting and/or detecting infrared radiation.

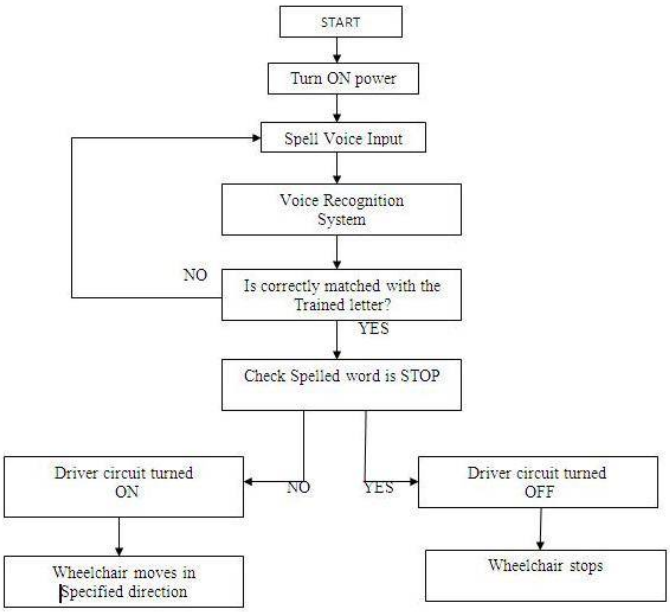

Fig.2. Flowchart.

VI. EXPECTED RESULTS

With the full fledged Design and Implementation of a Voice Actuated Miniature Model of Wheelchair, Handicapped Person will be able to do his/her day to day activity at own without taking help from others with user safety. This can be done with just a voice command of Handicapped Person which is readily trained to proposed system. End results of the work would be a wheelchair that operated with speaker dependent voice with high degree of accuracy and reliability.

VII. CONCLUSION AND FUTURE WORK

In his proposed system Voice Controlled Intelligent wheelchair, with voice control and obstacle detection is developed. The wheelchair we developed is more useful for the patient who paralyzed from waist down and even can't move their finger. It will be helpful to prevent uncontrolled movements of voice actuated wheelchair due to processing time required in speech recognition system.

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BIOGRAPHY

Renuka Wadekar is a PG Student in the Electronics and Telecommunication Department, SVERI's COE, Pandharpur. She received Bachelor of Engineering (BE) degree in 2011 from SVERI's COE, Pandharpur, India. Her research interests are Wireless Communication, Voice recognition, Embedded system etc.