SPEECH *CONTROLLED* SMART WHEELCHAIR USING REGIONAL LANGUAGES

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***Abstract*:** People with physical disability or subjected to other injuries who cannot walk will use wheelchairs. In today's world, development is so enhanced that it assures to develop a smart wheel chair. This paper presents a smart wheelchair which is developed to monitor the movement of wheelchair based on speech using regional languages for physically disabled people. To monitor this wheel chair inbuilt speech functions of regional languages are used. This system allows the user to robustly interact with the wheelchair at different levels of the control and sensing.

Keywords: Smart Wheelchair, Physically disabled, Regional languages, Speech function, Microcontroller

I. INTRODUCTON

Background scenario

According to World Report on disability [1] presented by World Health Organization (WHO), there are 70 million people handicapped in the world. Nowadays due to road accident and disease like quadriplegics the number of handicapped people is increasingdrastically. Percentage of physical disabilitystands first among all disabilities. Usually, handicapped people will have to be dependent on other people for their daily activities like transport, food and movement.

Indian Statistics on Disabilities

At every moment population of India is increasing rapidly. In India 120 million people are disabled in which 41.32% are physically handicapped.

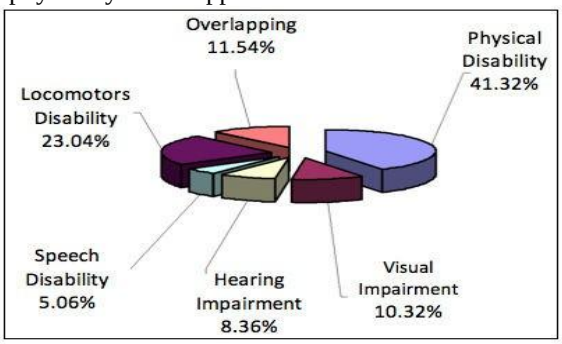

Fig 1: Statistics of Physical Disability in India

The aim of the project is to use wheelchair automatically and operate using voice through mike for moving forward,backward, left and right as well [2]. Quadriplegics and Multiple Sclerosis patients have severe disabilities and cannot drive joystick operated traditional wheelchair [5]. The limitation oftraditional wheelchair is bulkiness, flexibility and limited function.

A regional language is a language spoken in an area of sovereign state, whether it be a small area, a federal state or province, or some wider area. People who are illiterates, who does not know English will communicate through regional languages.

A wheelchair fitted with Obstacle Sensor, Motor and Mike to help driver to achieve independent mobility. By just giving commands using regional languages through mike the wheelchair can be moved in4 directions. The obstacle sensor can help the rider control the wheelchair by taking over some of the responsibility for steering and avoiding objects until the user is able to handle the job. The approach allows the user to use human voice synchronize with the movement of wheelchair so that they can use it with comfort.

The complexity is reduced by making use of mike. So that the size of the system is very compact.

Wheelchair is integrated with voice so that handicapped people who cannot walk, who does not have hands can move chair by voice commands through mike.

Taking advantage of technological evolution in order to increase the quality of life for handicapped people and facilitate their integration into the working world [2].

II. EXISTING METHODOLOGY

(a) Masato Nishimori, Takeshi Saitoh and RyosukeKonishi(2007) Voice commands are used for mobility of the wheelchair. Voice recognition is based on reaction commands which is given through headset microphone and a laptop.

(b) K.Sudheer, T.V Janardhanarao, Ch.Shridevi M.s Madhan Mohan(2012) Voice and gesture based electronic powered wheelchair using ARM used combination of speech and gesture recognition .In this speech recognition module ,hidden markov model are used. The MEMS sensor is used and it senses the angle of hand . For Voice recognition the voice IC is used.

(c) M. Prathyusha ,K.S Roy, Mahboob Ali sheikh(2013 April) Voice and touch screen based direction and speed control of wheelchair. The speech recognition system uses programmable speech recognition circuit. The speed controller works by varying the average voltage sent to the motor.

(d) Rakhi A. Kalautri , D.K Chitre (2013) Used automatic gesture recognition system based on acceleration sensor here used is 2–axis .By calculating amount of tilt and output of tilt will decide to more in which direction.

III. APPLICATIONS OF SMART WHEELCHAIR

-Hospitals
-Sports
-Physically handicapped individuals

IV.ARCHITECTURE OF SPEECH CONTROLLED SMART WHEELCHAIR

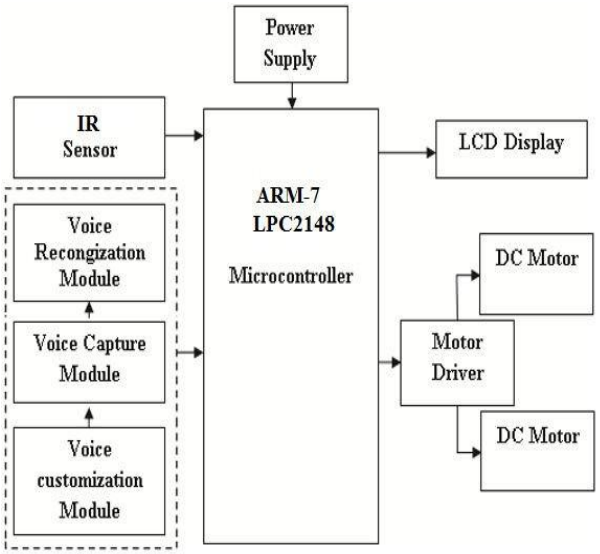

Fig 2: Block diagram of speech controlled smart wheelchair

Fig 2 presents block diagram of proposed Speech controlled Smart Wheelchair. There are 6 modules in it. They are power supply module, speech recognition module, Infrared module, LCD display module, Driver motor interface module and Microcontroller module. Microcontroller acts as a main controller. Input of 5V is provided to microcontroller through power supply module which can drive the remaining modules. The speech recognition module contains 3 sub modules in it, which are Voice recognition module, Voice capture module and Voice customization module. For training the kit to receive sound commands signals in which user gives customized commands using keypad present in the kit which can lead directions of the wheelchair such as FORWARD, BACKWARD, RIGHT, LEFT AND HOLD ON is given by Voice Customization module. The microphone present in the speech kit for capturing the speech commands is utilized by Voice Capture module. Then it will convert the received commands into binary codes according to its frequency of the speech command which are compared with predefined commands stored in the microcontroller. Comparing the binary codes converted with the one stored in the microcontroller then utilizing these command if both are alike is handled by Voice Recognition module.

To sense certain characteristics of surroundings Infrared Sensors are used. It senses either by emitting and/or detecting through Infrared radiations.In our project, it also acts as an obstacle detector.If obstacles are detected then it switches off the system immediately and the buzzer rings.

We also make use of LCD [Liquid Crystalline Display]. It is used to display the given commands.

V. RESULTS

The prototype system is implemented on small wooden chair. In this project, we make use of Regional Languages which will help people to communicate and operate the wheelchair in their own languages. Infrared sensor is interfaced with the microcontroller which detects obstacles and calculate the distance from the wheelchair and switch off the movement immediately and rings the buzzer. Under the back wheeled foot of wheelchair 2 DC motors are fixed which drive the wheelchair in different directions. The speech recognitions, driver interface, microcontroller, infrared sensor and power supply modules are implemented using Embedded C programming. To drive the DC motors in clockwise and anticlockwise directions, the microcontroller is programmed based on the requirement. The DC motor is controlled by 4 relays for themovement of the wheelchair according to the current commands received from the microcontroller. For forward and backward movement; both DC motors are rotated in clockwise and anticlockwise direction, respectively. For turning left, the left motor moves anticlockwise and for right movement, right motor moves clockwise on. Finally if an obstacle is to be detected by infrared detector, the microcontroller sends signals to both DC motors to stop operating immediately and the buzzer rings. In case of Emergency, Panic button is also included when pressed the buzzer rings. LCD module displays the command from the microcontroller.

Serial No.	COMMANDS	DIGITAL SIGNALS	ACTIONS PERFORMED
1	Mundhe	1010	Forward
2	Hindhe	0101	Backward
3	Eda	0010	Left
4	Bala	1000	Right
5	Edakke tirugu	0110	Instant Left
6	Balakke tirugu	1001	Instant Right
7	Nillisu	0000	Stop
8	Mundu	1010	Forward
9	Venaka	0101	Backward
10	Edamu	0010	Left
11	Kuda	1000	Right
12	Edam vaipu	0110	Instant Left

	tirugu		
13	Kuda vaipu tirugu	1001	Instant Right
14	Nilupu	0000	Stop
15	Front	1010	Forward
16	Back	0101	Backward
17	Left	0010	Left
18	Right	1000	Right
19	Instant Left	0110	Instant Left
20	Instant Right	1001	Instant Right
21	Stop	0000	Stop

TABLE I: List of Commands on which Speech controlled Smart Wheelchair operates

VI. CONCLUSION

By using regional languages majority of the people can operate the wheelchair comfortably. Microcontroller LPC2148 is programmed to move the wheelchair in all required directions. The speech recognition kit identifies the voice instruction provided to move the chair according to given directions or to stop. Infrared detector module detects the intruders that may appear in the path and stops the wheelchair for the response of identifying the intruder. LCD display is used to show the logic operation performed by the wheelchair. The DC motor is driven through 4 relays by the microcontroller instructions. The proposed wheel chair functions as a voice controlled load carrying robot that is very useful for aged and physically challenged people.

Instead of using voice recognition can use eye retina using optical sensor to move wheelchair in different directions. Tongue operated assistive technology is possible to access to android phone applications using Bluetooth link.

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