



# Joystick and Voice Recognition for Physically Challenged and Paraplegic Persons

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## Abstract:

Wheelchairs are utilized by the general population who can't stroll because of physiological or physical disease, damage or any incapacity. They can't move anyplace like a typical individual. Consequently they generally rely upon the other individuals. To help individuals with such imperfections, the proposed shrewd wheelchair framework utilizes double control for route in commonplace conditions. The two methods of information control to the wheelchair are voice recognition and joystick. The development of wheelchair can be control physically by the voice and joystick. When one need to alter the course, the summon is actualized by utilizing joystick and after that the order is sent to the pic-microcontroller board where the controller PIC16F877A will process the charge. In the wake of handling the controller send the charge as advanced flag to the engine driving IC and the engine driving IC control the development of wheelchair. In the projected structure is a joystick and voice controlled wheelchair robot. The voice of the individual is recognized by voice catch module and that contrasted and predefined voices stacked in the framework by voice acknowledgment module. As per the got voice, the goal is naturally comprehended and the wheelchair moves as indicated by the course which is predefined. The wheelchair can naturally explore from one point to other in the recognizable condition according to charge from the voice module.

**Keywords:** Analog Joystick, DC motor driver, voice Recognition, PIC Microcontroller PIC16F877A, PWM technique, wheelchair.

## I. INTRODUCTION

In the present time, an expected 1% of the total populace needs a wheelchair. An expanded level of elderly and crippled individuals who need to upgrade their own portability, for them wheelchair is the best assistive gadget. An incapacitated or an invalid individual (for the most part the handicap of the lower some portion of the body) can think that its advantageous to move around and move utilizing the assistance of a seat built on wheels which can either be pushed by another individual or impelled either by physical power or electronically. Such a seat is called as a Wheelchair. Some current wheelchairs are fitted with pc for the signal acknowledgment. In any case, making utilization of the pc alongside the seat makes it bulkier and expands many-sided quality. This multifaceted nature is lessened by making utilization of the MEMS accelerometer, the measure of which is exceptionally conservative and can be put on the fingertip of the patients. Other existing frameworks, which make utilization of the comparative sort of sensors are wired, which again expands the multifaceted nature of the framework. They additionally restrain the long range correspondence. This multifaceted nature is expelled by utilizing the RF transmission. Signs through RF travel bigger separations. Independent of viewable pathway correspondence, motions through RF travel notwithstanding when there is impediment between the transmitter and collector. The preparing velocity of this framework is made speedier by making utilization of I2C convention. The projected structure encourages individuals to defeat these deformities effectively by helping with the shrewd wheel seat framework. In the proposed double info framework, the joystick control wheelchair is anything but difficult to work. By utilizing the joystick the

physically tested individual can control the growth of wheelchair. In this wander, we have used smaller scale controller to screen and control the structure. In broad daylight gathering, particularly in healing facility the wheelchair is generally utilized and voice acknowledgment unit (HM2007) which comprises of 12 switches among which 4 switches utilized for course control and one change to stop the wheelchair. Also a brake control change is given to maintain a strategic distance from impact. To accomplish the development of all course in the wheel seat, microcontroller is coded with a scope of advanced esteems.

## II. LITERATURE SURVEY

Matlab software is utilized for input flag processing and that flag is given to the ARM Processor LPC2138 which is utilized to control the development of wheelchair by controlling the DC engines. Input to Matlab is furnished with the assistance of headphone according to input flag, controller will choose the operations of dual DC motors [1]. Input is given to the Arduino which is a Microcontroller used to control the motion of wheelchair by means of two ways first route is with the assistance of voice command or second path is with the assistance of a Touch screen. HM 2007 is utilized for voice recognition reason. A switch is utilized to switch between the information strategies. The Arduino controls the development of wheelchair in light of the information flag got from any of information techniques. For growth of wheelchair two DC motors are utilize [2]. Wheelchair is controlled through the voice command and a receptive fuzzy logic regulator is utilized and furthermore a sensor network is utilized to maintain a strategic distance from the crash of wheelchair with snags here responsive fuzzy logic

regulator is utilized in light of the fact that occasionally voice contribution from the client is low and that prompts wrong working of wheelchair. So a fuzzy logic regulator is utilized for legitimate operation of wheelchair. With this receptive fuzzy logic regulator and system of sensors the wheelchair is semi independent in nature [3]. In this strategy client speak in microphone and the voice recognition framework contrasts the voice summon and pre-stored memory and generates a control flag to control the developments of wheels [4, 5 and 6]. Non bio-signal based gadgets give 100% precision and require less training for patients. When all is said in done, non bio-flag based systems which impact usage of joystick to control, taste n-puff control, tongue control, Touch screen controlled, Voice activated, head development following a track and so forth [7]. The Electroencephalography (EEG) records electrical mind signals from the scalp, where the cerebrum flag begins from post-synaptic possibilities, totals at the cortex, and trades through the skull to the scalp. BCI is a gadget that concentrates EEG data from brain and changes over it into gadget control commands utilizing signal handling methods. EEG strategies are non-invasive and low cost. Nonetheless, it conveys great difficulties to signal handling and pattern recognition, since it has relatively poor signal-to-noise ratio and limited topographical determination and recurrence extend [8, 9, and 10]. In accelerometer based wheelchair, we have an acceleration sensor that is otherwise called tilt sensor. When we tilt the protest, the qualities enlisted by sensor are changed and these qualities are given to microcontroller. Contingent upon the track of tilt, microcontroller controls the wheelchair directions as LEFT, RIGHT, FRONT and BACK [11].

### III. BLOCK DIAGRAM OF PROPOSED SYSTEM

Figure.1 illuminates the square diagram of the proposed structure. The power supply of 5v is given to the joystick, microphone, voice recognition IC, and to the driver circuit by utilizing venture down transformer. Switch is utilized to choose input (Voice or joystick) from which the qualities are given to the microcontroller. At the position when appropriate esteems are shown in the LCD, the relay circuit is switched ON utilizing a rationale switch. This drives the DC brushless engines of the wheelchair that are appended at thebackside. The front wheels of the wheelchair are fit for pivoting 360o. The wheelchair can be ceased with the assistance of a similar rationale turn which kills the supply gave to the driver circuit to maintain a strategic distance from crash.

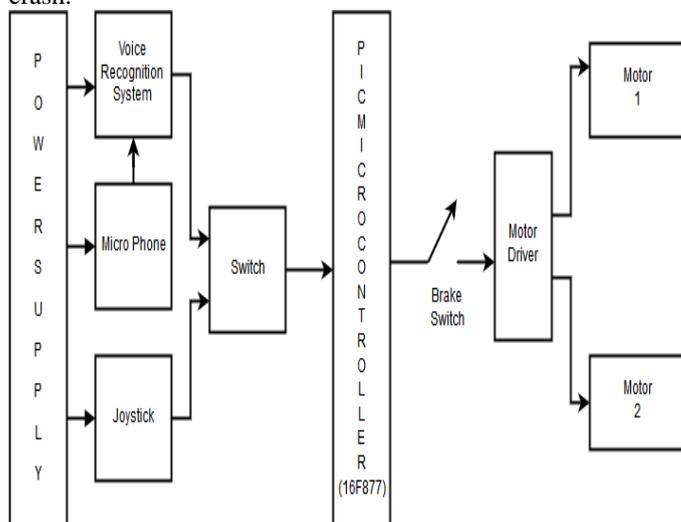


Figure.1 Block Diagram of the Proposed System

### A. VOICE RECOGNITION IC HM2007

ice acknowledgment IC HM2007 is prepared for working in speaker free mode. At first, the voice is recorded to the outer SRAM appended to the IC with the assistance of a specifically associated microphone at the simple info terminal of the HM2007 IC. Once these letters are put away in the SRAM, the framework is prepared to acquire precision for every bearing coded into the microcontroller. Subsequent to preparing, when issue spells the recorded letter through the microphone, the discourse through the microphone is contrasted and the recorded voice and as indicated by that computerized yield is produced. At that point yield of voice recognition IC is then encouraged to the computerized input ports of the PIC microcontroller.

### B. DC BRUSHLESS MOTOR

The projected structure comprises of 2 DC brushless engine at the backside of the wheelchair prototype. These engines are furnished with pulse flag utilizing Pulse Width Modulation (PWM) strategy. A RPM estimation of 200 is set alongside a torque estimation of 1 Nm so as to give the pivot to the wheels. Subsequently the wheelchair prototype of the projected structure can withstand a heap up to 2 kg. The two wheels in the front end of the wheelchair are fit for turning 360o. This causes the wheelchair to swing correctly to the required bearing.

### C. ANALOG JOYSTICK

A basic joystick, now and then called a control stick joystick or thumb stick is an information gadget for a controller that is utilized for two dimensional information. A simple joystick resembles two potentiometers one for the vertical movement(Y-turn) and other for the even movement(X-center point). The joystick moreover goes with a select switch. It can be to a great degree helpful for retro gaming, robot control or RC autos.

Table.1. Bearing Control Keys and their related letters in Voice Recognition System

KEY	LETTER	DIRECTION
1	F	Front
2	L	Left
3	B	Back
4	R	Right
5	S	Stop

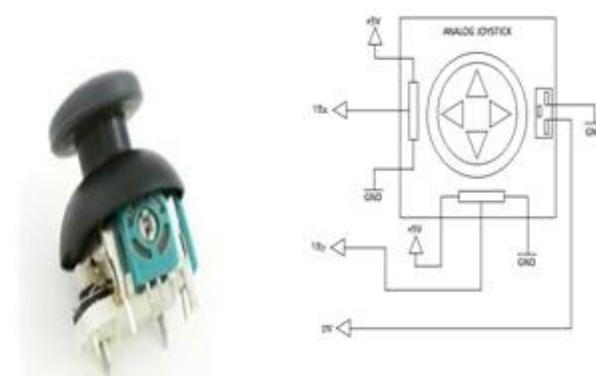


Figure.2. Analog Joystick

**D. PIC MICROCONTROLLER**

It is a 8-bit microcontroller works into a 40 or 44- stick pack up. The PIC16F877A decisions 256 bytes of EEPROM information memory, self programming, two Comparators, eight channels of 10-bit Analog-to-Digital(A/D) convertor, two catch/break down/PWM limits, the synchronous interface may be arranged as the 2-wire Inter- Integrated Circuit transport and a Universal Asynchronous Receiver Transmitter (USART). Those alternatives fabricate it perfect for extra propelled level simple into advanced applications in car, mechanical, apparatuses and customer applications.

**E. WORKING OF PROPOSED SYSTEM**

The proposed framework comprises of the 5-wire resistive joystick and voice recognition framework (HM2007). The voice control IC comprises of 12 switches among which 4 switches utilized for course control and one change to stop the wheelchair. The accompanying are key and their related letters put away in the cradle IC of the HM2007 pack to move the wheelchair the predetermined way is arranged in Table.1. At the point when power supply is turned ON, the subject chooses the sort of information mode by utilizing the information choice switch. Right when the voice mode is picked, supply to the joystick is slaughtered. The subject spells the readied letter through the receiver related with the unit. The comparing key esteem gets showed on the LED appended to the voice pack. This letters when perceived in the microcontroller, it triggers the backside engines of the wheelchair. Therefore the wheelchair moves in the spelled course. When one needs to stop the wheelchair, the letter S is explained. At the point when subject chooses the joystick as the info mode, the supply to the voice recognition is killed and give to the joystick is turned ON. In joystick, to move the wheelchair to the required bearing, the finger is squeezed against the required quadrant. Every quadrant in the joystick comprises of a scope of significant worth for every course that is coded in the microcontroller. When controller perceives the specific esteem; The signal at the yield port is given to the motor driver which drives the motor. This procedure of signal transmission and reception is same for every single working mode. The yield bits from the microcontroller to control the motor driver are appeared in table -2. The hand-off circuit is switched ON utilizing a rationale switch. This drives the DC brushless engines of the wheelchair that are joined at the backside. The 2 wheels in the front end of the wheelchair are fit for pivoting 360o. The wheelchair can be ceased with the assistance of a brake switch to maintain a strategic distance from impact.

**Table.2. Truth Table for Robot Movement**

4 Bit Output of PIC				Direction of Motion
Input to Left H-bridge		Input to Right H-bridge		
0	0	0	0	No Motion
1	0	1	0	Forward
0	1	0	1	Reverse
1	0	0	1	Right
0	1	1	0	Left

**The pseudo code of the algorithm is as follows:**

The pseudo code of the algorithm is as follows:  
 Input: Set of voice command  
 Output: Set of action to their commands(wheelchair moves)  
 F=forward;  
 L=left;  
 B=back;  
 R=right;  
 S=stop;  
 Begin  
 A={F,L,B,R,S}; /\*set of commands  
 stored in microcontroller\*/  
 IF I=forward then  
 F=wheelchair moves forward;  
 Else if H=left then  
 L=wheelchair moves left; Else  
 B=wheelchair moves back;  
 End if  
 IF K=left then L=wheelchair  
 moves left; Else  
 R=wheelchair moves right;  
 End if  
 IF R=back then  
 B=wheelchair moves back;  
 Else  
 S=wheelchair command stop;  
 End if  
 End

**IV. CONCLUSIONS AND FUTURE ENHANCEMENT**

From the framework proposed, it is watched that joystick control has high precision when contrasted with voice recognition framework. This paper depicted the framework which is driven by the voice recognition and joystick. Advance headways should be possible by diminishing the time delay in voice mode and sensors can be appended to the wheelchair to stay away from crash.

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