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Low cost and High Efficient Model for Multi Control Wheelchair Based on an Embedded System

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Abstract -- Multi Control wheelchair device revolves around one main idea is helping people with special needs to have a better independent life. A hardware implementation to a modification of a self-propelled wheelchair is presented in this paper. That modification is to move it electronically and with multi control. That to help people with special needs in different situations rely on themselves only to move from one place to another through the use of three different ways to control the chair. Each control is accordance to the situation of those with special needs. The first control is aimed to those who suffering of the paralysis those cannot move their feet. That control allows them to control the movement of the chair by their hands using the joystick easily. The second control is aimed at those who suffering from paralysis of the quadrilateral and cannot move any of the limbs. That control allows them to control the movement of the chair using voice commands. The third control is aimed at those who suffering from the inability to move any of the limbs and also cannot speak like those suffering from Amyotrophic lateral sclerosis "ALS". That control allows them to control the chair by moving the eyelids "blinks". The chair also has a fourth control, but is not aimed to those with special needs, but it aimed to those responsible for them. While the occurrence of whatever prevents who with special needs from the controlling by himself in the chair. This control allows the responsible to control the chair through the smart phone. The chair also has a high safety system so that the chair will automatically stop in case of any hurdle of about fifty centimeters by using ultrasonic waves. Our smart system is designed and developed to save cost, time, accuracy, energy and dependence on the others. Our system is based on using an embedded system as part of the complete device including electrical hardware component and mechanical parts. Several test results of the multi control systems have been monitored to verify the efficiency of the proposed device.

Keywords -- *wheelchair; electric wheelchair; joystick control; sound control; blinks control.*

I. INTRODUCTION

There are a lot of people around the world suffering of the paralysis with different situations and the wheelchair that using joystick to control the chair is not enough to meet all needs for different situations, in recent years are introduced a lot of research papers over wheelchair based on joystick controller details in [1:3]. Other studies have been developed from the wheelchair control style to control the chair using voice commands for the people who cannot using their hands to using joystick, details in [4 : 8] and other studies made EEG Controlled Wheelchair to control the chair using brain signals for people who cannot move nor speak details in [9 :13, 20]. All of that is coastally and have a big delay in response so we try to development all that and decrease the cost in hope to helping disabled people who suffer from severe obstacles during their movement from a place to another, their problems may be listed as in the need for someone's help to move, unavailability of an electric chair at an affordable price they can buy, the lack of an electric chair with different controls system to aid different situations, and the lack of an electric chair with safety system. On the basis of these problems, we managed to find the idea of an electric chair that helps the user and meets his needs. Our proposed device is on capacity building on disability and human rights advocacy amongst persons with physical disabilities, that's why our goals were to support them by firstly, spread manufacturing culture in support of the disabled in our industrial society. Secondly, manufacturing of different controls wheelchair to transport the disabled solely depending on himself. Third, provide that wheelchair with low coast as possible. Finally, Provide high safety. This paper is organized as, in section two; a mechanical implementation is presented.

An electrical hardware implementation is explained in section three, experiments and results exhibit in section four, section five presents a list of prices of our proposed model, conclusion is introduced in section six, a recommendations is shown in section seven, and finally, section eight presents the future lines.

II. MECHNICAL IMPLEMENTATION

The goal of the process is to convert the Standard Self-Propelled Wheelchair into an electric wheelchair by adding brushed DC motors to the chair. Not only does this save a lot of money by changing the type of engine used in wheelchairs by changing the engine type to a cheaper type and also using two Pulleys with a belt to increase the torque.

A. Mechanical parts

1) Geared DC series motor

It is a brushed dc motor fitted with gearbox, because we need a high torque. We have chosen the best type of dc motors so it is suitable for us, which is series motor because it also contains high torque [14]. As they are having considerable torque, they are most commonly used in robotics.

2) Pulley

It is a mechanical part found in the vehicles of the periodic movement of education (composite on axis) to gear or other mechanical part [15]. The gear differs from the pulley in that the gear is a circular wheel with protrusions (teeth). The gear is stronger than pulley, but it is so expensive. To support the movement and change the direction of the taut cable or belt, or transfer the power between the column and the cable or belt, the chain is used with the reel gears are the wheel on the axis is designed. We are used the pulley, because it is commonly used to cars and factories, and it is cheaper than gears and this suitable for us.

Fig. 1 Pulley

3) Wheel bearing

A wheel loader is a set of steel balls that hold together a metal ring called a race. It helps to rotate the wheels quickly with as little friction as possible. They are used on all types of vehicles from bicycles to airplanes and cars [15].

Fig. 2 Wheel bearing

4) Belt

A belt is a loop of elastic material used to tie two or more rotating shafts mechanically, often parallel. The belts can be used as a source of movement, for efficient power transmission, and the belt used to transfer energy from one column to another by a spin roller at the same speed [15]. The amount of energy transferred depends on the following factors:

- Belt speed.
- The tension by which the belt is placed on the pulleys.
- The situation which the belt is used in it.

B. Design of pulley and belt

We need from this design getting higher torque, so we did the ratio between pulleys 1:3, So, assume the small pulley is radius 5cm and the big pulley is radius 15cm, and the getting higher torque we must make the small pulley be is (driver pulley), and the big pulley is driven Pulley because the torque is directly proportional to the radius. Figure 4 shows the proposed design of pulley

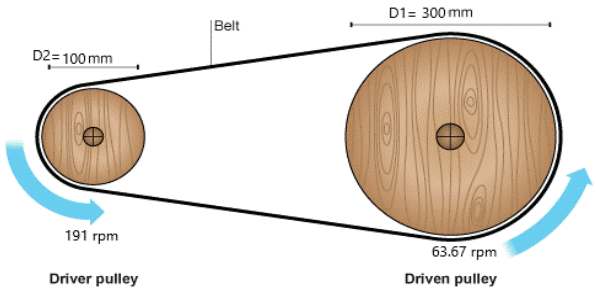


Fig. 3 Proposed design of pulley

III. ELECTRICAL HARDWARE IMPLEMENTATION

The Arduino mega is the brain of the of the whole proposed device as it is the unit that take the readings and results of every equipment individually and take action or give order to another equipment to do or preview. Firstly, it takes the readings of Bluetooth app if the button "X"(on) is pushed the master and only control will be the smart phone and a blue LED will ligating if the button "X" not pushed the control will transform to the controls on chair and that Based on the switch that change the type of control and each control with specific LED color (red for joystick , yellow for VR3 or green for (IR) also ultrasonic sensor continuously send signals to Arduino to know if there is any hurdle of about fifty centimeters to stop the wheelchair all that signals reading by the Arduino and then it send it to the motor driver that control the directions and speed of motors. **B**lock diagram of the proposed model is shown in figure 4.

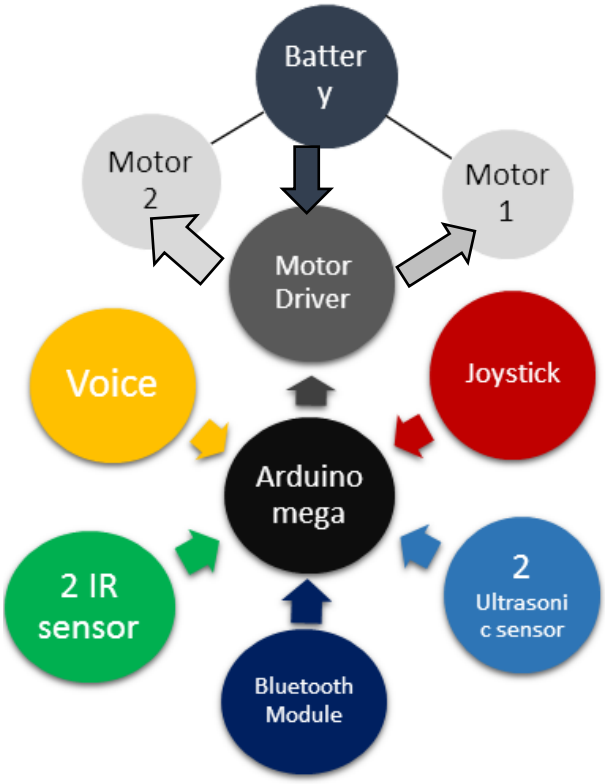


Fig.4 Block diagram component of the proposed model of multi control wheelchair

A. Hardware components

1) Lead Acid Battery

Lead Acid batteries [16] are widely used in automobiles, inverters, backup power systems etc. it consists of a series of plates kept immersed in sulphuric acid solution. The plates have grids on which the active material is attached. The plates are divided into positive and negative plates. Positive plates retain pure lead as active material while lead oxide is attached to negative plates. Figure 5 shows forms of Lead Acid Batteries.

2) MDD10A Motor driver

A motor driver is a little current controller; the function of motor drivers is to take a low-current control signal and then turn it into a

Fig. 5 Lead Acid Batteries

higher-current signal that can drive a motor [17]. So that, for controlling the rotation direction, we just need to inverse the direction of the current flow through the motor, and the most common method of doing that is by using an H-Bridge. An H-Bridge circuit contains four switching elements, transistors or MOSFETs, with the motor at the center forming an H-like configuration. By activating two particular switches at the same time we can change the direction of the current flow, thus change the rotation direction of the motor. On the other hand for controlling the speed, PWM" stands for Pulse Width Modulation which means varying (modulating) the pulse width (vary duty cycle while period is fixed) is used. So, if we combine these two methods, the PWM and the H-Bridge, we can have a complete control over the DC motor. Figure 6 shows a hardware connation of the mdd10A motor.

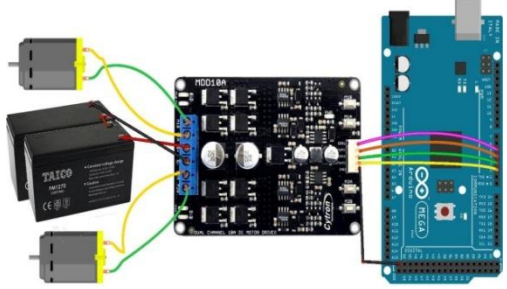


Fig. 6 Hardware connation of the mdd10A motor driver with Arduino mega, battery and motors.

3) ARDUINO MEGA 2560 R3

Arduino is a programabole electronic device, which used in realizing electronic projects. Arduino consists of both a programmable circuit board (often referred to as a microcontroller) and a software piece, or IDE (Integrated Development Environment) that runs on the computer system, used to write and upload computer code to the physical board [18]. The Mega Board runs on the ATmega2560 MCU. The Mega provides everything these other boards do but adds a ton of extra pins to make bigger.

Fig. 7 Arduino Mega board.

4) joystick

A joystick, as shown in Figure 8, is an input device that can be used to control the movement of a cursor in a computer [18]. The cursor movement is controlled by controlling the joystick. The input device is mostly used for children's games, and sometimes for animation applications. In our case, we used the joystick to control the movement of the chair for people with mobility impairments

Fig. 8 Joystick

5) Voice Recognition Module (VR3)

Speech Recognition Module is a compact and easy-to-use speech recognition panel [19]. This product is a voice recognition module that depends on the speaker. Supports up to 80 voice commands in total. Max 7 audio commands can work at the same time. No sound can be trained as driving. Users must train the unit before allowing it to recognize any voice commands. This motherboard has two forms of control: serial port (full function), general input pins (part of function). General output pins on the motherboard can produce several types of waves with recognition of the corresponding voice command. Parameters and properties in [45]. Figure 9 shows VR3. Connecting VR3 pins with Arduino is shown in Table 1. In our case, seven voice commands are used to control our wheelchair as follows: forward, backward, right, left, faster, slower and higher.

TABLE 1

PINS CONNECTIONS OF VR3 ARDUINO

VR3	Arduino
GND	Ground
VCC	5 V
RXD	Digital pin 10
TXD	Digital pin 11

Each commands will compared with an already recorded set of voices and then will send a digital code to Arduino across the digital pins between them then the arduino will send the commands to motor driver across two digital pins to control the direction and two PWM pins to control the speed of motors

Fig. 9 VR3 module

6) IR Sensor

IR is a detector that reacts to infrared (IR) radiation. The two main types of detectors are thermal and photonic (photo detectors) [18 and 21]. We are used the second type (photonic IR sensor), which works by looking for reflected light, it is possible to have a sensor that can return the value of the reflected light. This sensor can be used to measure how "bright" the object is. This is useful for tasks like line tracking and eyes blink details in [46]. Our proposed commands for eye motion controlled wheelchair using IR sensor corresponded as the following:

1- If eyes closed for 1500m second will take command against the current command i.e. if the motors are stopped, the motors will move forward.
2- If eyes closed for 1500 m second again and motors move forward, the motors will stop.
3- If the right eye closed alone for 1500m second and motors stop, the left motor will move alone to forward that's mean the chair will turn right.
4- If the left eye closed alone for 1500m second and motors stop, the right motor will move alone to forward that's mean the chair will turn left. Pins connections of the two IR sensors with the Arduino are shown in table 2.

TABLE 2
PINS CONNECTIONS OF IR SENSORS WITH ARDUINO

IR1	**Arduino**
G	Gnd
S	A2
V	5 v
IR2	**Arduino**
G	Gnd
S	A3
V	5 v

7) Ultrasonic Sensor

Ultrasonic sensors are a type of acoustic sensor divided into three broad categories: transceivers, transceivers and transceivers. Transmitters transmit electrical signals to ultrasound, switching ultrasonic receivers to electrical signals, and both transmitters and receivers can send and receive ultrasound [22]. Figure 10 shows an ultrasonic sensor. We were used the ultrasonic sensor in, when the ultrasonic sensor detect object in distance less than 50 cm it will send the information to the Arduino then it (Arduino) will send the information to the driver across two pins PWM! & PWM2 to make the speed equal to zero then the wheel chair will stop. Table 3 exhibits the pin connections of the two ultrasonic sensors, which were used in our proposed model with the Arduino.

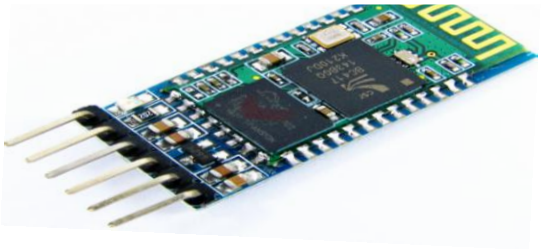
TABLE 3
PINS CONNECTIONS OFULTRASONIC SENSOR WITH ARDUINO

Ultrasonic1	**Arduino**
Trig	27
Echo	29
Gnd	Gnd
Vcc	5 v
Ultrasonic2	**Arduino**
Trig	50
Echo	51
Gnd	Gnd
Vcc	vcc

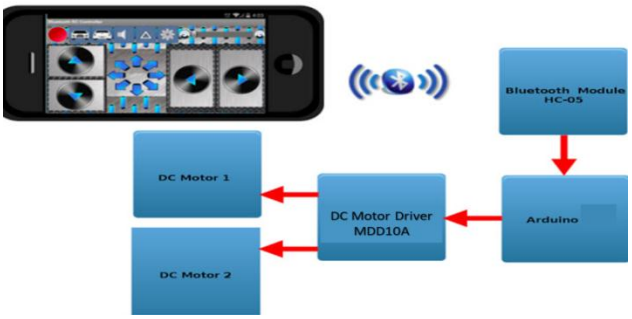
8) Bluetooth Module HC-05

HC-05 embedded Bluetooth has two work modes: automatic connection work mode and order-response work mode. For the automatic connection mode, the data is transmitted automatically by following the default way set. On the other side, the user can send the AT command to the module to set the control parameters and sent control order that is when the order-response is in work mode. For wireless communication The HC-05 Bluetooth Module can be used in a Master or Slave configuration [18 and 21].
Figures 11.a and 11.b show the Bluetooth Module HC-05, and the mobile application block diagram which presents the processes sequence of controlling the wheelchair by the mobile application.

Fig.10 Ultrasonic sensor



(a)



(b)

Fig. 11.a) Bluetooth Module HC-05, b) mobile application block diagram

TABLE4

PINS CONNECTIONS OF THE BLUETOOTH MODULE HC-5 WITH ARDUINO

Bluetooth 1	**Arduino**
Key	Pin 6
RX	Tx1
TX	RX1
VCC	5V
GND	GND
Bluetooth2	**Arduino**
Key	Pin 6
RX	Tx1
TX	RX1
VCC	5V
GND	GND

B. Schematic Diagram Illustration

As shown in figure 12 the schematic diagram consists from about 12 different components and they are, Arduino, motor drivers, two dc motors, two lead acid battery, Bluetooth module, three stage switch, LEDs, joystick, wires, VR3 module, two IR sensor and two ultrasonic sensor. In a continuous will illustrate some technical points in the use of some components, these points are not mentioned above.

1) ***Utility of Arduino***: is considered our control unit in our design, as it regulates the tasks between all surrounding modules, we utilized Arduino mega for providing power supply to other modules in this design, Data transfer between Arduino and the other components.
2) ***Utility of Battery:*** two lead acid battery Use series wiring to increase voltage for our 20-V DC Motors we used to increase the battery voltage level. we are using really big 12-volt industrial batteries the voltage of 2 batteries add to give us the effect of a battery 2 times the voltage in this case a very large 24-volt battery. In this circuit, the current is just the same like the current in the batteries.
3) ***Utility of Bluetooth Module:*** take the commands from smart phone application when pushed the button with "X" value and shape ▲ the Bluetooth will be the only controller in the wheelchair and the blue led will on.
4) ***Three Stage Switch:*** is a switch with two level when we change its small joystick the probabilities will be (pin 1 high & pin 2 low) or (pin 1 low & pin 2 low) (pin 1 low & pin 2 high) for each probability the control will change with new LED color.
5) ***LEDs***: they are based on the switch and the Bluetooth, there is 3 color each color refer for specific control the blue LED for Bluetooth, the red LED for joystick, the yellow LED for VR3 and the green LED for IR.
6) ***Ultrasonic Sensor***: generally is used as an object detector and it detects objects by calculating the time taken of propagating ultrasound waves which are generated from trigger and then reflected to the echo and then by applying a certain algorithm it coverts time into distance, 5 DC volts is applied for the sensor and the trigger pin is connected with a digital port from Arduino as well as the echo pin is connected with digital port too.
7) ***Wires:*** are used for connecting the components with each other for either transmitting data or electricity.

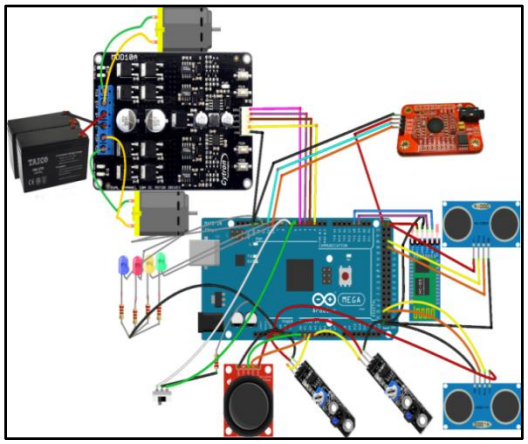


Fig. 12 A complete Schematic diagram of the proposed model

IV. EXPERIMENTS AND RESULTS

A.1. Transformation from Self-Propelled Wheelchair into Electronically Motion Wheelchair.

Figure 13 shows the result of the mechanical transformation of the wheelchair using pulleys and belts.

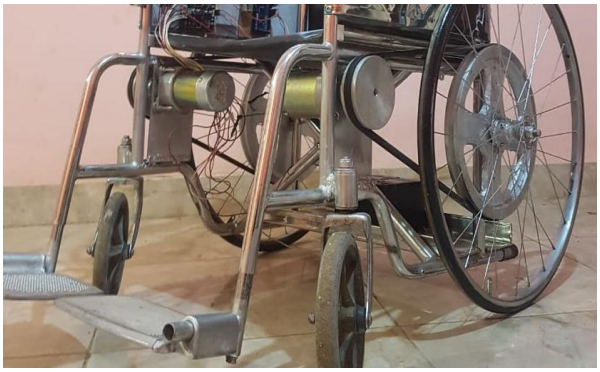


Fig. 13 Mechanical transformation of the wheelchair using pulleys and belts

A.2. *Controlling the Proposed Model by the Bluetooth App*

As shown in figure 12 when the Bluetooth app connected with Bluetooth module and press on the triangle shape the blue LED will light up as shown in figure 14, and then, the control will be only by the Bluetooth app and the three stage switch will not work. Symbols of commands that send to Arduino are shown in table 5

Fig. 14 Blue LED light up indicating to the control of the proposed model is done by the Bluetooth app.

TAPLE 5
SYMBBOLS OF COMMANDS THAT SENT TO ARDUINO

Value	Action	Shape
F	Forward	↑
B	Back	↓
R	Right	→
L	Left	←
X	On	△
x	Off	△

A.3 *Controlling the Proposed Model by the Three-Stage Switch*

When the Bluetooth app turned off, then the control changes to be by using the three-stage switch as shown in figure 15.a, then each color refers to different control. As shown in figure 15.b the Red color refers to controlling by the joystick, in figure 15.c the Yellow color refers to controlling by the voice, and finally, in figure 15.d Green color refers to the Blinks is the controller.

a)

b)

c)

d)

Fig 15 Controlling the proposed model by the three-stage switch, a) three-stage switch and the LEDs, b) Red LED is lighting indicating to controlling by the joystick, c) yellow LED is lighting indicating to controlling by the voice (VR3), d) Green LED is lighting indicating to controlling by Blinks.

A.4. Test results of Performance Accuracy

1) Based on voice commands

In order to evaluate the performance accuracy of our proposed model, four contributors were asked to become a part of testing of our proposed model. Each contributor was asked to give seven commands repeated in four times to give in total twenty eight command words. The accuracy and effectiveness of proposed model performance based on number of times that the system correctly responds. The test was carried in silent and noisy environment by both male and female users. Test results as shown in table 6 confirm the accuracy of the proposed model, which produce a voice recognition rate more than 92% in case of testing is done in noisy environment, and might reach 100% in case of clear environment. The test demonstrated that there is no big difference in recognition rate if the speaker is male or female. Voice commands are translated into a string and presented to Arduino which interprets and stimulates the wheelchair accordingly as shown in Table 7.

2) Based on Eye Commands

In order to test the accuracy of performance of our proposed model controlling by eye commands, it was tested on eight participants, where each person (P1, P2,…P8) was subjected to a total of 45 trial iterations. The trial was conducted to test three principal motions coordinated by corresponding eye movements by means; first state (S1) its, when left/right eyes are closed(Off/off), at that case the left/right motors move forward, second state (S2) its, when left eye is open, while, right eye is closed (On/off), at that case the wheelchair turns to move to right, and finally state (S3), its, when left eye is closed, while, right eye is open (Off/on), at that case the wheelchair turns to move to left. All eye commands and motor conditions are shown in table 8. We must to know that, eyes must keep in closed for 1.5 second. When chair is moving, it can stop if any or each eyes closed for 1.5s. The total number of successful detections out of the net trials conducted (15 trials per eye motion) was logged with their respective accuracy and error percentages as shown in table 9.

TABLE 8
EYE COMMANDS AND MOTOR CONDITIONS

Eye commands	Condition	Left/right motors
Left/right Off/off (s1)	Moving forward	ON/ON forward
Left/right On/off(s2)	Moving right	ON/OFF forward
Left/right Off/on(s3)	Moving left	OFF/ON forward

V. LIST OF PRICES

Cost of our proposed multi control wheelchair in Egyptian pound LE and in USA Dollars is shown in table 10. This is all the cost to produce our proposed model, which is a wheelchair with multiple control methods suitable for the use of different disabilities. Note that the cost of the wheelchair with only joystick controller starts from 900 $.

TABLE 6
TEST RESULTS BASED ON VOICE COMMANDS

Speakers	No. of words spoken	No. of times system Correctly responds	Accuracy
A(Male) Silent Environment	28	28	100 %
B(Female)Silent Environment	28	28	100%
C(Male) Noisy Environment	28	26	92.3%
D(Female) Noisy Environment	28	26	92.3%

TABLE 7

VOICE COMMANDS, CONDITIONS, COMMAND NUMBER, COMMANDS IN BINARY, AND MOTOR CONDITIONS

Voice command	Condition	Command No.	Binary	Left/right motors
Go	Moving forward	01	00000001	ON/ON forward
Back	Moving backward	02	00000010	ON/ON backward
Right	Moving right	03	00000011	ON/OFF forward
Left	Moving left	04	00000100	OFF/ON forward
Stop	Stop	05	00000101	OFF/OFF
Faster	Moving faster	06	00000110	ON/ON Forward/fast
Slower	Moving slower	07	00000111	ON/ON Forward/slow

TABLE 9

TEST RESULTS BASED ON EYE COMMANDS

No. persons	Total no. of detections	Total no. of accurate s1 detections	Total no. of accurate s2 detections	Total no. of accurate s3 detections	Total no. of accurate detections	Accuracy	Error
P1	45	15/15	15/15	15/15	45	100%	0%
P2	45	15/15	14/15	14/15	43	95.5%	4.5%
P3	45	15/15	14/15	13/15	42	93.3%	6.7%
P4	45	15/15	15/15	15/15	45	100%	0%
P6	45	14/15	13/15	13/15	40	88.9%	10.1%
P7	45	13/15	15/15	14/15	42	93.3%	6.7%
P8	45	14/15	15/15	15/15	44	97.7%	2.3%

TABLE 10
LIST OF PRICESOF OUR PROPOSED WHEELCHAIR MODEL

Component	**Price in Egyptian pound**	**Price in USA Dollar**
Standard Self-Propelled Wheelchair	used 300 LE new 1700 LE	used 25 $ new 100 $
Turning	1000 LE	60 $
Belt	50 LE 2x 100 LE	3 $ 2x 6 $
MDD10A Dual Channel Motor Driver	500 LE	27.5 $
Dc motor	Used 500 LE 2x 100LE	24.7 $ 2x 49.4 $
Arduino Uno china	140 LE	3.5 $
Ultrasonic Module HC-SR04	45 LE 2x 90 LE	1 $ 2x 2$
Bluetooth Module HC-05	125 LE	3.5 $
Lead Acid Battery 12v 7AH	275 LE 2x 550LE	16 $ 2x 32 $
Wires and connectors	100 LE	5$
Joystick	30 LE	1 $
Cost for joystick *Only with Arduino Uno*	**Used 3805 LE** **New 5205 LE**	**Used 215 $** **New 290 $**
VR3	375 LE	18 $
Cost for voice *Only with Arduino Uno*	**Used 4150 LE** **New 5550**	**Used 232 $** **New 307 $**
IR sensor TCRT5000	10 LE 2x 20 LE	0.75 $ 2x 1.5 $
Glasses frame	50 LE	2 $
Cost for blink *Only with Arduino Uno*	**Used 3845 LE** **New 5245 LE**	**Used 217.5 $** **New 292.5 $**
Arduino Mega 2560 china	260 LE	7 $
Cost for all controls in one wheelchair with Arduino mega	**Used 4420 LE** **New 5820 LE**	**Used 661 $** **New 886 $**

VI. CONCLUSION

A hardware implementation to a modification of a self-propelled wheelchair is presented in this paper. That modification is to move it electronically and with multi control. That to help people with special needs in different situations rely on themselves only to move from one place to another through the use of three different ways to control the chair. Each control is accordance to the situation of those with special needs. The first control is aimed to those who suffering of the paralysis those cannot move their feet. That control allows them to control the movement of the chair by their hands using the joystick easily. The second control is aimed at those who suffering from paralysis of the quadrilateral and cannot move any of the limbs. That control allows them to control the movement of the chair using voice commands. The third control is aimed at those who suffering from the inability to move any of the limbs and also cannot speak like those suffering from Amyotrophic lateral sclerosis "ALS". That control allows them to control the chair by moving the eyelids "blinks". The chair also has a fourth control, but is not aimed to those with special needs, but it aimed to those responsible for them. While the occurrence of whatever prevents who with special needs from the controlling by himself in the chair. This control allows the responsible to control the chair through the smart phone. The chair also has a high safety system so that the chair will automatically stop in case of any hurdle of about fifty centimeters by using ultrasonic waves. Our smart system is designed and developed to save cost, time, accuracy, energy and dependence on the others. Our system is based on using an embedded system as part of the complete device including electrical hardware component and mechanical parts. Several test results of the multi control systems have been monitored to verify the efficiency of the proposed device.

VII. RECOMENDATIONS

1. Multi control wheelchair provides the special needs for the disabled as its different controls for the different paralysis cases

2. The seat provides the user comfort and driving ease.

3. In addition, we aimed to choose an elongated life-time battery for use

4. The system's movement depend mainly on electric energy which shows our advocacy for the lead of clean environment.

5. When it gets to the safety, we use the ultra-sonic sensor for calculate the distance of the obstacle and in case there is any obstacle at 50 cm from the chair the chair will stop automatically.

6. For emergency when the rider cannot control himself we provide control via mobile for that who Responsible for him.

VIII. FUTURE DEVELOPMENT

1. Auto-Open Auto-Close Umbrella based on rain sensor

   The idea is to add an umbrella to open when it rains that will based on a rain sensor to sensing the existence of the water and then send the signals to Arduino then the Arduino send the order to the servo that is control the motion of the Umbrella.

2. GSM and GPS modules for the emergency

   The idea is the chair will be always know it's the current area when accident happened the wheelchair will automatically send an alarm message with the location area.

3. Connect the wheelchair with a Google Assistant

Imagine you have an Assistant that help you in navigation, calls, send a message and a lot of things with just your Voice commands

References

[1] Thomas R, Christian M, and Tim L. Controlling an Automated Wheelchair via Joystick/Head-Joystick Supported by Smart Driving Assistance. 2009 IEEE 11th International Conference on Rehabilitation Robotics Kyoto International Conference Center, Japan, pp. 743-748, June 23-26, 2009.

[2] Alonso A. Alonso, Ramón de la Rosa, Albano C. A Control System for Robots and Wheelchairs: Its Application for People with Severe Motor Disability. Mobile Robots – Current Trends, pp. 105-127, 26, October, 2011

[3] Yassine R , Makrem M, and Farhat F. Intelligent Control Wheelchair Using a New Visual Joystick. Hindawi, Journal of Healthcare Engineering, pp. 1-21, February 2018

[4] Azam, G., and M. T. Islam. Design and Fabrication of a Voice Controlled Wheelchair for Physically Disabled People" International Conference on Physics Sustainable Development & Technology, pp 80-90, 2015 .

[5]Andrej Š, Anton Z. Speech-controlled cloud-based wheelchair platform for disabled persons. Journal of Microprocessors &Microsystems, Elsevier Science Publishers B. V. Amsterdam, Volume 39 Issue 8, November 2015, Pages 819-828.

[6] Klabi I., Masmoudi M.S., Masmoudi M., Advanced user interfaces for intelligent wheelchair system, 1st IEEE Conference on Advanced Technologies for Signal and Image Processing, Tunisia, pp.130-136,2014.

[7] Deepak K. Lodhi, Prakshi V, Addala. V, and Prashant S. Smart Electronic Wheelchair Using Arduino and Bluetooth Module. International Journal of Computer Science and Mobile Computing, Vol. 5, Issue. 5, May 2016, pg.433 – 438.

[8] Ritika P, Narender K.. Android Mobile Phone Controlled Bluetooth Robot Using 8051 Microcontroller. International Journal of Scientific Engineering and Research, Volume 2, pp. 14-17, July 2014.

[9] Nikhil R. Folane , R. M. Autee,"EEG Based Brain Controlled Wheelchair for Physically Challenged People",International Journal of Innovative Research in Computer and Communication Engineering , pp. 134-137, January 2016.

[10] Arjon T. Member, Demi S, Mardi T, Endra J. EEG-based brain-controlled wheelchair with four different stimuli frequencies. Internetworking Indonesia Journal, pp. 64-69, 21 March 2017.

[11] A. Turnip & M. Siahaan. Adaptive Principal Component Analysis based Recursive Least Squares for Artifact Removal of EEG Signals. Advanced Science Letters, pp. 2034-2037, October 2014.

[12] A. Turnip & K. S. Hong. Classifying mental activities from EEGP300 signals using adaptive neural network. Int. J. Innov. Comp. Inf. Control, pp.1-7, 2012.

[13] M. Kh. Hazrati and A. Erfanian. An online EEG-based brain-computer interface for controlling hand grasp using an adaptive probabilistic neural network. Medical Engineering & Physics, pp. 730-739, 2010 .

[14] Zisu Ding. Motor Comparison & Selection For Electric Jet Ski. School of Electrical and Electronic Engineering, University of Western Australia, pp.16-22, October 26th 2015.

[15] Hibbeler, R. C, "Engineering Mechanics", Pearson, Prentice Hall, p.393.

[16] Battery Technology for Data Centers and Network Rooms: U.S. Fire Safety Codes Related to Lead Acid Batteries, Schneider Electric – Data Center Science Center, P31, 2012.

[17] Cytron Technologies "MDD10A Dual Channel 10A DC Motor Driver.pdf", User's Manual, pp.1-11, June 2017.

[18] Elegoo,"THE MOST COMPLETE STARTER KIT TUTORIAL FOR MEGA2560", Article available at www.elegoo.com , pp.32-42, 2017.

[19] Ali A. Abed "Design of Voice Controlled Smart Wheelchair", International Journal of Computer Applications, Volume 131 – No.1, pp. 32-38, December2015

[20] Sim Kok Swee, Kho Desmond Teck Kiang and Lim Zheng You "EEG Controlled Wheelchair", MATEC Web of Conferences, Malaysia, published by EDP Sciences, pp. 1-9, 2016

[21] Deepak K. Lodhi , Prakshi V, Addala V , Prashant S , Ritakshi G , Manoj K.. Pandey & Rajat B. Smart Electronic Wheelchair Using Arduino and Bluetooth Module. International Journal of Computer Science and Mobile Computing, Vol.5 Issue.5, pg. 433-438, May- 2016.

[22] M. Jain, S. Puri, S. Unishree. Eyeball Motion Controlled Wheelchair Using IR Sensors. International Journal of Computer, Electrical,

Automation, Control and Information Engineering Vol:9, No:4, pp. 1012-1015, 2015.

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