Human and Machine Interface for Controlling Smart Wheelchair

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Abstract - The purpose of this project is to serve these people by automating the process of moving in direction using Different methods. First kind of interface is push button switches in which displays arrow keys so that the user can move in direction of his/her choice. Similarly, wheelchair can be controlled using Hand Gesture, as well as android phone and joystick. Smart Wheelchair is mechanically controlled devices designed to have self-mobility with the help of the user command.

Key Words: Arduino, Android, Bluetooth, Push Button, Joystick, Hand Gesture

1. INTRODUCTION

Smart Wheelchair is automatically controlled devices designed to own self mobility with the assistance of the user command. This reduces the user's human effort and force to drive the wheels for chair moreover it conjointly provides a chance for visually or physically impaired persons to maneuver from one place to a different. These devices area unit helpful particularly in transportation from one place to a different. The machines may also be employed in maturity homes wherever the maturity persons have problem in their movements. The devices function a boon for people who have lost their mobility.

2. LITERATURE SURVEY

K. Shiva Prasad1, Prince Kumar2, E.V.N.Paradesi, Smart chair is automatically controlled devices designed to possess self-mobility with the assistance of the user command. This reduces the user's human effort and force to drive the wheels for chair. The chair is additionally given obstacle detection system that reduces the possibility of collision whereas on the journey. sensible chair has gained heaps of interests within the recent times. These devices are helpful particularly in transportation from one place to a different. The machines can even be utilized in adulthood homes wherever the adulthood persons have problem in their movements. The devices function a boon for those that have lost their quality. differing types of sensible chair are developed within the past however the new generations of wheelchairs are being developed and used that options the utilization of computer science and therefore leaves a bit to tinker close to the user UN agency uses the wheelchair. The project additionally aims to create the same chair which might have a kind of intelligence and therefore helps the user on his/her movement.

Jesse Leaman, and Hung M. La, Senior Member, IEEE, A smart chair (SW) may be a power chair (PW) to that

computers, sensors, and helpful technology square measure connected. within the past decade, there has been very little effort to supply a scientific review of sou'-west analysis. This paper aims to supply a whole progressive summary of sou'-west analysis trends. we tend to expect that the knowledge gathered during this study can enhance awareness of the standing of latest PW moreover as sou'-west technology and increase the practical quality of individuals WHO use PWs. we tend to consistently gift the international sou'-west try, beginning with Associate in Nursing introduction to power wheelchairs and therefore the communities they serve. Then we tend to discuss well the sou'-west and associated technological innovations with a stress on the foremost researched areas, generating the foremost interest for future analysis and development. we tend to conclude with our vision for the long run of sou'-west analysis and the way to best serve individuals with every type of disabilities.

3. METHODOLOGY

Arduino is Associate in Nursing open supply platform and that we will do several comes with the utilization of it. In this, Arduino receives the input from the user and analyze it whether or not the input matches the command aren't. to manage via Bluetooth command is given to the Arduino by Associate in Nursing humanoid app(Blue Term),Push button is that the another methodology moving four ways in which of direction, Hand gesture(accelerometer) is another methodology for moving completely different directions, still as joystick is employed for moving directions

4. WORKING

Arduino UNO has fourteen digital I/O pins of that six provides PWM outputs and six analogue pins. it's non-volatile storage of 8KB and SRAM of 1KB. we have a tendency to used it for a wheelchair management. It controls the system of wheelchair and also the Arduino is controlled by the user's completely different commands. The Bluetooth module is connected with the Arduino UNO. we have a tendency to use it to transmit and receive the signals from the user. The RX pin of the Bluetooth is connected with the American state pin of the Arduino and also the American state pin of the Bluetooth is connected with the RX pin of the Arduino. The RX pin of Arduino receives the data from the user and also the American state pin of Arduino transmits the data from Arduino to the user. The input voltage pin of the Bluetooth is connected to the 5V pin of the Arduino UNO. and also, the GND pin of the Bluetooth is connected with the GND pin of the Arduino. And in similar method button switch, joystick, measuring system square measure connected to the Arduino

UNO. The motors of the wheelchair is connected with the motor driver L293D (H-Bridge). The Arduino give the input signals to the motor drivers. There square measure four motors used for the movement of the wheelchair. The Tyres square measure connected with the motors for the movement.

5. MODES OF CONTROL

In this project Human and machine interface for controlling smart wheelchair. There are four modes of control
1. Bluetooth
2. Hand Gesture
3. Joystick
4. Push Button Switch

We can control the wheelchair by the above modes.

5.1 BLUETOOTH

To control via Bluetooth application. There are five commands. There are five signals behind these five commands. The commands and signals are as follow.

Tabel-1: Android Application (commands)

COMMANDS	SIGNALS
Front	F
Reverse	R
Left	L
Right	l
Stop	S

When we click the command "Front", the signal 'F' can send to Bluetooth and this signal are going to be received by the Bluetooth module connected with the Arduino module. Like this all the commands and signals can work. By mistreatment this command, we will simply operate chair within our house or on the streets. And conjointly we will modification the commands and its signals within the Bluetooth application. The transmitting and receiving speed of Bluetooth module is 1Mbps. Arduino solely receives the serial signals. So only, we tend to use characters as signals.

5.1.1 BLOCK DIAGRAM

This block diagram shows that:

➢ The User enter command on android applications. Which is connected to Bluetooth module HC-05.

➢ The command received by Bluetooth module HC-05. It is connected with the Arduino module.

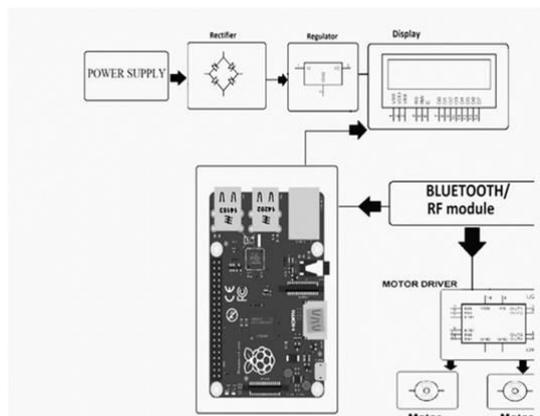➢ Arduino read the signal from the Bluetooth and give response to it.

Fig -1: Block Diagram

5.2 HAND GESTURE

The accelerometer is a mechanical device system that tests the powers of acceleration. These forces could also be static, like the constant force of gravity pull at your feet, or they'll be dynamic, caused by the movement or vibration of the measuring instrument. The measuring instrument could be a device that measures the vibration or acceleration of the motion of the structure. The force evoked by vibration or by a shift of motion (acceleration) permits the mass to "squeeze" the electricity substance that generates an electrical charge that's up to the force applied thereon. as a result of the charge is up to the force and therefore the mass could be a constant, the charge is so proportional to the acceleration. therefore, By tilting the measuring instrument it passes signal to Arduino and therefore the wheel chair moves in numerous directions
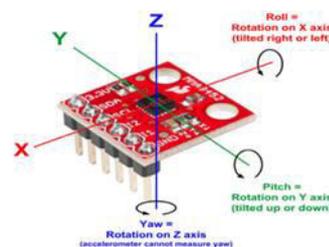

Fig -2: Accelerometer Module

5.3 JOYSTICK

Initially joystick is turned to actual middle position. until the joystick is unbroken at middle position the motor are getting to be stop. once the joystick is rapt the potentiometer encodes analog voltage values and transfers it to the Arduino board through the analog knowledge pin. The Arduino take these

associate degree a log values and send it to an ADC(Analog to digital converter).The ADC convert the analog price to digital signal .The digital signal is shipped to the motor driving IC(L293D) via digital knowledge output pin. L293D contains 2 y H-bridge driver circuits. In its common mode of operation, 2 DC motors area unit typically driven at the same time, each in forward or reverse and right or left direction. The motor operations of 2 motors area unit typically controlled by input logic at pins a pair of & seven and ten & fifteen. As joystick is slightly turned forward the voltage input at ADC will increase and therefore the motor starts rotating in forward direction. once the pot is turned back to middle position, the motor can stop. currently as a result of the pot is turned slightly reverse, the motor starts rotating in reverse direction. to prevent motor once more, the pot is turned back to middle position. Thus, the motors move forward or reverse and right and left as a result of the pot is turned forward or reverse and right or left. To implement these functionalities a software system program is embedded into internal FLASH of ATMega328P small controller. the 2 DC motors area unit controlled by L293D IC and Arduino ATMega328P consistent with the instruction of the Joystick.

Fig -3: Joystick Module

5.4 PUSH BUTTON SWITCH

A push button switch may be a tiny, sealed mechanism that completes an electrical circuit after you proceed it. once it's on, a tiny low metal spring within makes contact with 2 wires, permitting electricity to flow. once it's off, the spring retracts, contact is interrupted, and current will not flow. The body of the switch is formed of non-conducting plastic.

5.4.1 Normally-Off

With the normally off switch, there is no association until you push the button. Most push switches area unit used this manner. Examples embody button buttons, cellular phone keys

5.4.2 Normally-On

Here the switch conducts usually, however interrupts the circuit after you maintain it. this is often a lot of specialized and will be utilized in conjunction with a wiring trick. Like this fashion after we press the button switch it transmits signal to wheelchair and move in several directions

Fig -4: Push Button Switch Module

6. CONCLUSIONS

Many people are suffering of temporary or permanent disabilities because of diseases or accidents. For cases of inauspicious or not possible walking, the employment of a chair is turning into essential. Manual or electrical chairs are satisfying for many of the low and medium level incapacity case wherever patients will use the wheelchair severally. However, in severe cases, it's tough or not possible to use wheelchairs severally. In such cases chair users typically lack freelance quality and have faith in someone else handle the chair. Researchers concerned in chair are aiming at coming up with good wheelchairs to unravel such issues. This paper is to review the recent studies on good chair systems. It aims to gauge the present out their technologies and to debate new future directions for our in-progress research

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