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Gesture Control Wireless Wheelchair using ARDUINO

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ABSTRACT

This paper describes the design of a smart, motorized, gesture controlled wireless wheelchair using ARDUINO..People with physical disabilities and partial paralysis always find it difficult to navigate through their habitat or their home without the assistance of someone. Often after paralysis or physical disability the wheelchair is the most common means of locomotion for such people. But to navigate through one's own house without help of someone every time can be demoralizing for the person as well. This paper introduces a wheelchair, which operates on some easy hand gesture. As it works on hand gestures this wheelchair does not requires help of any other person for pushing it, hence handicapped or physically disabled person feel independent. This wheelchair will also be helpful for increasing the self-confidence of handicapped or physically disabled persons. With the present development on the field of robotics, embedded system and artificial intelligence a successful project has been developed in order to easily solve this matter and that too at a very low cost. The wheelchair in context can be remotely controlled from several meters wirelessly without actually sitting on it. The chair can be controlled by hand gesture method with directions as needed.This system was designed and developed to save cost, time and energy of the patient.

Keywords—Gesture control, Wireless, Arduino, Smart Wheelchair, Handicapped.

I.INTRODUCTION:

Previous developments on this topic include the presence of a laptop or CPU on the wheel chair for the purpose of processing. The recent development on this topic has been related to the development of gesture control wheelchair. [1] The problem that these systems have is that it makes the system very heavy and the wheelchair can only be controlled while sitting on it. Therefore the technology is not providing the expected freedom for the handicapped people [2]. Gestures control robots are extensively employed in human non-verbal communication which works with our hand gestures. This project enhances this work with the development of the wireless mechanism for control of the locomotion. This robot is mainly divided into two practical parts:

1. Transmitter – The gesture device.
2. Receiver – The Robot.

They allow to express orders (e.g. "stop"), mood state (e.g. "victory" gesture), or to transmit some basic cardinal information (e.g. "two"). Thus, it seems convenient that human-robot interfaces incorporate hand gesture recognition capabilities.

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II. LITERATURE REVIEW:

Recently development promises scope in making intelligent wheelchairs for handicapped one. In earlier days, Automatic wireless gesture control wheelchair has gained popularity due to advanced technology. And also there is need of advanced wheelchair due to today's fast working world, no one has free time for the handicapped person, every person is busy in their personal life. After paralysis or physical disability person require hand recognition and the wheelchair is most common need of gesture recognition[3]. A disable individual which is physically partial paralysis feels more convenient to survive in world also to move anywhere using with the help of chair. This wheelchair gives valuable physical support to disabled person. In this project accelerometer sensor is used which is main component of system and used to measure static as well as dynamic acceleration. Accelerometer sensor measures gravity force and it is related to the displacement [4].

III. IMPLEMENTATION:

a. Hardware Description:

i. Arduino:

Arduino is a tool for making computers that can sense and control more of the physical world than your desktop computer. It's an open-source physical computing platform based on a simple microcontroller board, and a development environment for writing software for the board. Arduino can be used to develop interactive objects, taking inputs from a variety of switches or sensors, and controlling a variety of lights, motors, and other physical outputs as shown in figure 1. Arduino projects can be stand-alone, or they can be communicating with software running on your computer (e.g. Flash, Processing, MaxMSP.) The boards can be assembled by hand or purchased preassembled; the open-source IDE can be downloaded for free. The Arduinoprogramming language is an implementation of Wiring, a similar physical computing platform, which is based on the Processing multimedia programming environment.

ii. Flex Sensor:

These are based on carbon thick elements. When the thin substrate is bent, the sensor is produced a resistance output which is correlated to the bend radius as shown in Fig 2. Smaller the radius, higher the resistance. These sensors require 5v input and output between 0-5V. The resistivity varies with sensor's degree of bend and the voltage output changing accordingly. Flex Sensors changes resistance in one direction only. An unflexed sensor has resistance of about 10Kohm. When the flex sensor is bent more, the resistance increases to 30-40Kohm at 90degree. One side of the sensor is printed with a polymer link that has conductive particles embedded in it. When sensor is straight, the particles give the link a resistance of say 30kohm. When sensor is bend away from link, the conductive particles move further apart increasing this resistance(to about 50Kohm).When the sensor straightens out again , the resistance returns to the original value. By measuring the resistance, we can determine how much sensor is bent. Hand signs.

iii. Accelerometer:

The ADXL335 is a small, thin, low power, complete 3-axis accelerometer with signal conditioned voltage outputs. The product measures acceleration with a minimum full-scale range of ±3 g.It can measure the static

acceleration of gravity in tilt-sensing applications, as well as dynamic acceleration resulting from motion, shock, or vibration.

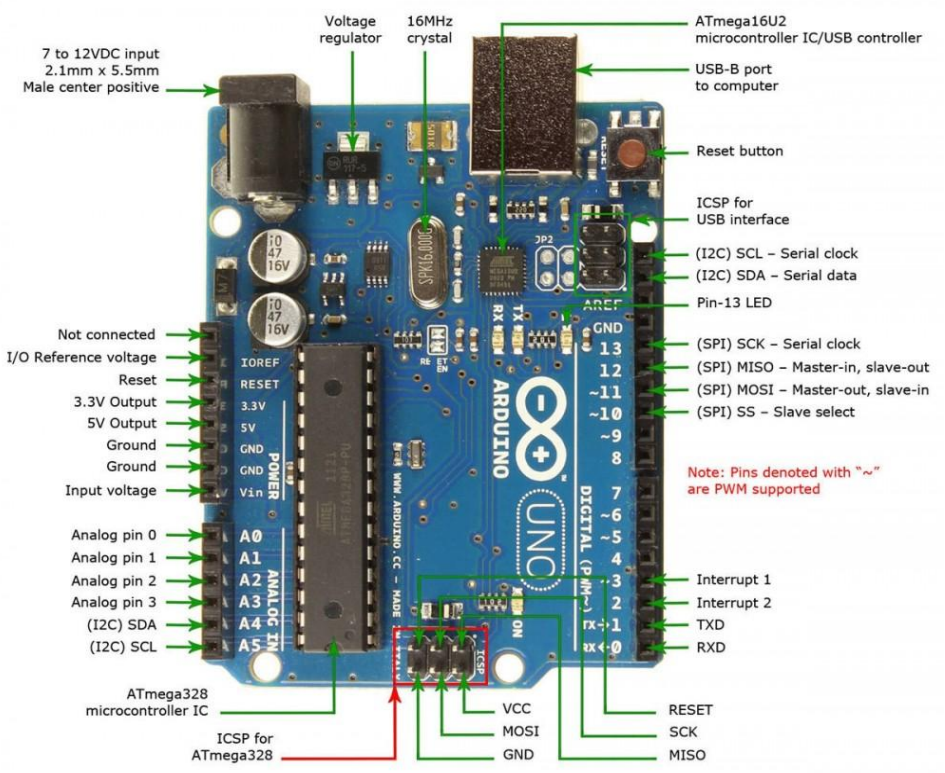

Fig-1: Arduino

Fig. 2: Flex Sensor

The ADXL335 is a complete 3-axis acceleration measurement system. The ADXL335 has a measurement range of ±3 *g* minimum. It restrains a polysilicon surface-micro machined sensor and signal conditioning circuitry to implement open-loopacceleration measurement architecture.

Software requirement

1-MIT app invertor

2-Arduino

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1-MIT app Invertor:

App Inventor for Android is an open-source web application originally provided by Google, and now maintained by the Massachusetts Institute of Technology (MIT).

It allows newcomers to computer programming to create software applications for the Android operating system (OS). It uses a graphical interface, very similar to Scratch and the StarLogo TNG user interface, which allows users to drag-and-drop visual objects to create anapplication that can run on Android devices. In creating App Inventor, Google drew upon significant prior research in educational computing, as well as work done within Google on online development environments.

IV. HAND GESTURE MODULE

Speaking glove consist interconnection of Arduino, flex sensor, Bluetooth module and 10K resistance. 5 Flex sensors after voltage divider with 10K resistance connected with arduino. [5] For wireless connection with mobile app a Bluetooth module is connected with arduino. Block diagram of proposed project is shown in fig3. Circuit diagram is shown in fig 4 and hand glove was shown in fig. 5.

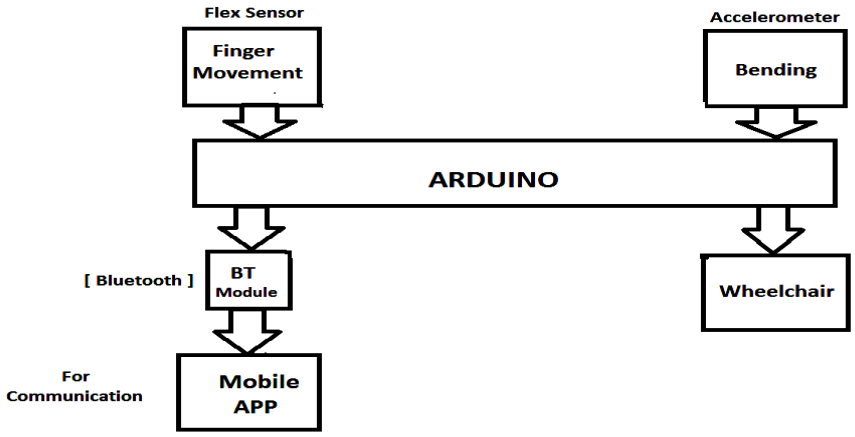

Fig 3: Block Diagram

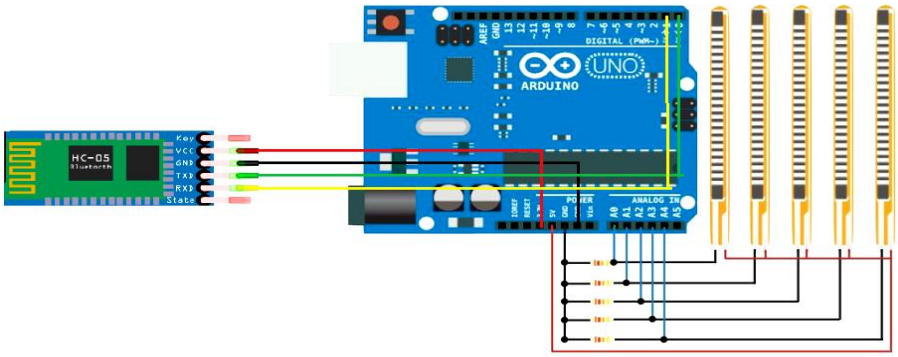

Fig 4: Circuit Diagram

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Fig 5-Hand glove

V. COMPLETE HARDWARE SETUP FOR TRANSMITTER AND RECEIVER:

To control the motion of wheelchair accelerometer sensor is fitted on head of handicapped persons. Depending upon gestures of head transmitter side sends the command to receiver side. Based on head gesture an accelerometer generates command signal. According to transmitter signal driver circuit will drive the motor fitted to the wheelchair as shown in fig 6. The wheelchair controlled unit is operates on wireless technology. Transmitter and receiver are used in this wheelchair for removing complexity which is shown in fig 6. In this paper hand gesture controlled wheelchair is designed with arduino. Because An Arduino is an open- source electronics platform based on easy to use hardware and software. It's intended for anyone making interactive projects.

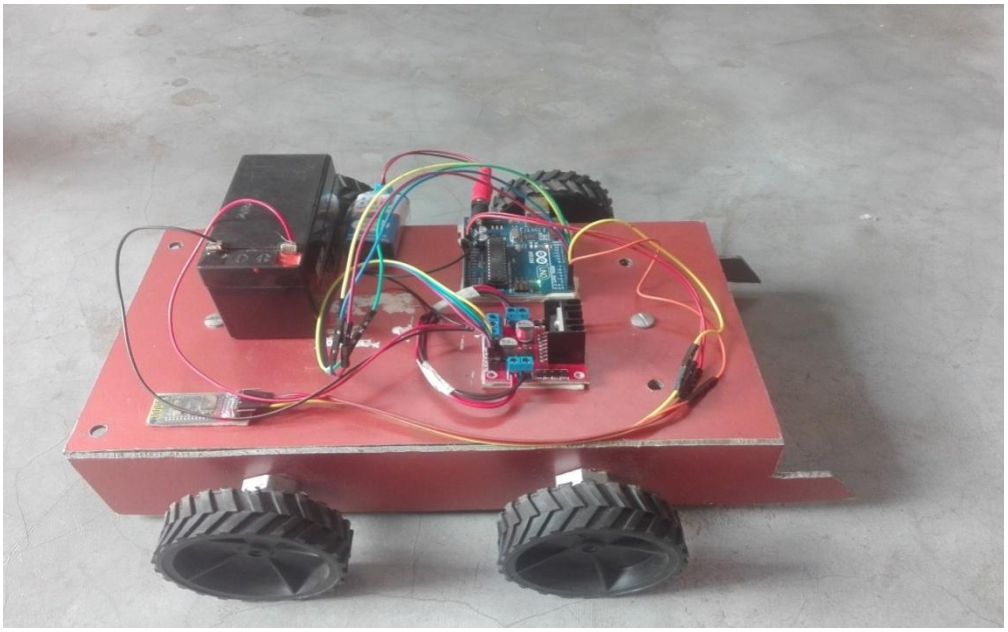

Fig 6: Hardware Setup for transmitter and receiver

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VI. CONCLUSION:

With the development of the project it can be successfully implemented on a larger scale for the handicapped people. The low cost of the assembly makes it really a bonus for the general public. Thewireless system will be a boost to the confidence and willpower of physically challenged people as it will help them to be self reliable. As a part of further development the project can be developed with addition voice recognition features through on board processing and power supply. There can also be the application of intelligent home navigation for handicapped people to go through the entire house and get help from technological interface for the navigation. The object avoiding and careful navigation principle can be improved with algorithm based image processing technology.

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