IMPLEMENTATION OF VOICE, GESTURE AND TOUCHSCREEN BASED MOVING WHEELCHAIR

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ABSTRACT: Wheelchairs are used by the people who cannot walk due to physical illness, injury or other disability. Now a day's development promises a wide scope in developing smart wheelchairs. This paper is to develop an intelligent wheelchair control using android phone for the movement of wheel chair based upon voice for the physically challenged persons. The system is designed to control a wheelchair by using an android device. The objective of this project is to facilitate the movement of disable people or handicapped and also the senior people who are not able to move well. Android technology is a key which may provide a new approach of human interaction with machines or tools. Thus their problem can be solved by using android technology to control the movement of a wheelchair. In this, basic android interface is designed to program the android device that will be able to control the movement of wheelchair. In addition to voice, gesture and touch control functions are also used to control the wheelchair in this project work. MEMS is used for the gesture recognition and a touch screen for the touch command inputs.

KEYWORDS: Microcontroller, MEMS, touch screen, bluetooth, DC motors , H-bridge.

I. INTRODUCTION:

Independent mobility is crucial for development of physical, cognitive, communicative and social skill for physically impaired people. Conventional electric powered wheelchairs are inappropriate for some critical situations. This project is thus aimed at the development of more sophisticated control scheme for electric powered wheelchair by adopting the voice, gesture and touch control technologies. Care taker is essential to operate the system for few Persons whose hands are completely out of order. If the user can move his/her right hand, then care taker is not required, because in addition to the voice, the gesture and touch sensors along with the control circuit can also be provided over the wheel chair, such that the user himself can operate the chair. In general, the remotes are designed using push – buttons or keys. This is the precedent technique and now with the advancement of technologies, the latest trend is the hand gestured movements of the wheel chair. Depending on the hand movement in the desired direction the wheel chair will be moved in that particular direction. This is possible through the MEMS technology. And for voice control operation, android device with a Bluetooth is used. The Bluetooth module is connected over the wheelchair to the controller and through a free app available in the google play store, voice inputs are given through the android device that is transmitted through the Bluetooth of the device which will be received by the Bluetooth receiver on the wheel chair and will be controlled accordingly.

II. LITERATURE REVIEW:

BLUETOOTH MODULE: The Bluetooth wireless technology is set to revolutionize the way people perceive digital devices in our homes and office environment. Now they are no longer just the individual devices; instead, with the embedded Bluetooth technology, they form a network in which appliances can communicate with each other. This wireless technology is especially useful in short rage wireless communication, where there exists hardly any infrastructure. Operating over unlicensed, universally available frequency of 2.4 GHz, it can link digital devices within a range of 10 m (approx). Building upon this theme is designed to control a robotic vehicle based on Bluetooth technology on android platform. A bluetooth module is usually a hardware component that provides a wireless product to work with the computer.

Figure 1: HC-05 Bluetooth module

MEMS:

MEMS: Micro - Small size, micro fabricated structures Electro - Electrical signal / control (In / Out)Mechanical - Mechanical functionality (In / Out) System -Structures, Devices, Systems, Control MEMS is a class of systems that are physically small. These systems have both electrical and mechanical components. MEMS originally used modified integrated circuit (computer chip) fabrication techniques and materials to create these very small mechanical devices. Sensors and actuators are the two main categories of MEMS. Sensors are non-invasive while actuators modify the environment. Micro sensors are useful because their physical size allows them to be less invasive while Micro actuators are useful because the amount of work they perform on the environment is small and therefore can be very precise.

TOUCH SCREEN: A touch-screen controller is simply an ADC that has built-in switches to control which electrodes are driven and which electrodes are used as the input to the ADC. The ADC can often be operated with different reference modes: single-ended or differential. Touch-screen interfaces are effective in many

information appliances, in personal digital assistants (PDAs), and as generic pointing devices for instrumentation and control applications. Getting the information from a touch screen into a microprocessor can be challenging.

Resistive touch screens consist of a glass or acrylic panel that is coated with electrically conductive and resistive layers made with indium tin oxide (ITO). The thin layers are separated by invisible spacers. Resistive screens are generally the most affordable type of touch screen, which explains their success in high-use applications like PDAs and Internet appliances**.**

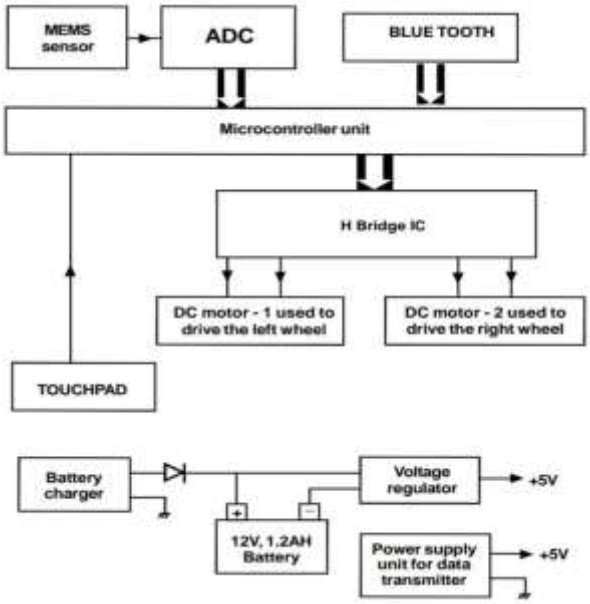

FIGURE 2: BLOCK DIAGRAM

III. HARDWARE DESCRIPTION:

H-BRIDGE:

The motor driving circuit is designed with L293D chip; this is popularly known as 'H' bridge device generally used to drive the low power DC motors. The current flowing through each driver circuit is restricted to 600 ma and it can with stand up to a peak current of 1.2amps.This chip is having two drive circuits internally; therefore it can drive two DC motors simultaneously. Since the device can accept TTL logics, it can be interfaced with controller directly. This device is built in with four channel drivers, there by both motors can be rotated in both directions. The enable pins and the channel inputs are controlled by the microcontroller. The DC motors used to drive the wheels will not consume more than 300 milliamps at full load, there by heat sink is not required. If any higher rating motor is used, heat sink is essential for long run and this heat sink must be coupled to the center 4 pins of the chip.

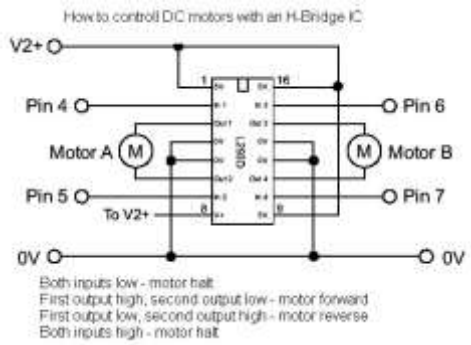

Figure 3: DC motor control with H-bridge

DC MOTORS:

DC motors are widely used, inexpensive, small and poweful for their size. They are most easy to control. One DC motor requires only two singals for its operation. They are non-polarized, means you can reverse the voltage without any damage to motor. DC motors have +ve and –ve leads. Connecting them to a DC voltage source moves motor in one direction (clockwise) and by reversing the polarity, the DC motor will move in opposite direction (counter clockwise). The maximum speed of DC motor is specified in rpm (rotation per minute). It has two rpms: no load and loaded. The rpm is reduces when moving a load or decreases when load increases.

POWER SUPPLY:

The required power supply to drive the wheel chair is derived by 12V, 1.2 AH, rechargeable, lead acid heavy duty battery. Here we required two different DC levels of +5V and +12V. The battery as it is delivering 12V is used to drive the DC motors through the H Bridge IC, where as for the remaining electronic circuitry consists of microcontroller, H – Bridge IC, RF receiver module, etc requires +5V constant source. To generate a stable supply of +5V, 7805 three terminal voltage regulator chip is used which provides constant supply, though the battery terminal voltage falls down to 8V. The DC motors are designed to operate at 12V DC and each motor consumes a maximum current of 150 milli-amps, there by two motors for the wheel chair together consumes 300 milli-amps. Likewise by calculating the current drawn by the entire circuit, the backup time of the battery can be calculated. The relation for calculating the backup time is given as:

The battery backup time = battery rating / consumed energy (current drawn by the entire circuit).

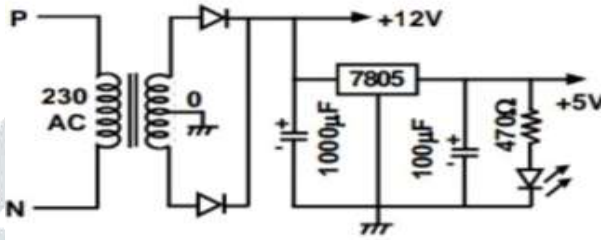

Figure 4: power supply unit

IV. CONCLUSION:

Here we have tried to construct a wheelchair for both elderly and physically challanged people by the means of MEMS, touch and bluetooth. Android phone has become a part of our day to day life. Hence android phone is used as the medium of communication with wheelchair here. Since it is a prototype module, much amount is not invested, the whole module is constructed with locally available components, and they are not up to the requirement. Some of the modifications must be carried out in design and is essential to make it as real working system.This project revealed that building a relatively low cost, high precision controlled wheel chair and electrical gadgets which is aimed control through three different input modules depending on the requirement.

VI. FUTURE SCOPE:

Another feature namely obstacle avoidance can be added to the present prototype model. The remote monitoring desktop shows the direction in which the patient is moving. This direction indication can be replaced by the actual image of the wheelchair by using a acamera on the wheelchair.

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