HEAD MOVEMENT BASED WHEEL CHAIR FOR PHYSICALLY CHALANGED PERSON

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Abstract:

Technical design using MEMS system is now a days becoming a challenging work for disabled persons.This project is to rehabilitate that people suffering from quadriplegic patients whose body parts below the neck is paralyzed and paraplegia normally has dis-functioning of both their legs. These people can move only the head, based on the movement of the head motion using accelerometer, proximity sensor and a controller that detects the movement of the head. Depends upon the movement controller will navigate the wheel chair for the patients .Those patients are given a perfect wheel chair for indoor & outdoor and also giving rest for the the patients who are sitting in same position which is discomfort for those persons.

Keyword: Accelerometer, proximity sensor, Atmega microcontroller, pushback seat condition.

1. Introductions:

Patients with paraplegia and Quadriplegia cannot move their arms and legs. Many wheelchair are designed and introduced to control the joystick of the automated wheel chair. But patients sitting on the wheel chair having many problems such as

1. Resting
2. Moving from wheelchair to another vehicle
3. Working on table
4. Outdoor train travel

This project describes the resting positions using atmega microcontroller based on the tilting axis of the accelerometer. The proposed system using atmega microcontroller proximity and accelerometer to control the speed of the wheel chair in train region.Which are described in block diagram fig1.1.

2.1:Accelerometer:

An accelerometer is a device that measures proper acceleration; proper acceleration is not the same as coordinate acceleration (rate of change of velocity). For example, an accelerometer at rest on the surface of the Earth will measure an

acceleration due to Earth's gravity, straight upwards (by definition) of g ≈ 9.81 m/s^2. By contrast, accelerometers

2. Proposed system:

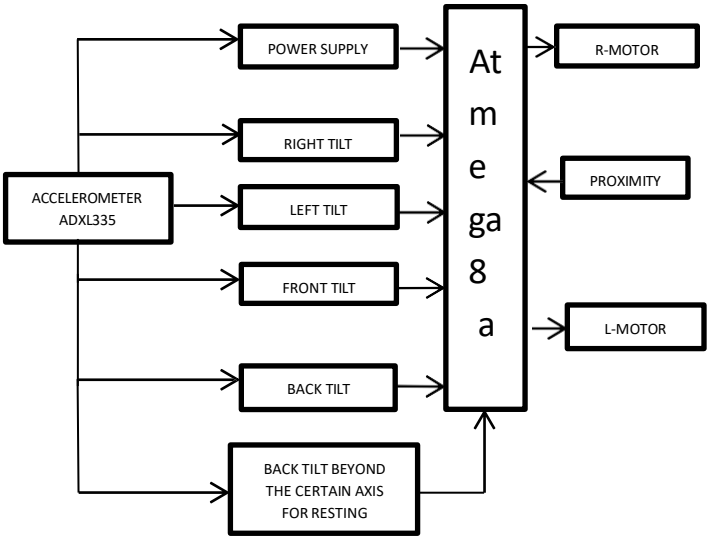


Fig:1.1

in free fall (falling toward the center of the Earth at a rate of about 9.81 m/s^2) will measure zero.

Accelerometers have multiple applications in industry and science. Highly sensitive accelerometers are components of inertial navigation systems for aircraft and missiles. Accelerometers are used to detect and monitor vibration in rotating machinery. Accelerometers are used in tablet computers and digital cameras so that images on screens are always displayed upright. Accelerometers are used in drones for flight stabilisation. Coordinated accelerometers can be used to measure differences in proper acceleration, particularly gravity, over their separation in space; i.e., gradient of the gravitational field. This gravity gradiometry is useful because absolute gravity is a weak effect and depends on local density of the Earth which is quite variable.

Single- and multi-axis models of accelerometer are available to detect magnitude and direction of the proper acceleration, as a vector quantity, and can be used to sense orientation (because direction

of weight changes), coordinate acceleration, vibration, shock, and falling in a resistive medium (a case where the proper acceleration changes, since it starts at zero, then increases). Micromachined accelerometers are increasingly present in portable electronic devices and video game controllers, to detect the position of the device or provide for game input.

2.2 :Atmega microcontroller:

A microcontroller fig1.2 (sometimes abbreviated μC, uC or MCU) is a small computer on a single integrated circuit containing a processor core, memory, and programmable input/output peripherals. Program memory in the form of NOR flash or OTP ROM is also often included on chip, as well as a typically small amount of RAM. Microcontrollers are designed for embedded applications, in contrast to the microprocessors used in personal computers or other general purposeapplications.

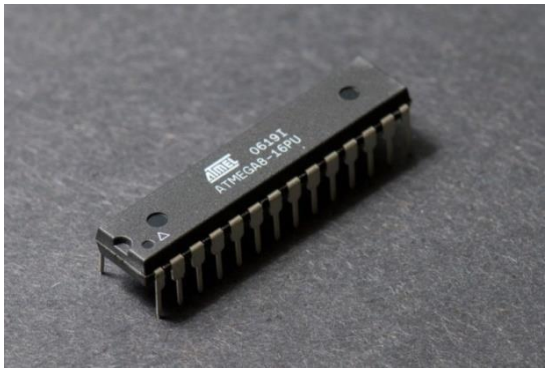


Fig:1.2

Memory:

It has 8 Kb of Flash program memory (10,000 Write/Erase cycles durability), 512 Bytes of EEPROM (100,000 Write/Erase Cycles). 1Kbyte Internal SRAM

I/O Ports:

23 I line can be obtained from three ports; namely Port B, Port C and Port D.

Analog Comparator:

A comparator module is integrated in the IC that provides comparison facility between

two voltages connected to the two inputs of the Analog comparator via External pins attached to the micro controller.

Analog to Digital Converter:

Inbuilt analog to digital converter can convert an analog input signal into digital data of 10bit resolution. For most of the low end application, this much resolution is enough.

In this prototype, controller rotate the motor in following directions depends upon the conditions signal from the accelerometer

Front: If(x_axis>30&&y_axis > 49&&z_axis>24) **Left:**If(x_axis>26&&y_axis>31&&z_axis>43)

Right: If(x_axis>45&&y_axis>33&&z_axis>23) **Back:**If(x_axis>21&&y_axis>53&&z_axis>29)

Semisleep: If(x_axis>18&&y_axis>43&&z_axis
>21)

Sleep: If(x_axis>15&&y_axis>42&&z_axis>20)

Controller control the speed of the motor using pwm when the following conditions satisfies

Speedreduced:

if(proximity1==1||proximity2==1)

2.3 : proximity sensor:

A proximity sensor is a sensor able to detect the presence of nearby objects without any physical contact.

A proximity sensor often emits an electromagnetic field or a beam of electromagnetic radiation (infrared, for instance), and looks for changes in the field or return signal. The object being sensed is often referred to as the proximity sensor's target. Different proximity sensor targets demand different sensors. For example, a capacitive or photoelectric sensor might be suitable for a plastic target; an inductive proximity sensor always requires a metal target.

2.4.Motor driver(relay):

The first relay(fig1.3) was invented by Joseph Hendry in 1835. The name relay derives from the French noun relais that indicates the horse exchange place of the postman. Generally a relay is an electrical hardware device having an input and output gate. The the output gate consist in a one or more electrical contacts that switch when the input gate ie electrically excited.It can implement a decoupler, a router or breaker for the electrical power, a negation, and, on the base of the wiring, complicated logical functions containing AND,OR, and FLIP- FLOP.In the past relays had a wide use ,for instance the telephone switching or the railways routing and crossing systems.In spite of electronic progresses (as programmable devices), relays are still used in applications where ruggedness, simplicity, long life and high reliability are important factors (for instant in safty applications).

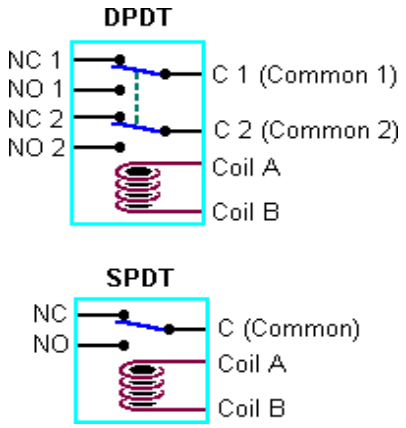
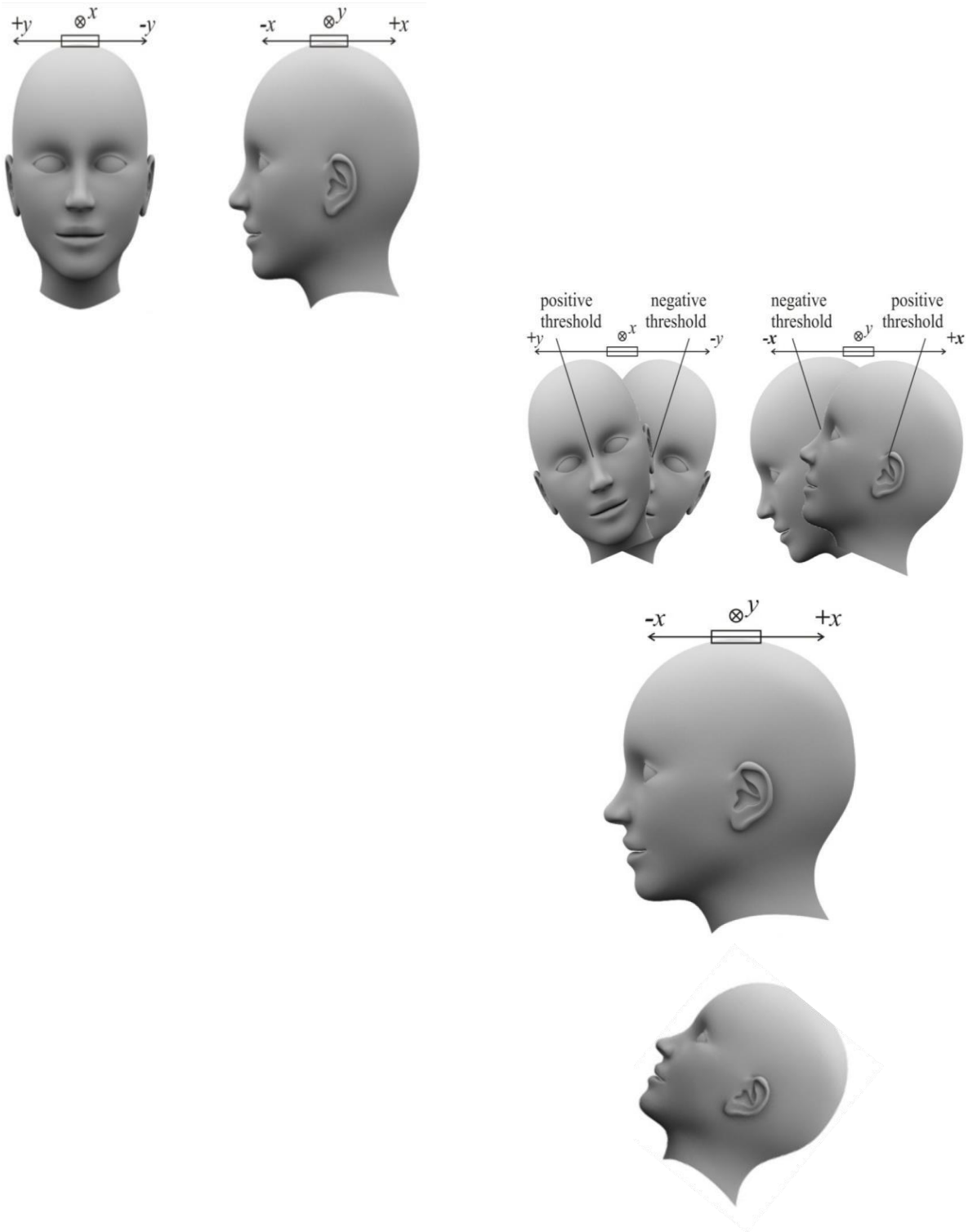


fig1.3

3.Motion recogonition:

Based on the above description of the project the wheel chair movement is monitored and tested in both indoor and outdoor environment,movement of the head are shown in fig 1.4.


+y
x
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y
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positive threshold
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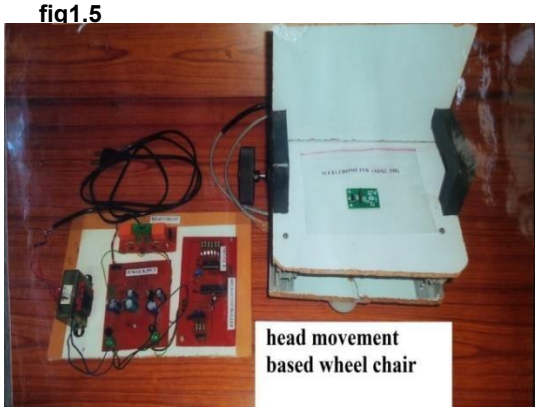
fig1.4

Photos:

fig1.5



Conclusion:

From the above simulation and results, we conclude that the developed head movement based wheel chair for physically challanged person is tested and works satisfactorily in indoor and outdoor environment with minimum assistance of the person suffered with Quadriplegia or Paraplegia. It works well for head tilt motions and it providean effective solution for quadriplegic patients with more than 45 % disability or for the patients with spinal cord injury who could not move their hands and legs for driving a manual or automatic wheel chair. It has a good response with MEMS activating the motors connected to the wheels of the chair.

wheelchairs in terms of ease of operation and head tilt control. Also, the project comes out to be economical as compared to other available wheelchairs in the market.

Refrences:

1) X. Huo and M. Ghovanloo. Using unconstrained tongue motion as an alternative control mechanism for wheeled mobility. IEEE Transactions on Biomedical Engineering, 56(6):1719-1726, 2009.
2) Manju devy , R.Deepa . “Hardware Implementation Based On Head Movement Using Accelerometer Sensor”,2014
3) J Aleksandar Pajkanović1 , Branko Dokić1, “Wheelchair Control by Head Motion”, SERBIAN JOURNAL OF ELECTRICAL ENGINEERING Vol. 10, No. 1, February 2013, 135-151