University of Pune

M.V.P. SAMAJ'S

K.S.K.W. COLLEGE

NASHIK-08.

DEPARTMENT OF PHYSICS

A

PROJECT REPORT

On

"Gesture Controlling Wheel Chair"

Submitted by

RUCHIRA RAJU BORADE

M.Sc. (Physics-II)

Academic Year: 2020-21

Guided By

Prof.A.M.Pawar.

University of Pune

M.V.P. SAMAJ'S

K.S.K.W. COLLEGE

NASHIK-08.

DEPARTMENT OF PHYSICS

CERTIFICATE

This is to certify that Miss. Ruchira Raju Borade of class M.Sc. (Physics-II) is a bonafide student of our college, has completed the project entitled,

"Gesture Controlling Wheel Chair"

Under my guidance. The entire work is carried out in college.

Prof.A.M.Pawar

(Project Guide)

Prof.Dr.P.G.Loke

(Head of the Department)

(Internal Examiner)

(External Examiner)

ACKNOWLEDGEMENT

I wish to thank the Principal Dr.J.D.Sonkhaskar of my college for permitting me to use all the facilities available in the institution of my project work. I would also like to thank the head of the physics department Dr. P. G. Loke mam, the teaching faculty and all the non-teaching staff of my college for their support in completing the work successfully.

I am grateful to my guide for his encouragement ,guidance and supervision of my project work during the year .I was fortunate to have received sponsorship for my project work from .I express my thankfulness to them .My classmate have been of great help to me during the project work .My ideas were shaped and refined progressively through my discussion with them from time to time, I cannot miss to thank them all. The completion of this project could not have been acomplished without the advice, support and direction from those who are all present around me. I heartly appreciate their contribution and thank them too.

INDEX

INTRODUCTION

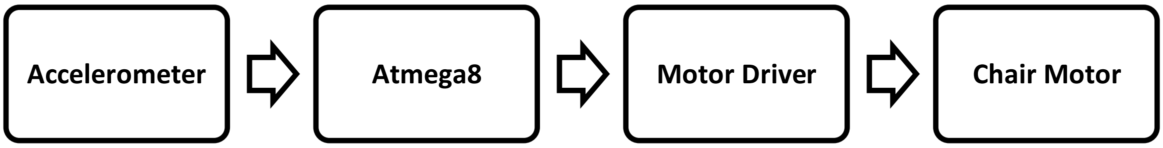
Wheelchairs are useful for people for people for whom walking is difficult or impossible due to injury or disability.

In case a person is unable to move wheelchair even with joystick or voice command, an alternative is gesture-controlled wheelchair. The wheelchair moves as per user's hand gesture.

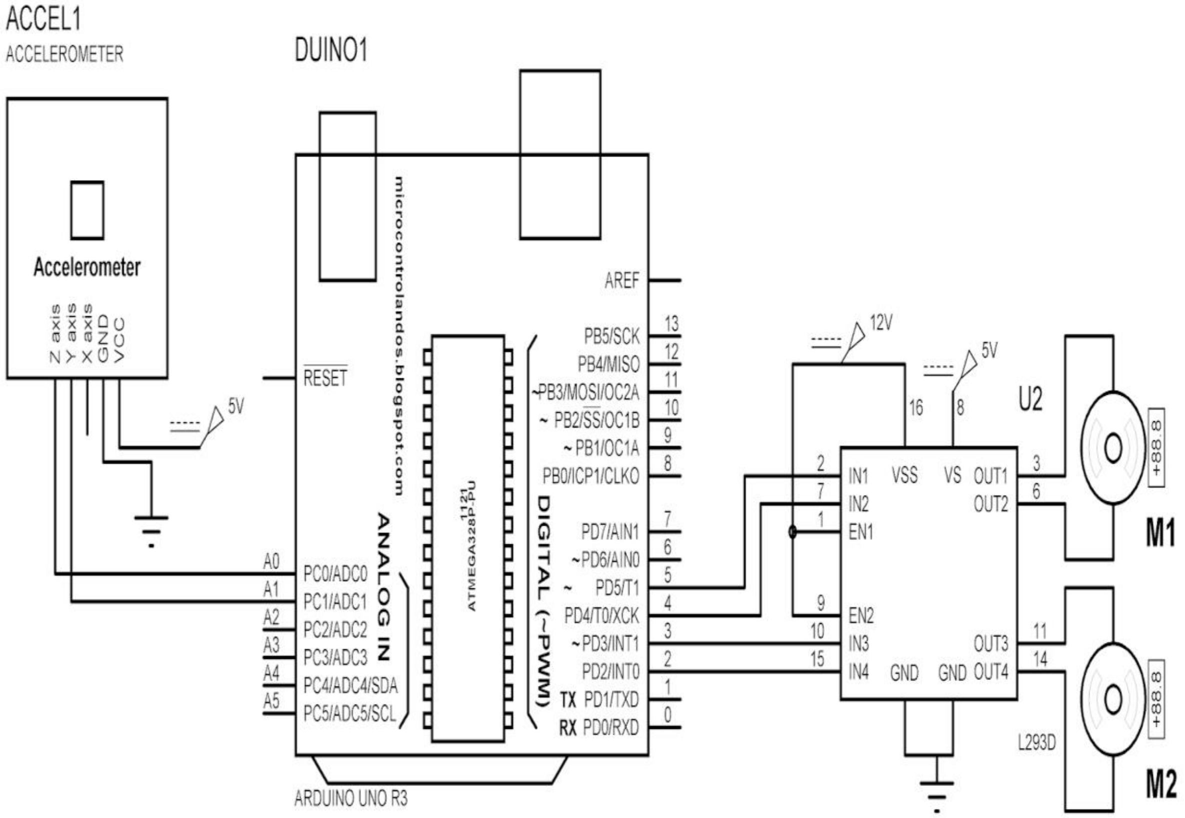
This project is developing a wheelchair for physically disabled people. Our main aim is to build a low cost and powerful wheelchair which helps the handicapped people to travel without depending others.

Easy to operate, because this wheelchair can operate even by a user without palm.

BLOCK DIAGRAM



CIRCUIT DIAGRAM



CIRCUIT WORKING

Main part of this Circuit is Accelerometer ADXL345 it is Tilt sensor which is used to measure the tilt. It has 2 output pins name as SDA and SCL. Each pin gives the Digital output voltage with respective to the 3-dimensional imaginary axis plotted with respect to gravitation.

This analog information of axis is given to Arduino microcontroller which having internal Communication pins who convert this information in angle form. In this microcontroller programming is such a way that when X and Y axis are perpendicular to the ground it generates one code and it is given to the motor driver. When we change the position of our hand then with respective to the gravity X axis change its output voltage. Hence with respective to our hand gesture microcontroller generate the code and transmit it. Following Table shows the code transmitted From the Transmitter.

Hand Motion	Code			
	D0	**D1**	**D2**	**D3**
Perpendicular to gravity	Low	Low	Low	Low
Down Side	High	Low	High	Low
Up Side	Low	High	Low	High
Right Side	Low	High	High	Low
Left Side	High	Low	Low	High

Motor Driver IC L293D and motors are used. According to the data which is coming from arduino the motor and our robotics Move. Following table show the according to the command how robot is move.

Code				Motor State		Motion
D0	**D1**	**D2**	**D3**	**Motor1**	**Motor2**	
Low	Low	Low	Low	Stop	Stop	Stop
High	Low	High	Low	Clockwise	Clockwise	Forward
Low	High	Low	High	Anti-Clockwise	Anti-Clockwise	Reverse
High	Low	Low	High	Anti-Clockwise	Clockwise	Right
Low	High	High	Lo w	Clockwise	Anti-Clockwise	Left

SOURCE CODE

```
#include <Adafruit_ADXL345_U.h>


float xaxis=0.0;

float yaxis=0.0;

int sensorstate = 0;


void setup(void)

{

  Serial.begin(9600);

  if(!accel.begin())

  {

    while (1);

  }

  pinMode (5, OUTPUT);

  pinMode (6, OUTPUT);

  pinMode (7, OUTPUT);
```

```
  pinMode (8, OUTPUT);
}


void loop(void)
{
  accel.getEvent(&event);


  xaxis=event.acceleration.x;
  yaxis=event.acceleration.y;


  delay (300);
  if (xaxis < -5)//Rev
  {
        digitalWrite (5,HIGH);
        digitalWrite (6,LOW);
        digitalWrite (7,HIGH);
        digitalWrite (8,LOW);
        sensorState = 1;
```

```
}
if (xaxis > 5)//Forword
{
        digitalWrite (5,LOW);
        digitalWrite (6,HIGH);
        digitalWrite (7,LOW);
        digitalWrite (8,HIGH);
        sensorState = 1;
}
if (yaxis < -5)//Left
{
        digitalWrite (5,HIGH);
        digitalWrite (6,LOW);
        digitalWrite (7,LOW);
        digitalWrite (8,HIGH);
        sensorState = 1;
}
if (yaxis > 5)//Right
```

```
{
        digitalWrite (5,LOW);
        digitalWrite (6,HIGH);
        digitalWrite (7,HIGH);
        digitalWrite (8,LOW);
        sensorState = 1;
}
if (sensorState == 0)
{
digitalWrite (5,LOW);
digitalWrite (6,LOW);
digitalWrite (7,LOW);
digitalWrite (8,LOW);
}
sensorState = 0;
}
```

COMPONENTS INFORMATION

ATmega8L

Introduction

The Atmel ATmega8A is a low-power CMOS 8-bit microcontroller based on the AVR enhanced RISC architecture. By executing powerful instructions in a single clock cycle, the ATmega8A achieves throughputs close to 1MIPS per MHz This empowers system designer to optimize the device for power consumption versus processing speed.

Features

• High-performance, Low-power Atmel AVR 8-bit Microcontroller

• Advanced RISC Architecture

– 130 Powerful Instructions - Most Single-clock Cycle Execution

– 32 x 8 General Purpose Working Registers

– Fully Static Operation

– Up to 16MIPS Throughput at 16MHz

– On-chip 2-cycle Multiplier

• High Endurance Non-volatile Memory segments

– 8KBytes of In-System Self-programmable Flash program memory

– 512Bytes EEPROM

– 1KByte Internal SRAM

– Write/Erase Cycles: 10,000 Flash/100,000 EEPROM

– Data retention: 20 years at 85°C/100 years at 25°C (1)

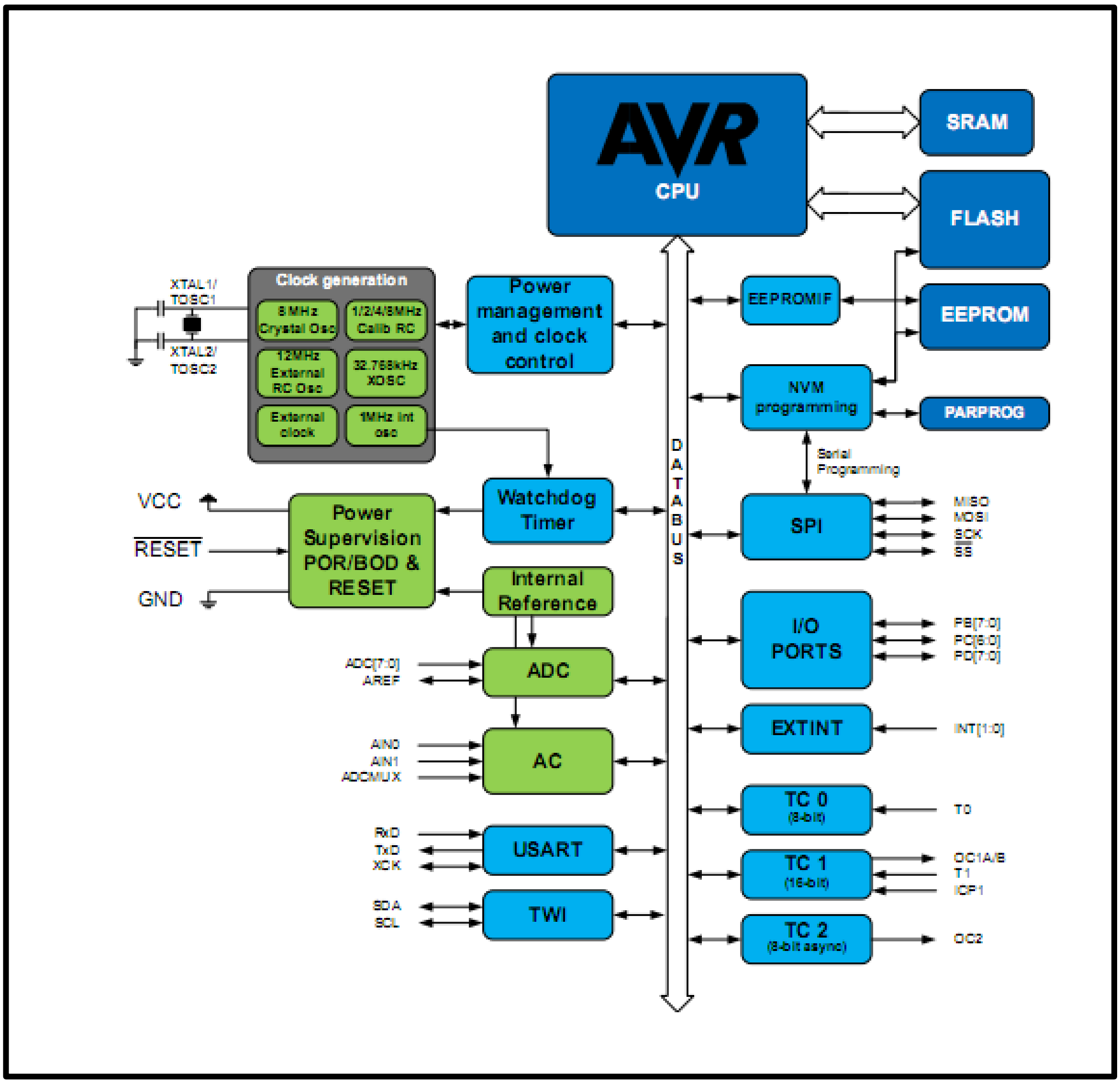
– Optional Boot Code Section with Independent Lock Bits

  - In-System Programming by On-chip Boot Program

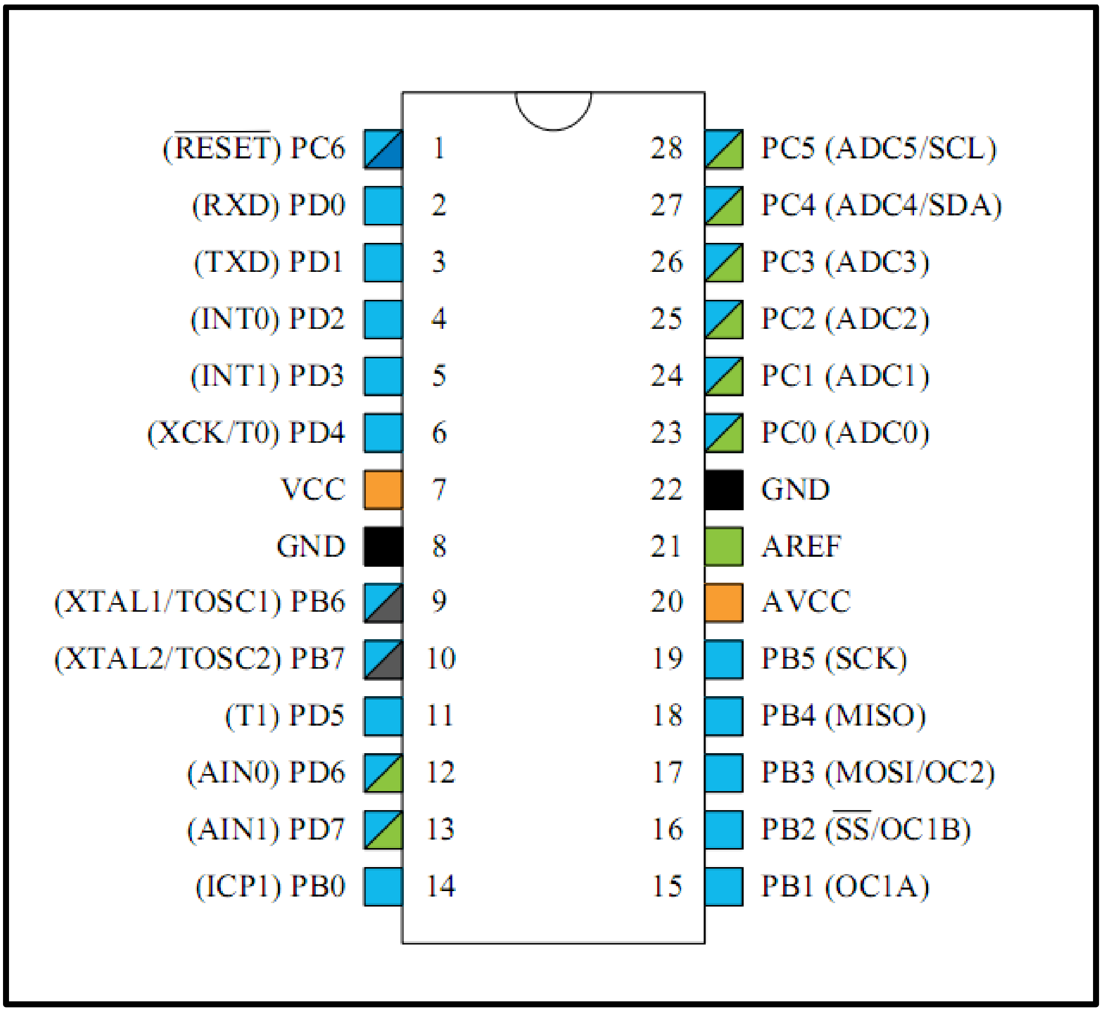
  - True Read-While-Write Operation

– Programming Lock for Software Security

Block Diagram



Pin Diagram



(RESET) PC6
1
28
PC5 (ADC5/SCL)
(RXD) PD0
2
27
PC4 (ADC4/SDA)
(TXD) PD1
3
26
PC3 (ADC3)
(INT0) PD2
4
25
PC2 (ADC2)
(INT1) PD3
5
24
PC1 (ADC1)
(XCK/T0) PD4
6
23
PC0 (ADC0)
VCC
7
22
GND
GND
8
21
AREF
(XTAL1/TOSC1) PB6
9
20
AVCC
(XTAL2/TOSC2) PB7
10
19
PB5 (SCK)
(T1) PD5
11
18
PB4 (MISO)
(AIN0) PD6
12
17
PB3 (MOSI/OC2)
(AIN1) PD7
13
16
PB2 (SS/OC1B)
(ICP1) PB0
14
15
PB1 (OC1A)

Pin Descriptions

VCC

Digital supply voltage

GND

Ground

Port B (PB7:PB0) – XTAL1/XTAL2/TOSC1/TOSC2

Port B is an 8-bit bi-directional I/O port with internal pull-up resistors (selected for each bit). The Port B output buffers have symmetrical drive characteristics with both high sink and source capability. As inputs, Port B pins that are externally pulled low will source current if the pull-up resistors are activated. The Port B pins are tri-stated when a reset condition becomes active, even if the clock is not running. Depending on the clock selection fuse settings, PB6 can be used as input to the inverting Oscillator amplifier and input to the internal clock operating circuit. Depending on the clock selection fuse settings, PB7 can be used as output from the inverting Oscillator amplifier. If the Internal Calibrated RC Oscillator is used as chip clock source, PB7:6 is used as TOSC2:1 input for the Asynchronous Timer/Counter2 if the AS2 bit in ASSR is set. The various special features of Port B are elaborated in Alternate Functions of Port B and System Clock and Clock Options.

Port C (PC5:PC0)

Port C is a 7-bit bi-directional I/O port with internal pull-up resistors (selected for each bit). The Port C output buffers have symmetrical drive characteristics with both high sink and source capability. As inputs, Port C pins that are externally pulled low will source current if the pull-up resistors are activated. The Port C pins are tri-stated when a reset condition becomes active, even if the clock is not running.

PC6/RESET

If the RSTDISBL Fuse is programmed, PC6 is used as an I/O pin. Note that the electrical characteristics of PC6 differ from those of the other pins of Port C. If the RSTDISBL Fuse is un-programmed, PC6 is used as a Reset input. A low level on this pin for longer than the minimum pulse length will generate a Reset, even if the clock is not running. The minimum pulse length is given in Table 30-5. Shorter pulses are not guaranteed to generate a Reset. The various special features of Port C are elaborated in Alternate Functions of Port C.

Port D (PD7:PD0)

Port D is an 8-bit bi-directional I/O port with internal pull-up resistors (selected for each bit). The Port D output buffers have symmetrical drive characteristics with both high sink and source capability. As inputs, Port D pins that are externally pulled low will source current if the pull-up resistors are activated. The Port D pins are tri-stated when a reset condition becomes active, even if the clock is not running. Port D also serves the functions of various special features of the ATmega8A as listed in Alternate Functions of Port D.

RESET

Reset input. A low level on this pin for longer than the minimum pulse length will generate a reset, even if the clock is not running. The minimum pulse length is given in Table 30-5. Shorter pulses are not guaranteed to generate a reset.

AVCC

AVCC is the supply voltage pin for the A/D Converter, Port C (3:0), and ADC (7:6). It should be externally connected to VCC, even if the ADC is not used. If the ADC is used, it should be connected to VCC through a low-pass filter. Note that Port C (5:4) use digital supply voltage, VCC.

AREF

AREF is the analog reference pin for the A/D Converter.

ADXL 345

The ADXL345 is a small, thin, low power, 3-axis accelerometer with high resolution (13-bit) measurement at up to ±16 *g*. Digital output data is formatted as 16-bit twos complement and is accessible through either a SPI (3- or 4-wire) or I2C digital interface. The ADXL345 is well suited for mobile device applications. It measures the static acceleration of gravity in tilt-sensing applications, as well as dynamic acceleration resulting from motion or shock. Its high resolution (4 m*g*/LSB) enables measurement of inclination changes less than 1.0°. Several special sensing functions are provided. Activity and inactivity sensing detect the presence or lack of motion and if the acceleration on any axis exceeds a user-set level. Tap sensing detects single and double taps. Free-fall sensing detects if the device is falling. These functions can be mapped to one of two interrupt output pins. An integrated, patent pending 32-level first in, first out (FIFO) buffer can be used to store data to minimize host processor intervention. Low power modes enable intelligent motion-based power management with threshold sensing and active acceleration measurement at extremely low power dissipation. The ADXL345 is supplied in a small, thin, 3 mm × 5 mm ×1 mm, 14-lead, plastic package.

FUNCTIONAL BLOCK DIAGRAM

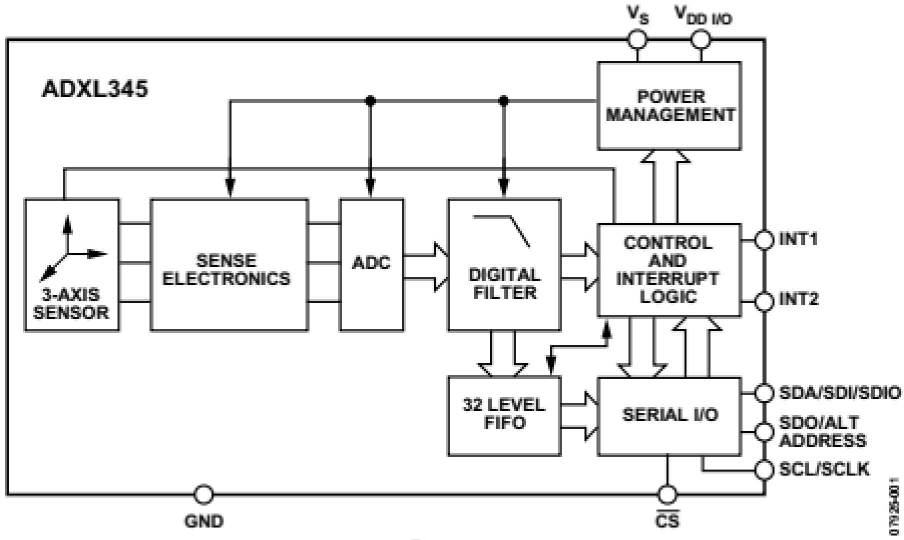


Figure 1.

THEORY OF OPERATION

The ADXL345 is a complete 3-axis acceleration measurement system with a selectable measurement range of ±2 g, ±4 g, ±8 g, or ±16 g. It measures both dynamic accelerations resulting from motion or shock and static acceleration, such as gravity, which allows the device to be used as a tilt sensor. The sensor is a polysilicon surface-micromachined structure built on top of a silicon wafer. Polysilicon springs suspend the structure over the surface of the wafer and provide a resistance against acceleration forces. Deflection of the structure is measured using differential capacitors that consist of independent fixed plates and plates attached to the moving mass. Acceleration deflects the beam and unbalances the differential capacitor, resulting in a sensor output whose amplitude is proportional to acceleration. Phase-sensitive demodulation is used to determine the magnitude and polarity of the acceleration.

FEATURES

Ultralow power: as low as 40 μA in measurement mode and
0.1 μA in standby mode at VS = 2.5 V (typical)
Power consumption scales automatically with bandwidth
User-selectable resolution
Fixed 10-bit resolution
Full resolution, where resolution increases with *g* range,
up to 13-bit resolution at ±16 *g* (maintaining 4 m*g*/LSB
scale factor in all *g* ranges*)*
Embedded, patent pending FIFO technology minimizes host
processor load

Tap/double tap detection

Activity/inactivity monitoring

Free-fall detection

Supply voltage range: 2.0 V to 3.6 V

I/O voltage range: 1.7 V to VS

SPI (3- and 4-wire) and I2C digital interfaces

Flexible interrupt modes mappable to either interrupt pin

Measurement ranges selectable via serial command

Bandwidth selectable via serial command

Wide temperature range (-40°C to +85°C)

10,000 *g* shock survival

Pb free/RoHS compliant

Small and thin: 3 mm × 5 mm × 1 mm LGA package

APPLICATIONS

Cost sensitive, low power, motion- and tilt-sensing applications

Mobile devices

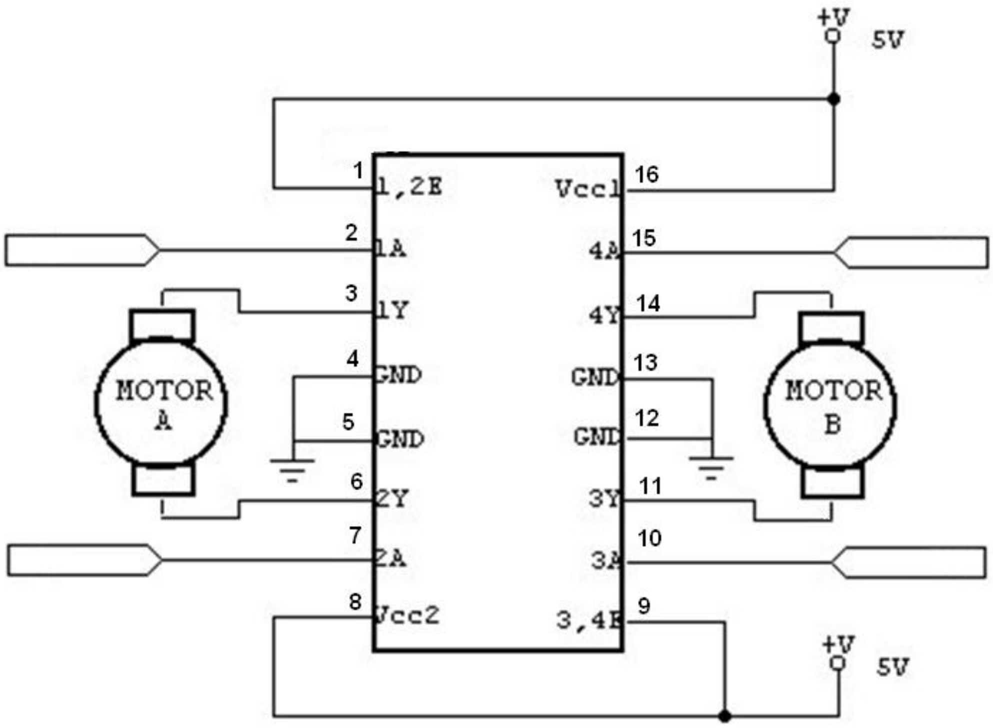
Gaming systems

Disk drive protection

Image stabilization

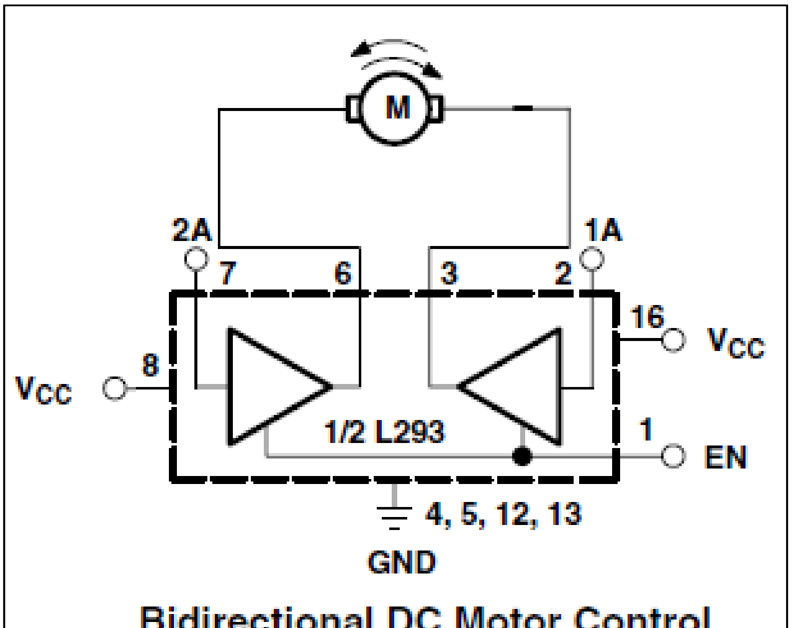
Sports and health devices

IC L293D:



The L293D motor driver is available for providing User with ease and user friendly interfacing for embedded application. L293D motor driver is mounted on a good quality, single sided PCB. The pins of L293D motor driver IC are connected to connectors for easy access to the driver IC's pin functions.

The L293D is designed to provide bidirectional drive currents of up to 600-mA at voltages from 4.5 V to 36 V. This device is designed to drive inductive loads such as relays, solenoids, dc and bipolar stepping motors, as well as other high-current/high-voltage loads in positive-supply applications. All inputs are TTL compatible. Each output is a complete totem-pole drive circuit, with a Darlington transistor sink and a pseudo-Darlington source. Drivers are enabled in pairs, with drivers 1 and 2 enabled by 1, 2 EN and drivers 3 and 4 enabled by 3,4EN. When an enable input is high, the associated drivers are enabled, and their outputs are active and in phase with their inputs. When the enable input is low, those drivers are disabled, and their outputs are off and in the high impedance state. With the proper data inputs, each pair of drivers forms a full-H (or bridge) reversible drive suitable for solenoid or motor applications.



Bidirectional DC Motor Control

EN	1A	2A	FUNCTION
H	L	H	Turn right
H	H	L	Turn left
H	L	L	Fast motor stop
H	H	H	Fast motor stop
L	X	X	Fast motor stop

L = low, H = high, X = don't care

Features:

- Easily compatible with any of the system
- Easy interfacing through FRC (Flat Ribbon Cable)
- External Power supply pin for Motors supported
- Onboard PWM (Pulse Width Modulation) selection switch
- 2pin Terminal Block (Phoenix Connectors) for easy Motors Connection
- Onboard H-Bridge base Motor Driver IC (L293D)

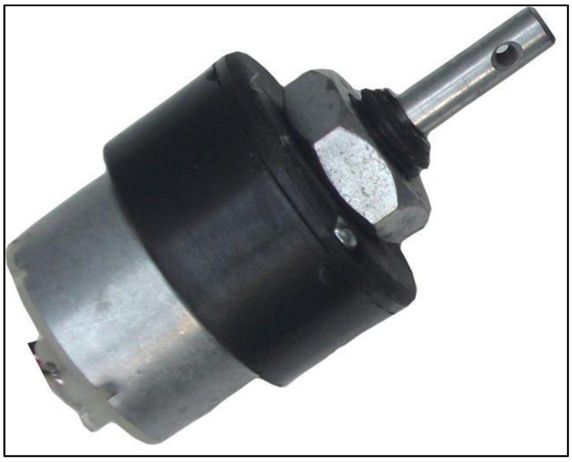
Technical Specification:

- Power Supply: Over FRC connector 5V DC
- External Power: 9V to 24V DC
- Dimensional Size: 44mm x 37mm x 14mm (l x b x h)
- Temperature Range: 0°C to +70 °C

Gear motor:

Almost every mechanical movement that we see around us is accomplished by an electric motor. Electricmachines are a means of converting energy. Motors take electrical energy and produce mechanical energy. Electric motors are used to power hundreds of devices we use in everyday life. Motors come in various sizes. Huge motors that can take loads of 1000's of Horsepower are typically used in the industry. Some examples of large motor applications include elevators, electric trains, hoists, and heavy metal rolling mills. Examples of small motor applications include motors used in automobiles, robots, hand power tools and food blenders. Micro-machines are electric machines with parts the size of red blood cells, and find many applications in medicine.

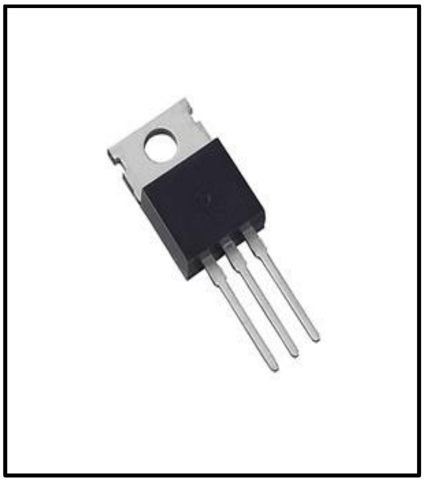
Electric motors are broadly classified into two different categories: DC (Direct Current) and AC (Alternating Current). Within these categories are numerous types, each offering unique abilities that suit them well for specific applications. In most cases, regardless of type, electric motors consist of a stator (stationary field) and a rotor (the rotating field or armature) and operate through the interaction of magnetic flux and electric current to produce rotational speed and torque. DC motors are distinguished by their ability to operate from direct current. There are different kinds of D.C. motors, but they all work on the same principles. In this chapter, we will study their basic principle of operation and their characteristics. It’s important to understand motor characteristics so we can choose the right one for our application requirement. The learning objectives for this chapter are listed below.



Learning Objectives:

- ✔ Understand the basic principles of operation of a DC motor.
- ✔ Understand the operation and basic characteristics of simple DC motors.
- ✔ Compute electrical and mechanical quantities using the equivalent circuit.
- ✔ Use motor nameplate data.

LM7805 (Voltage Regulator)



Pin Diagram

Description:

The KA78XX/KA78XXA series of three-terminal positive regulator are available in the TO-220/D-PAK package and with several fixed output voltages, making them useful in a wide range of applications. Each type employs internal current limiting, thermal shut down and safe operating area protection, making it essentially indestructible. If adequate heat sinking is provided, they can deliver over 1A output current. Although designed primarily as fixed voltage regulators, these devices can be used with external components to obtain adjustable voltages and currents.

A voltage regulator is designed to automatically maintain a constant voltage level. A voltage regulator may be a simple "feed-forward" design or may include negative feedback control loops. It may use an electromechanical mechanism, or electronic components.

Depending on the design, it may be used to regulate one or more AC or DC voltages.

Electronic voltage regulators are found in devices such as computer power supplies where they stabilize the DC voltages used by the processor and other elements. In automobile alternators and central power station generator plants, voltage regulators control the output of the plant. In an electric system, voltage regulators may be installed at a substation or along distribution lines so that all customers receive steady voltage independent of how much power is drawn from the line.

Features:

- Output Current up to 1A
- Output Voltages of 5, 6, 8, 9, 10, 12, 15, 18, 24V
- Thermal Overload Protection
- Short Circuit Protection
- Output Transistor Safe Operating Area Protection

LED

A light-emitting diode (LED) is a two-lead semi-conductor light source. It is a basic PN-junction diode, which emits light when activated. When a suitable voltage is applied to the leads, electrons are able to recombine with electron holes within the device, releasing energy in the form of photons. This effect is called electroluminescence, and the color of the light(corresponding to the energy of the photon) is determined by the energy band gap of the semiconductor.

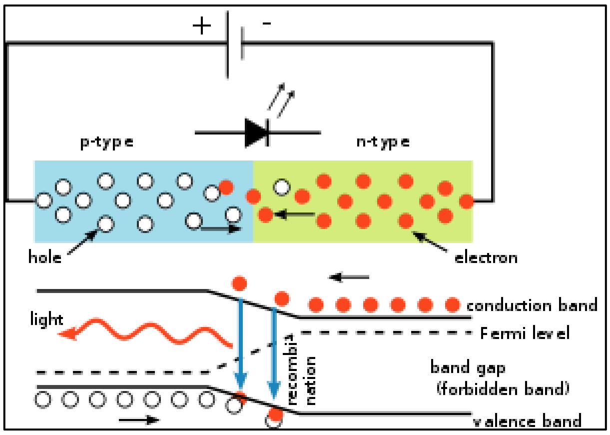
An LED is often small in area (less than 1 mm2) and integrated optical components may be used to shape its radiation pattern.

Appearing as practical electronic components in 1962, the earliest LED emitted low-intensity infrared light. Infrared LEDs are still frequently used as transmitting elements in remote-control circuits, such as those in remote controls for a wide variety of consumer electronics. The first visible-light LEDs were also of low intensity, and limited to red. Modern LEDs are available across the visible, ultraviolet, and infrared wavelengths, with very high brightness.

Early LEDs were often used as indicator lamps for electronic devices, replacing small incandescent bulbs. They were soon packaged into numeric readouts in the form of seven-segment displays, and were commonly seen in digital clocks.

LEDs have allowed new text, video displays, and sensors to be developed, while their high switching rates are also useful in advanced communications technology.

On October 7, 2014, the Nobel Prize in Physics was awarded to Isamu Akasaki, Hiroshi Amano andShuji Nakamura for "the invention of efficient blue light-emitting diodes which has enabled bright and energy-saving white light sources" or, less formally, LED lamps.


+
-
p-type
n-type
hole
electron
light
conduction band
Fermi level
band gap
(forbidden band)
recombination
valence band

APPLICATION

- Which is useful the physically disable person with his hand movement
- Reduce complexity, easy controlling, great reliability compares to other conventional wheel chair.
- Also using many applications such as hospital air ports.

FUTURE SCOPE

☞ Automated wheelchair can be operated by a wireless remote which can reduce the wiring arrangements.

☞ Instead of using acceleration motion we can use eye retina using an optical sensor to move wheel chair accordingly.

☞ We can use voice command IC'S to interface our voice signal with microcontroller.

☞ This system can be extended by including GSM which sends an SMS during emergency.

☞ Research is going on development of handicap wheel chair using nervous system of human.

RESULT AND CONCLUSION

This is very superior way of communicating with Robot. Complex controlling command of Robots are avoided due to this Project Everyone can be handling the Robot even uneducated person also. To achieve independence in mobility for people with physical disability, right mobility equipments have to be designed based on the severity and type of disability. This is not a trivial job just because the nature and type of disability varies from person to person.

Gesture recognition module and the motor driver control the overall operation. The proposed AVR microcontroller-based Gesture operated wheelchair would bring more convenience for the disabled people. By its very special features Gesture operated wheelchair become an advanced means of mobility aid for patients suffering from Multiple Sclerosis and quadriplegics. This Wheel chair is thus a ray of hope to freedom of mobility for many disabled. Hence the programmed for voice operated wheelchair is done by using the software Arduino and run successfully. In future we are developing Autonomous wheelchair for physically disabled people such as blind, quadriplegics and multiple sclerosis. In which the wheel chair can be operated in two modes automatic as well as by using voice of the user.

REFERENCE

Books

1) MICROCONTROLLER AND EMBEDDED SYSTEM.

2) Programming in ANSI C: E BALAGURUSAMY.

3) www.google.com

4) www.datasheets4u.com

5) www.datasheetcatalog.com

6) www.ATmega8.com

7) http://www.arduino.cc/.

8) https://sites.google.com/a/umn.edu

9) http://arduino.cc/en/Guide/HomePage.

10) http://arduino.cc/en/Main/ArduinoBoardUno

11) www.robotic.net