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"SUPER CAPACITOR BASED METRO TRAIN"
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ABSTRACT
Hectic problem around the world is about traffic densities. This is also common to railway sector too. Metro run on another power source these power source may be recent source like solar power, battery storage, super capacitor etc. Regular electric supply can provides of electrical and mechanical losses regarding there power equipments. for overcome of above associated problem we can providing another power source like super capacitor. Metro train is the best option to overcome this traffic problem and also these train mass transit vehicle enable large reduction in terms of emissions. The locomotive has unveiled a proto type light metro train set which uses super capacitor energy storage to operate without an external power supply. These metro' s is not completely depend on regular electricity. In this paper to drive the metro train with the help of super capacitor. The super capacitor based metro train is one of the best achievement in future by seeing rapid consumption of and other fuel in present situation. For better convenience of traffic problem resolution, metro is the best option.

Keyword : microcontroller(PIC18F25K22), Controller, Motor Drive IC(L293D), Obstacle Sensor(HC-SR04).
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1. INTRODUCTION

Since, last few years people mobility has been increased in urban areas. improving in terms of passenger capacity number of journey than metro is the best option. Metro train aim to provides safe and comfortable journey to a large number of passenger in short period of time, which make them become an important part of transportation to relieve traffic congestion. Greater amount of energy consume in daily operation of metro system. Hence, to reduce the losses eliminate overhead lines. The super capacitor having capability to storing more power hence the discharge time of these capacitor is much more, so it is efficient to drive metro train. The charging of this unit is done by using electric supply, and this charging ports is positioned on each and every metro station to make available supply to super capacitor for its charging. The main benefit of super capacitor is, it take less charging time. We also install ultrasonic sensor in our metro system in order to avoid accident and maintain safety of passenger and vehicle.

we drive our metro with the help of Super capacitor which is capable of storing excessive power. The super capacitor based on metro train, so that it directly transmits power to motor. This figure consists of microcontroller it operates whole system of metro train. Charge controller is used to limit the rates at which current and gives protection against over charging and over voltage.
This metro train is run on power of super capacitor which is controlled and monitored from loco pilot with the help of microcontroller assembly. After the discharging of Super capacitor it will get charge. The train set has under floor power pick up which are used to charge the roof mountain super capacitor unit from a pick supply while the train stood at station. Manual command is provided by the rail operations control centre(ROCC) to the loco pilot.

2. SYSTEM DESCRIPTION :

3. COMPONENT DESCRIPTION

3.1 SUPER CAPACITOR

Capacitor are passive component which are capable of drawing storing and releasing energy, in a circuit and are possible by means of providing the potential difference to two conductors which where separated by an insulating dielectric thus electric field will be created and electric charges will be store. Capacitor with a very high energy density can be consider as "super capacitor". Super capacitor also known as electric double layer capacitor.
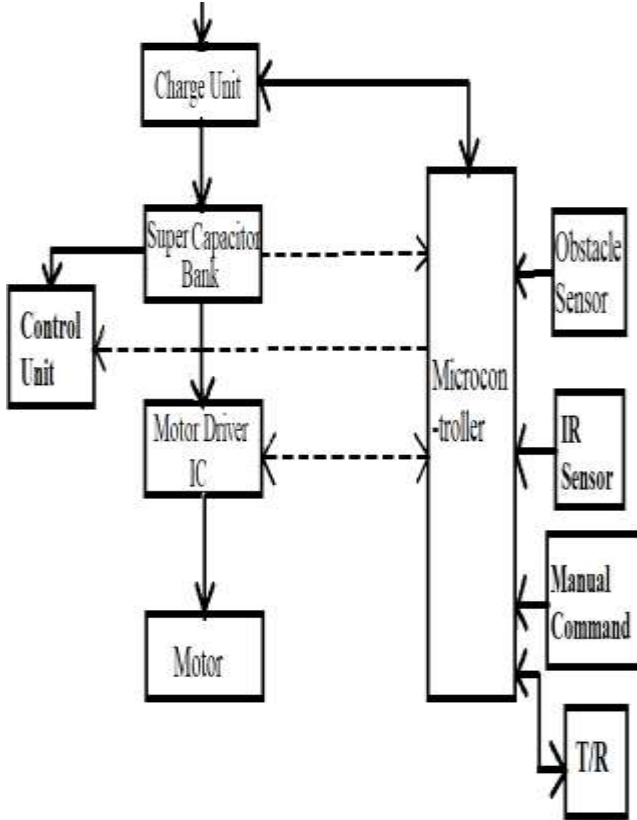
Fig-1:-Block diagram of system

Each station proves overhead lines for electric supply. This supply can get in metro train with the help of pantograph. This supply provides required power to discharged capacitor for charging. This type of station known as charging station. The pantograph is operate with the help of servo motor for opening & closing operation.
d line follower instead of rout. It also consist of motor which operated through microcontroller. motor driver IC is used for amplification and changing the direction of motor. This electric power is generated with the help of fossil fuel . Consumption of fossil fuel is very rapidly increasing now a days. In this paper drive metro train with the help of super-capacitor as this capacitor is totally different from ordinary capacitors, because its capability of storing more power than any other ordinary capacitor.

Fig-3. Super Capacitor

1.Terminal	6. Separator
2. Safety Vent	7. Carbon Electrode
3.Sealing Disc	8.Collector
4.Aluminum Can	9.Carbon Electrode
5.Positive Pole	10.Negative

Sr. no.	Name of Component.	Sr. No.	Name of Component.
1	Super capacitor	5	Display(LM016L) LCD(16*2)
2	Microcontroller (PIC18F25K22)	6	Servo Motor
3	Obstacle Sensor (HC-SR04)	7	DC Motor
4	Motor Driver IC (L293D)	8	IR Sensor

Specifications	Super Capacitor
Charge time	1 to 10 seconds
Cycle life	1 million or 30000h
Cell voltage	2.3 to 2.75 V
Specific Energy in Wh/Kg	5 (typical)
Specific Power (W/Kg)	Upto 10000
Service life (mounted on vehicle)	10 to 15 years
Charge temperature	-40 to 65°C
Discharge temperature	-20 to 60°C
Form factor	Small
Weight	1 to 2 g
Pros (i.e. Advantages or benefits)	• Long cycle life • High load currents • short charging times • excellent temperature performance

3.2 CONTROL UNIT:

Control unit limit the rate at which electric current is added to or drawn from electric batteries. It prevents over charging and may protect against over voltage. It provide feedback signal to microcontroller about charging and discharging of super capacitor.

3.3 MICROCONTROLLER(PIC18F25K22)

Features:-

- 16 bit wide instruction, 8 bit wide data path
- Priority levels for interrupts
- 8*8 single cycle Hardware Multiplier
- Up to 1024 Bytes Data EEPROM

Fig-4. Pin diagram of PIC18F25K22

3.4 INFRA RED SENSOR:

Infra red are connected to the microcontroller in which two IR sensor are used to show stations and the two sensors are used to control the train door Whenever the metro train reaches the station it stop

automatically and open the door activated with the help of sensor.

3.5 OBSTACLE SENSOR(HC-SR04):

Obstacle sensor is a ultrasonic sensor which is used to stop train in emergency. The basic concept of an infrared sensor which is used as obstacle detector is to transmit an infrared signals. This infrared signal bounces from the surface of the object and the signal is received at the infrared receiver.
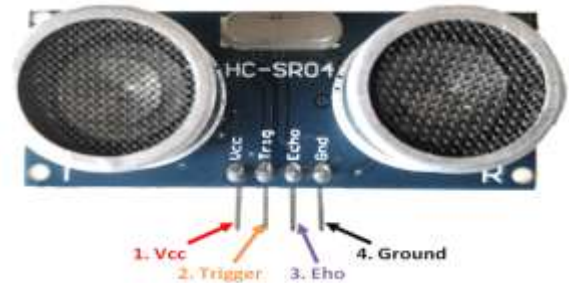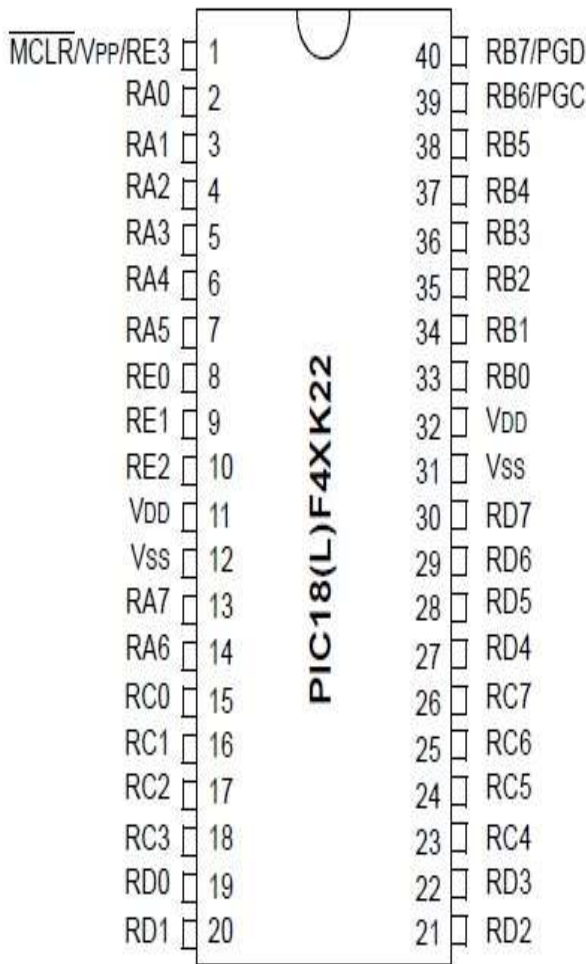
Fig-5. Obstacle Sensor.

Pin Number	Pin Name	Description
1	Vcc	The Vcc pin powers the sensor, typically with +5V
2	Trigger	Trigger pin is an Input pin. This pin has to be kept high for 10us to initialize measurement by sending US wave.
3	Echo	Echo pin is an Output pin. This pin goes high for a period of time which will be equal to the time taken for the US wave to return back to the sensor.
4	Ground	This pin is connected to the Ground of the system.

HC-SR04 SENSOR FEATURES

- Operating voltage: +5V
- Theoretical Measuring Distance: 2cm to 450cm
- Practical Measuring Distance: 2cm to 80cm
- Accuracy: 3mm
- Measuring angle covered: <15°
- Operating Current: <15mA
- Operating Frequency: 40Hz

3.6 MOTOR DRIVER IC:

Motor driver IC is the duel H bridge IC. Motor Driver is act as a current amplifier, Low current signal provide high current signal. This high current used to drive the motor. In the motor operation two DC motor can be driven simultaneously both the forward and reverse direction the two motor can be controlled by the input

Motor Driver ICs are primarily used in autonomous robotics and to drive motors. Most microprocessors operate at low voltages and require small amount of current to operate while the motors require a relatively higher voltages and current Thus current cannot be supplied to the motors from the microprocessor. This is the primary need for the motor driver IC use for amplification purpose, and changing the motor direction. L293D contains two inbuilt H-bridge driver circuits. In its common mode of operation, two DC motors can be driven simultaneously, both in forward and reverse direction.

The motor operations of two motors can be controlled by input logic at pins 2 & 7 and 10 & 15. Input logic 00 or 11 will stop the corresponding motor. Logic 01 and 10 will rotate it in clockwise and anticlockwise directions, respectively.

The L293 IC receive signals from the microprocessor and transmits the relative signal to the motors
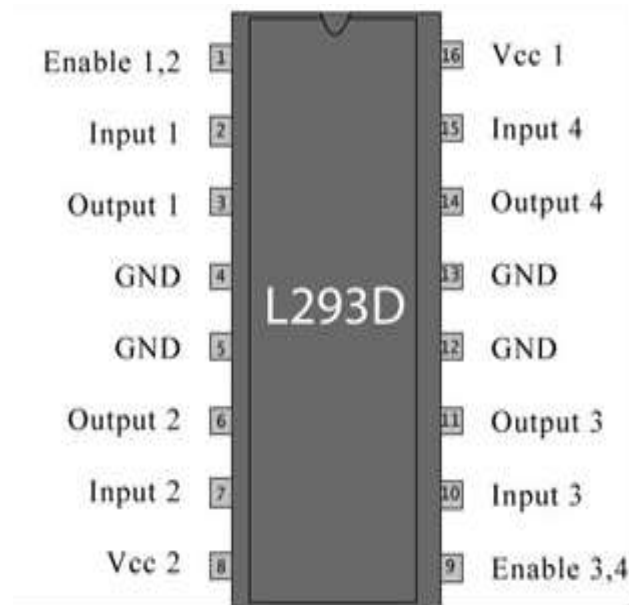

Fig-7. Motor Driven IC

Features

- Can be used to run Two DC motors with the same IC.
- Speed and Direction control is possible
- Motor voltage Vcc2 (Vs): 4.5V to 36V
- Maximum Peak motor current: 1.2A
- Maximum Continuous Motor Current: 600mA
- Supply Voltage to Vcc1(vss): 4.5V to 7V
- Transition time: 300ns (at 5Vand 24V)
- Automatic Thermal shutdown is available
- Available in 16-pin DIP, TSSOP, SOIC packages

3.7 LCD DISPLAY (16*2)

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display seven segments and other multi segment LEDs. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations and so on. A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data. is very basic module and is very commonly used in various devices and circuits.

Fig-7. LCD display (16*2)

Pin No	Function	Name
1	Ground (0V)	Ground
2	Supply voltage; 5V (4.7V – 5.3V)	Vcc
3	Contrast adjustment; through a variable resistor	VEE
4	Selects command register when low; and data register when high	Register Select
5	Low to write to the register; High to read from the register	Read/write
6	Sends data to data pins when a high to low pulse is given	Enable
7	8-bit data pins	DB0
8		DB1
9		DB2
10		DB3
11		DB4
12		DB5
13		DB6
14		DB7
15	Backlight Vcc (5V)	Led+
16	Backlight Ground (0V)	Led+

3.8 SERVO MOTOR
Servo motor is used to rotate an object with at some specific angles or distance. It consists of a suitable motor coupled to a sensor for position feedback.

3.9 DC MOTOR
Dc motor is a device which convert electrical energy into mechanical. The speed of motor can be controlled by using variable supply. In this paper dc motor used is for moving wheel metro train.

3.10 TRANSMITER/RECEIVER:

T/R is used to detect the location of train on the routs and also rail road operation. It provides information about direction of routs.

4. CONCLUSION

This paper gives a design which has many benefits like low cost, small size. In this system we are using the microcontroller (*PIC18F25K22) in* combination with and obstacle sensor (*HC-SR04).* Interfacing of this two device will helps to find out the obstacle more accurately.

4. FUTURE SCOPE

- This system help to reduce used of fossil fule which going to decrease now days.
- Charging facility provided at 3.5Km to 5Km distance of metro station.
- Reducing power losses and maintenance.
- Eliminating the over headlines.

5. ACKNOWLEDGEMENT

REFERENCE

[1]Liu ,R., golovitcher " Energy efficient operation of rail vehicles" Trans.Res.Part A 2003,37,917-932.

[2]Howlett P.G. " optimal strategies for the control of train" , Automatica 1996,32,519-532.

[3] Kotz, R. and M. Carlen (2000). " Principle and application of electrochemical capacitors." Electrochemical Acta 45(15-16) : 2483-2498.

[4]Jes.ecsdl.org/content/138/6/1539.full.pdf .

[5]J.Auer.Gsartorelli,andJ.M.Miller," Ulteracapacitors improving energy storage for hybrid vehicles" ,In proceeding of the EET,2007.

[6]T.Montanie," Electric energy storage evaluation for urban rail vehiclas" ,In procceding of the EPE,2003.

[7]www.wikipedia.org