

SUPER-CAPACITOR BASED METRO TRAIN

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ABSTRACT

We can generate energy from most of the sources like solar, wind, hydro, coal as a fuel in plant etc. But in most there is cost problems for plant establishing, running, maintenance or availability of resources (fuels) which are going to be exhausted one day new generation of rapid transit trains requires a more effective energy management for reduction of energy consumption during the journey. In the country like INDIA where the population is growing up drastically now a day so it is necessary to control traffic in big cities of INDIA and also it is necessary to control of pollution in environment, so that's why metro is the best way to reduce traffic and also these mass transit vehicle enable large reduction in terms of emissions. But this metro is not completely depended on electricity means to say that here the continuous supply will be eliminated which is use to drive metro with the help of overhead line. We also eliminated overhead line and other electrical equipment required in metro train system. We use to drive our metro with the help of super-capacitor, it is a type of battery with huge size and its very bulky as this capacitor unit required some more place to install it on train so that it will give continuous supply to motor. It having one time installation cost and maintenance cost is low with last long of its life. The super capacitor based metro train is one of the best achievement in future by seeing rapid consumption of coal and other fuel in present situation.

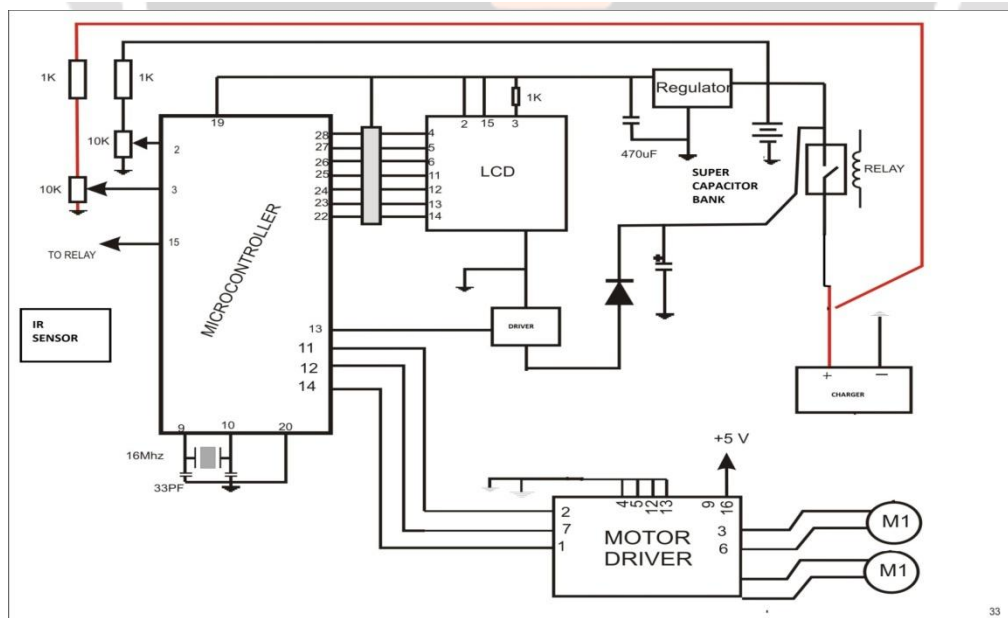
INTRODUCTION:

Since last few years people mobility has increased in urban areas, Implying the necessity of rapid transit improvement in terms of passenger capacity and number of journey than metro is the best option. Metro train aim to provide safe and comfortable journey to a large number of passenger in a short period of time, which make then become an important part of public transportation to relieve traffic congestion. In addition, metro can transport more passengers with less energy consumption and, thus are regarded as a green transportation mode. which compared to buses and private car services. However, due to the large-scale operations of metro systems especially in big cities and high-frequency services, a great amount of energy is consumed for the daily operation. For example, in Beijing metro systems, there are 18 operating lines, and the passengers can on average reach 10 million per day, which could increase to 11.5 million for peak periods. The annual energy consumption is over 500 MWh. Hence, improving the energy efficiency of metro systems will be of great interest for the operation company to reduce the energy consumption. One of the most important issues in power system is energy. Due to fossil fuel down fall, global warming and greenhouse effect which are important environmental effects of fossil fuel burning to produce energy and energy price variation, energy saving and recycling industry especially in electrical vehicles and electrical trains are very important and vital. Typically railway traction drives make use of the overhead contact lines for transferring the electrical energy from the feeding substations to the moving rail vehicles, by means of sliding current collector known as pantograph. But here we eliminated overhead line which is very efficient way to reduce energy consumption we use super-capacitor to drive a metro train as super-capacitor having capability to accumulate more power than any others ordinary capacitors. In CHINA there are 14 cities with population over 10 million never before has accessible and efficient public transportation been so critical. As the china railway system continues to experience increased ridership and longer hours of operation, the opportunity widens to employ super-capacitor power systems for grid energy efficiency and stabilization. As super-capacitor having capabilities of storing more power hence the discharge time of this capacitor is much more, so it is efficient to drive motor of the metro train. This super-capacitor also get discharge by supplying continuous energy to motors of metro train so the charging of this capacitor is necessary to give continuous and. trouble-free operation of metro. The charging of this unit is done by using electric supply, and this charging port 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 ultra sonic sensors in our metro system in order to avoid accident and maintain the safety of passengers and vehicle. These sensors are to be found in-front of the train. These sensors be full of transmitter and receiver. When metro train engages in the braking action, the super-capacitor unit converts kinetic energy-energy that is lost in friction braking system into stored electrical energy. Unlike batteries, super-capacitor rapidly charge and discharge, enabling them to capture and store energy during braking. Battery based system have limited ability to absorb energy in few second required to stop metro train.

CONSTRUCTION AND WORKING:

As we know our project is based on metro train which is more important part of transportation now a day in big cities all around the world. This transportations service is one of the best services among other services. As it is a very comfortable to public of their respective cities. As we know metro train service is totally depend on electricity. This electric power is generated with the help of fossil fuel which are going to end one day. Consumption of fossil fuel is very rapidly now a days. By seeing this concept we decided to drive our metro train with the help of super-capacitor as this capacitor is totally different from ordinary capacitors, because it is capable of storing more power than any other ordinary capacitor. This super-capacitor unit is placed on train so that it directly transmits its power to the motor of the metro train. This super-capacitor is acts like a battery hence, battery also gets discharge by giving its power to full filling the need of some system operation. Just like that super-capacitor also get discharge after some period of time by supplying continuous power to motor, so it is necessary to charge this capacitor unit. The charging of super-capacitor bank is done on metro station means we will provide charging point on each and every station and the charging is done via means of pantograph which is situated at top of metro train. Pantograph is operated with the help of servo motor. A servo motor is electrical device which can push or rotate an object with great precision. If you want to rotate an object with at some specific angles or distance you can use servo. It is just a simple motor which can run on servo mechanisms. If motor works o dc then it is called DC servo motor and when it work on AC then it is called as AC servo motor. We can get very high torque servo motor in a small and light package. Does these features they are being use in toy car, RC helicopter and planes, robotics etc. We use line follower instead of rail route. Our metro train will run with the help of line follower .line follower is the autonomous train which follower either black line in white area. Train must be able to detect particular line and keep following it.



The above fig shows the circuit diagram of our project. Consist of microcontroller which is important part of this project it operates whole system of metro train. It contains of motor which is operated through microcontroller. From supply it comes 230volts ac but our devices are work on12 volt so we have to step down this voltage to 12 volt for operating whole project. There are two DC motor connected across each other. This motor will moves in both the direction forward as well as in reverse direction. We provide logic 0 or 1 across

the input pin for rotating motor. The operation of the motor explain below. Let's consider a motor connected with output pin for rotating a motor logic 1 & logic 0.

Logic 1 & logic 0 = Clockwise direction

Logic 0 & logic1 = Anticlockwise direction

Logic 0 & logic 0 = No rotation

Logic 1 & logic 1 = idle (no rotation).

COMPONENT:

MOTOR DRIVER IC :-



- 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.

DISPLAY:-



- Display the power rating on display screen.
- Used to display any fault in the circuit.

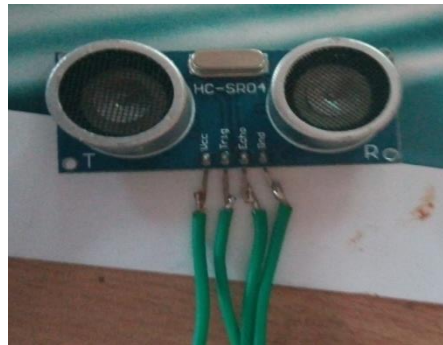
MICROCONTROLLER:-

- A microcontroller is a self-contained system with peripherals, memory and a processor that can be used as an embedded system.
- Most programmable microcontrollers that are used today are embedded in other consumer products or machinery including phones, peripherals, automobiles and household appliances for computer systems. Due to that, another name for a microcontroller is "embedded controller."
- Microcontrollers are used in automatically controlled devices including power tools, toys, implantable medical devices, office machines, engine control systems, appliances, remote controls and other types of embedded systems.

SUPER-CAPACITOR:-

- It is a type of Battery Bank used to Drive the motor train.
- A capacitor Bank is group of several capacitors of the same rating that are connected in series or parallel with each other to store electrical energy.
- The resulting bank is then used to counteract or correct a power factor lag or phase shift in an AC power supply.



OBSTACLE SENSORS:-

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

CHARGE CONTROLLER:-

- A charge controller limits the rate at which electric current is added to or drawn from electric batteries.
- It prevents over charging and may protect against over voltages.
- The primary roll is to manage to charging to battery bank.

OBJECTIVES :-

We use super capacitor in this project. The super capacitor unit is nothing but the battery unit which is use to drive the metro train. By using super capacitor, elimination of overhead line, catenaries and other electrical equipment like pantograph which is use to take power from overhead line. Super capacitor having low maintenance and it having one time investment. It gives better attractiveness.

MERITS :-

- Low maintenance.
- Eliminate of overhead line
- Eliminate of other electric component.

DEMERITS :-

- The system is bulky.

- Require more space.

REFRANCES :-

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