ACCELERATION AND BRAKING OF EV USING ELECTRONIC CONTROLLER

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Abstract

We are slowly reaching the age of electric vehicles within the last few years research for electric vehicles has significantly increased. The major issue behind the mass use of electric vehicle is the battery charging time and lack of charging station. So, here we proposed "Regenerative braking system". When we switch on the power supply the wheel starts propelling, but due to some interruption when brakes are applied small amount of voltage will be generated. Further that energy will be stored in the battery which will be given to a load.

Keywords*: Electric Vehicle, Charging Station, Regenerative Braking*

I. Introduction

Now a days, with the increasing of the pollution and global warming one of the solution for the current problem could be resolved with the usage of electric vehicles. The development and research of the electric vehicle includes establishment of electrical and mechanical system Every time you step on your vehicle brakes, you are wasting energy. Physics tells us heat energy cannot be destroyed. So when your vehicle slows down, the kinetic energy dissipates as heat and becomes useless. That energy which could have been used to do work .In most vehicles it is inevitable byproduct of braking and there is no way you can drive a vehicle without occasionally hitting the brakes. But engineers have given this problem a thought and have come up with a kind of braking system that can recapture much of the vehicles batteries. This system is called
"Regenerative braking". Regenerative braking is the most excellent way for electrical vehicle to expand their during capabilities. The regenerative braking plays an vital role to maintain the vehicle strength and better energy. Electric vehicle use mechanical brake to boost the roughness of
wheel for the deceleration purpose. However from the point of view of saving energy,

DOI- 10.18486/ijcsnt.2021.10.1.01
ISSN: 2053-6283

mechanical brake increases out much energy, while electrical vehicles kinetic energy is renewed into the thermal one.

The four quadrants operation of the dc motor is best suited for industries where motors are used and as per requirement they can rotate in clockwise, counter clockwise and also apply brakes immediately in both directions. In case of specific operation in industrial environment, the motor need to stop immediately. In such scenario, this proposed system is very apt as forward brake and reverse brake are its integral features. In this work the concept of four quadrant speed control i.e. clockwise movement, anti-clockwise movement, instantaneous forward braking and instantaneous reverse braking of a dc motor with the help of microcontroller through motor driver (L293D) has been proposed.

Block Diagram

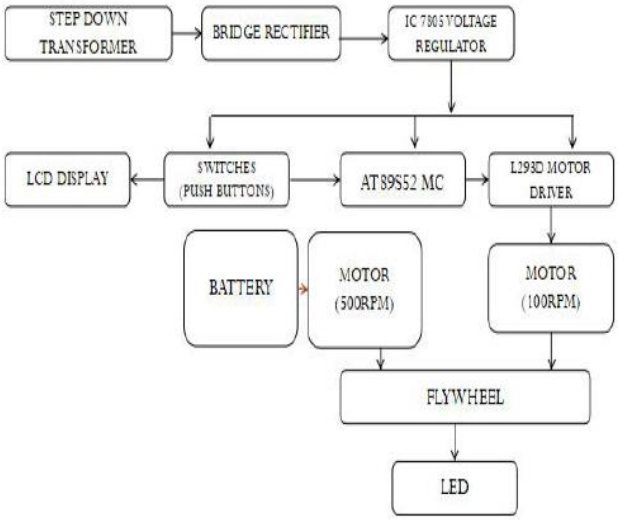

Fig.1: Block diagram

II. Components

The various components used in designing the project are

i) Regulated power supply ii) Step down transformer iii) Bridge rectifier iv) IC7805 voltage regulator v) LCD display vi) DC motor vii) L293D motor driver viii) LED ix) Battery x) AT89S52 Microcontroller

III. Working

From the mains, a 230V AC supply is fed to the step down transformer which steps down the voltage from 230V AC to 12V AC. Further 12V AC is given to the bridge rectifiers which rectifies the voltage and convert 12V AC to 12V DC. An electrolytic capacitor mainly 1000micro farad is added to reduce unwanted frequencies. Since, the components which we have used works on 5V DC so, to get that 5V DC, IC7805 which is a 5V voltage regulator is used which regulates the output voltage to 5V DC. A regulated 5V dc may contain some ripples so in order to get pure DC 10 microfarad capacitor is used. This regulated power is distributed to AT89S52 microcontroller, L293D Motor driver IC, push buttons and other components. In AT89S52 micro-controller chip, the program is dumped with the help of KEIL software. According to the instructions given by AT89S52 microcontroller the push buttons, L293D driver IC and the other components operates. .L239D motor driver is connected to two motors rated 100rpm and 500rpm. From the microcontroller we cannot connect a motor directly because microcontroller cannot give sufficient current to drive the DC motors. Thus we insert motor driver ie.L293D IC between microcontroller and motors.L293D motor driver IC takes the input signals from the microcontroller and it will generate the corresponding output for motor. Basically L293D is a current enhancing IC, there are 6 push buttons namely to increase speed, to decrease speed, clockwise start, clockwise stop, anticlockwise start, anticlockwise stop. With the help of these push buttons we can increase or decrease speed in steps in both directions and these operations will be displayed on LCD screen. When we increase or decrease the speed in either clockwise or ant clockwise direction in

DOI- 10.18486/ijcsnt.2021.10.1.01
ISSN: 2053-6283

steps with the help of push buttons, the L293D motor driver IC will make the 100rpm motor to operate which in turn rotate the flywheel in clockwise or anti clockwise direction. The shaft is attached with the flywheel by chain and schoket mechanism. When brakes are applied with the help of dynamo which act as a brake, suddenly the power supply is cut down and the rotating flywheel stops but not completely because of the kinetic energy being present. So here this kinetic energy is converted into electrical energy with 500rpm motor and this electrical energy is stored in the battery and subsequently that will be used by the load. So in this prototype the load we have used is LEDs ie.red and white LEDs.Red LED will glow for clockwise and white LED for anticlockwise direction which indicates that braking energy is recaptured.

Fig. 2 Prototype model

IV. Advantages

1. Less maintenance cost.
2. As PMDC motor do not required field windings, they do not have field circuit copper losses. This increases their efficiency.

V. Disadvantages

1. The initial cost is high.
2. There will be losses due to friction

Vi. Results

1. With the help of optical tachometer we have measured the speed of the flywheel by increasing speed in steps both in clockwise and anti-clockwise direction.
2. We have measured amount of voltage generated when suddenly the brake is applied in both clockwise and anti-clockwise direction.
3. In clockwise direction voltage generated is 3V and in anti-clockwise direction 2V.

Table 1: Results

STEPS	VOLTAGE(V) (CONSTANT)	SPEED(RPM) IN CLOCKWISE	SPEED(RPM) IN ANTICLOCKWISE
1	12	5	2
2	12	20	5
3	12	40	24
4	12	70	43
5	12	80	56

Summary

When we are driving the vehicle, due to some interruptions when we hit the brake we are wasting the energy. In our project we are utilizing that braking energy by “Regenerative braking system”. In experimental results we have measured speed and voltage being generated during braking. This is practical and highly feasible in economic point of view.

DOI- 10.18486/ijcsnt.2021.10.1.01
ISSN: 2053-6283

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DOI- 10.18486/ijcsnt.2021.10.1.01
ISSN: 2053-6283