Design And Analysis of Regenerative Braking In Electric Vehicles Using Ann Algorithm

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Abstract- *The regenerative braking plays a vital part to maintain the vehicle's strength and getting better energy. Electric vehicle's use mechanical brake to boost the roughness of wheel for the deceleration purpose. However, from the point of view of saving energy, mechanical brake increases out much energy while the EV's kinetic energy is renewed into the thermal one. This project proposes the efficient battery energy management system for regenerative braking application. This project has presented the RBS of EVs which are driven by the BLDC motor. The performance of the EVs' regenerative brake system has been realized by our control scheme which has been implemented both in the simulation and in the experiments. By combining fuzzy control and PID control methods which are both sophisticated methods, RBS can distribute the mechanical braking force and electrical braking force on. In this paper, we have chosen the three most important factors: SOC, speed, and brake strength as the fuzzy control input variables. Conventional braking systems use friction to counteract the forward momentum of a moving car. As the brake pads rub against the wheels, excessive heat energy is created. This heat energy dissipates into the air, wasting up to 30% of the car's generated power.*

I. INTRODUCTION

Prologue to Regenerative Braking Systems When a regular vehicle applies its brakes; motor vitality is changed over to warm as grinding between the brake cushions and wheels. This warmth is diverting in the airstream and the vitality is viably squandered the aggregate sum of vitality lost along these lines relies upon how frequently, how hard and for to what extent the brakes are applied. Regenerative slowing down alludes to a procedure in which a bit of the motor vitality of the vehicle is put away by a momentary stockpiling framework. Vitality regularly dispersed in the brakes is guided by a force transmission framework to the vitality store during deceleration. That vitality is held until required again by the vehicle, whereby it is changed over go into motor vitality and used to quicken the vehicle. The size of the part accessible for vitality stock piling changes as per the kind of capacity, drive train effectiveness, and drive cycle and idleness weight. A lorry on the mother way could travel 100 miles between stops. This speaks to small sparing regardless of whether the proficiency of the framework is 100%. Downtown area driving includes a lot additionally slowing down occasions speaking to a lot higher vitality misfortune with more prominent likely investment funds. With transports, taxis, conveyance vans, etc. there is much increasingly potential for economy. Since regenerative slowing down outcomes in an expansion in vitality yield for a given vitality contribution to a vehicle, the effectiveness is improved the measure of work done by the motor of the vehicle is diminished, thusly decreasing the measure of prime vitality required to impel the vehicle. All together for a regenerative slowing mechanism to be practical the prime vitality spared over a predetermined lifetime must balance the underlying cost, size and weight punishments of the framework To be effective a regenerative breaking mechanism ought to in a perfect world have the accompanying properties, Efficient vitality transformation A vitality store with a high limit for each unit weight and volume, A high force rating so a lot of vitality can stream in a short space of time, Not require over entangled control frameworks to connect it with the vehicle transmission, Smooth conveyance of intensity from the regenerative framework, Absorb and store slowing down vitality in direct extent to slowing down, with the least deferral and misfortune over a wide scope of street speeds and wheel forces.

II. RELATED WORK

[1] S.H. Park, J.S. Kim, J.J. Choi, H. Yamazaki, "Modelling and Control of Adhesion Force in Railway Rolling Stocks", IEEE Control Systems Magazine A wheel slide protection (WSP) system of a railway train has the role of reducing excessive wheel slide from brake applications in situations where wheel/rail adhesion is temporarily impaired. The mechanism of the WSP is complex and is related to highly nonlinear dynamics of the train. Hardware-in-the-loop simulation (HILS) for the WSP system can test various dangerous braking conditions which are not possible in actual train tests, and help to find appropriate parameters of the WSP system. [2] Picasso, D. Caporal, P. Colaneri, "A distributed braking control algorithm with preview action for railroad vehicles", A method is proposed to enhance the overall

braking performance of a railroad vehicle (train) by properly exchanging information among the single control units. Taking advantage of data transmitted from the coaches at the front of the train to the rear carriages, a novel distributed braking control algorithm is proposed that, based on preview control techniques, allows one to reduce the stopping distance.[3] N.S.A.Zulki fi, F.K.Che Harun and N.S. Azahar, "Centralized Heart Rate Monitoring Telemetry System Using Zigbee Wireless Sensor Network", This project is mainly concerned about monitoring patient's condition simultaneously via Wireless Mesh Network. Wireless Mesh Network is a network that allows data transmitted to the node's nearest neighbours and it can be easily maintained as each node are self-configuring and self-healing.[4] Guojin Li and Jing Han, " Application of the Medical Care System Based on ZigBee Technology"Monitoring equipment used in hospital wards that most of the networking capabilities most of the cable, so that the hospital must consider the routing problem and health care workers in the process of care patients of ward rounds not only time-consuming and inefficient. To solve these problems, combined with the ZigBee network technology to design a new type of medical monitoring system.[5] A.Juels ,"RFID security and privacy"A research survey RFID tags are small, wireless devices that help identify objects and people. Thanks to dropping cost, they are likely to proliferate into the billions in the next several years – and eventually into the trillions. RFID tags track objects in supply chains, and are working their way into the pockets, belongings and even the bodies of consumers.[6] Stephen a. Weis, Sanjay E.Sarma, Ronald.L.Rivest , "Security and Privacy aspects of low cost radio frequency identification Systems" Like many technologies, low-cost Radio Frequency Identification(RFID) systems will become pervasive in our daily lives when affixed to everyday consumer items as "smart labels". While yielding great productivity gains,RFID systems may create new threats to the security and privacy of individuals or organizations. This paper presents a brief description of RFID systems andtheir operation. We describe privacy and security risks and how they apply tothe unique setting of low-cost RFID devices.

III. SYSTEM DESIGN

PWM generator is converted with bidirectional converter, and the torque produced from braking of motor is transferred to converter and energy from converter is transferred to battery. The power from battery is inverted using inverter, it can be directly used in electric vehicles. But in case, it is an electric train the power from battery is inverted and it is connected to grid for further use. To monitoring the voltage fluctuation and to monitoring the power production the LED display is connected. To control the whole process control driver connected with micro controller is used.

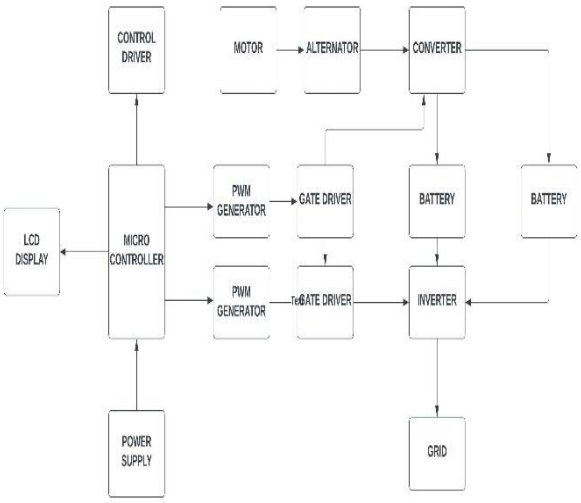


Figure.1 Block Diagram of Proposed System

A. PIC MICROCONTROLLER

PIC has only 35 single word instructions. All are single cycle instructions except for program branches, which uses two-cycle. The Operating speed of PIC in DC is 20 MHz and clock input in DC is 200 ns instruction cycle. The PIC has 8K x 14 words of flash Program Memory, 368 x 8 bytes of Data Memory (RAM).

Figure. 2 PIC Microcontoller

B. BATTERY

The proposed charging application requires a deep cycle battery. Deep cycle batteries have larger plates and different chemistry to avoid the corrosive effect of frequently using the full capacity. The solar energy is converted into electrical energy and stored in a lead-acid battery. The ampere-hour is the rated capacity of the battery. There are a few types of lead acid deep cycle batteries: If lead acid batteries are maintained properly, they will function at 80-90% efficiency. To extend the life of the battery and maintain efficiency it is important to maintain a full charge under most condition.

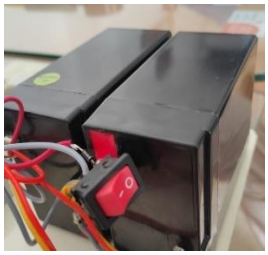


Figure.3 Battery

C. MOTOR

All motors are generators, the old saying goes, with the caveat that few types are equally good at both modes of operation, and some are downright awful as generators (a classic example being the single-phase shaded pole induction type, used in myriad small appliances the world over). Fortunately, both types of AC motor commonly used in EVs – the permanent magnet synchronous and the induction asynchronous – work perfectly fine in generator mode, although each has its own quirks and practical limits of operation. All that is required to turn any motor into a generator is to spin its rotor faster than it would spin on its own while field excitation is present. The very easiest motors to use as a generator are those with a permanent magnet for their field excitation – whether AC or DC – as they will obviously have field excitation present at all times; just spin the shaft and connect an appropriate load and you have a generator (note that the PM AC motor produces 3-phase AC with both voltage and frequency proportional to RPM).

Figure.4 Motor

D.INVERTER

A power inverter, inverter or invertor is a power electronic device or circuitry that changes direct current (DC) to alternating current (AC).The resulting AC frequency obtained depends on the particular device employed. Inverters do the opposite of "converters" which were originally large electromechanical devices converting AC to DC.The input voltage, output voltage and frequency, and overall power handling depend on the design of the specific device or circuitry. The inverter does not produce any power; the power is provided by the DC source.

Figure.5 Inverter

E.LIQUIDCRYSTALDISPLAY(LCD):

Figure. 6 LCD Display

An LCD consists of two glass panels, with the liquid crystal material sandwitched in between them. The inner surface of the glass plates are coated with transparent electrodes which define the character, symbols or patterns to be displayed polymeric layers are present in between the electrodes and the liquid crystal, which makes the liquid crystal molecules to maintain a defined orientation angle. One each polarizes are pasted outside the two glass panels. These polarizes would rotate the light rays passing through them to a definite angle, in a particular direction. When the LCD is in the off state, light rays are rotated by the two polarizes and the liquid crystal, such that the light rays come out of the LCD without any orientation, and hence the LCD appears transparent. When sufficient voltage is applied to the electrodes, the liquid crystal molecules would be aligned in a specific direction. The light rays passing through the LCD would be rotated by polarizes, which would result in activating/highlighting the desired characters. The LCD‟s are lightweight with only a few millimeters thickness. Since the LCD‟s consume less power, they are compatible with low power electronic circuits, and can be powered for long durations. Crystalloidsdot–matrix (alphanumeric) liquid crystal displays are available in TN, STN types, with or without backlight. The use of C-MOS LCD controller and driver ICs result in low power consumption. These modules can be interfaced with a4-bit or8-bitmicroprocessor/Micro controller. The built-in controller IC has the following features: Correspond to high speed MPU interface (2MHz),

16x 2bit display RAM(40 Characters max), 9,920-bit character generator ROM for a total of 240 characters, 208 Character fonts (5x8dots) 32 Character fonts (5x10 dots), 64x 8bit character generator RAM 8 character generator RAM, 8 Character fonts (5x8dots) 4 character fonts (5x 10dots).

F. TRANSFORMER:

Figure. 7 Transformer

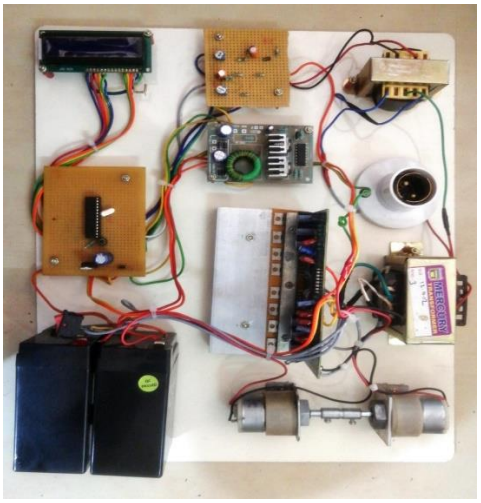
12-0-12 5Amp Center Tapped Step Down Transformer is a general purpose chassis mounting mains transformer. Transformer has 230V primary winding and center tapped secondary winding. The transformer has flying colored insulated connecting leads (Approx 100 mm long). The Transformer act as step down transformer reducing AC - 230V to AC - 12V.

IV. RESULT COMPARISION

Existing system	Proposed system
The efficiency of this system is 80%	The efficiency of this system has increased to 90%
It has 30% of the losses	The losses are reduced to 18%
It has poor grid performance	It has perfect grid performance
Switch losses are high	Switch losses are low
Voltage fluctuations are high	Voltage fluctuations are low
Using PID controller the Processing speed is slow	Using ANN Algorithm the processing speed is quick

V. CONCLUSION

In this project, a new RBS based on utilization of HESS is proposed for EVs driven by BLDC motor. During regenerative braking and/or energy regeneration, the kinetic energy of the vehicle is harvested by the super capacitor using appropriate switching template of the inverter. Hence, the need to additional power electronics interfaces is eliminated. Moreover, the PI controller is used to control the duty cycle of the PWM in the inverter to realize constant torque braking. In comparison with other similar types of the regenerative braking schemes, the proposed method has the superiorities of being simple and being high-efficient.



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