Retraction

Retraction: Self-Powered Vehicle with Enhanced Battery Technology (J. Phys.: Conf. Ser. 1916 012182)

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This article (and all articles in the proceedings volume relating to the same conference) has been retracted by IOP Publishing following an extensive investigation in line with the COPE guidelines. This investigation has uncovered evidence of systematic manipulation of the publication process and considerable citation manipulation.

IOP Publishing respectfully requests that readers consider all work within this volume potentially unreliable, as the volume has not been through a credible peer review process.

IOP Publishing regrets that our usual quality checks did not identify these issues before publication, and have since put additional measures in place to try to prevent these issues from reoccurring. IOP Publishing wishes to credit anonymous whistleblowers and the Problematic Paper Screener [1] for bringing some of the above issues to our attention, prompting us to investigate further.

[1] Cabanac G, Labbé C and Magazinov A 2021 arXiv:2107.06751v1

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Self-Powered Vehicle with Enhanced Battery Technology

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Abstract. The covid-19 pandemic has created a situation where public transportation turns out to be not advisable, and people start encouraging their vehicles for safety reasons. If this was the situation, then the number of vehicles on the road would be increased drastically which will lead to a lot of pollution problems and also demand for fuel. To balance the situation, an innovative vehicle with a self-powered facility using piezo transducer and regenerative braking technology with innovative battery pack technology has been created and it turns transportation into a sustainable one. The battery system is designed with new innovative and efficient techniques. All the innovations and designs lead to eco-friendly, sustainable, and more comfortable transport facilities with cheap prices that could be affordable by normal people. The application for the designed self-powered vehicle including Battery Management System (BMS) can be applied in various application of battery vehicles. This innovative technology move on the fact of renewable energy and the environmentally friendly process is a goal aiming to stop the the valuable natural resources which pretend to destroy. Self-powered source of energy plays a major part in the future of the nation. It is cent percent sure that the development of this prototype will indeed contribute to the technology development in electrical and electronics engineering, which make the pride of very own country, India.

1. Introduction

This self-powered electric vehicle aims to create a platform using multiple green energy systems to which every individual parameter of the vehicle can be self-controlled. When the vehicle moves, the complete region of the tire gradually changes its area and relaxes in a cyclic pattern whose output power is dependent upon the speed of the vehicle. The piezoelectric flexible elements would deform and transform to their original state within the tire. Thus the change in the area of the tyre allows the implementation of new technology. Thus, at present electric vehicles are powered by batteries which make the vehicle move [1]. The main drawback with batteries is that they have only a specified capacity of power, which results in the use of only shorter range using the battery-powered vehicles. Though, the hybrids vehicles are incorporated with an internal combustion engine along with the electric motor, which recharges the batteries and helps in extending the vehicle’s range while it is powered by utilizing different fuels [2]. This method challenges the purpose of an electrical vehicle, which helps to reduce environmental pollution using renewable energy. Even though the hybrid vehicles increase the efficiency and range the need to generate higher green energy that allows higher range of vehicle which
can be increased with minimum environmental concerns[3]. In the present situation, there is an increasing demand for transportation and this has led to the huge development in the area of electric vehicles[4]. The piezo transducer act as a key component in the power generation which is used to charge the battery. The enhanced battery technology makes proof of charging the entire battery back in 20 minutes. The BMS can control the entire battery profile and provides virtual data such as the percentage of power remaining in the battery pack displayed in the screen, easy interface method with the user operation and precise every component of the battery pack, the safety measure of the entire system highly monitored, warnings for the entire vehicle if some problem occurs, manage the battery pack temperature level within the standard Figure 1.

![Figure 1. Block diagram of proposed grid systems.](image)

The important aspect to increase the efficiency of the electric vehicle has moved forward to the development of the Regenerative Braking System (RBS). [5] The RBS working principle is based on the conversion of mechanical force of the vehicle into electrical energy while brake is applied. While brake is applied, the motor which acts as the drive of the vehicle switch over into a generator and the power produced during brake is again delivered to the battery pack which helps to charge the battery pack. In RBS, the traditional braking method is avoided and the necessary braking force is created by the motor due to the load of the battery acting on the motor which helps to charge the battery pack while the brake is applied. Whenever the motor switch over to the generator, as the battery load acts on the motor, it will create a braking force acts on the motor and as a result, the vehicle stops. It is possible to save a large amount of power through RBS and utilize the generated power through the brake, which results in the improvement of the entire efficiency of the vehicle.

2. Piezo Transducer

At present many research is going on in the field of energy which would help as the energy source for the future. Piezoelectric materials have unique properties that exhibit various properties at various conditions because of their unusual material along with interesting and specific properties. These materials able to produce electrical energy from mechanical vibrations moreover, they can change mechanical vibrations into electrical energy. [6] These devices are specified as energy harvesters or transducers which are used in various applications at which any external source of power is not available Figure 2.
By conducting various experiments it has been proven that piezo transducer used to generate power, the energy produced by the transducer is comparatively less, [7] but as the number of the piezo transducer is getting increased simultaneously, the output power also increases rapidly and thus the obtained power can be used to charge the battery pack.

3. Battery Management System (BMS)

The four main important components need to be considered for the entire battery pack. They are BMU (Battery Monitoring Unit), BCU (Battery Control Unit), CAN (Controller Area Network) and TM (Temperature Management). Furthermore, the various parts of the vehicle not only be interlinked to one another within the system. As a key feature, they allow transferring data with BMS through CAN bus as the same methodology implemented in Thermal Management System (TMS), [8-10] incorporated with the theft-detection system that can deactivate output power.

4. BMU (Battery Monitoring Unit)

The Battery Monitoring Unit (BMU) helps to display the health status of the entire battery pack. It works with a predefined algorithm defined in the microcontroller of the system. That is BMU analysis the capacity of the battery and calculates the efficiency of battery that differ with the various interval of time to and continuously check individual cells based on the cell deterioration in advance to fail of an individual battery. The failure of the battery can easily be figured out by checking the status of each cell voltage while it is discharged. Other various conditions that create failure of battery are aging and fault-failure where they are caused by manufacturing defects and corrosion respectively. A multiplexer is used to reduce component count. Not only analysing all the individual cells but thus the multiplex structure can also be easily incorporated to the BMU to decrease the overall cost. According to the design, digital output can be obtained at various intervals.

5. Battery Control Unit (BCU)
One of the important components that interface with Battery Control Unit (BCU) is power electronics. The BMU gets its commands in form of control signals, BMU to undergoes a unique task, that helps to control the battery profile while it is in charging process. In various situations, standard limit of voltage and current during the charging process, stabilize the charging limits to the individual cells in the battery pack that helps to maintain same level of charge in the entire battery pack, isolation of the battery terminal occurs whenever any fault occurs, regenerative braking system that helps to recharge the battery pack whenever the brake is applied. To implement all these features that function precisely, individual battery cells must be provided with switching device that has higher current rating, moreover it must be able to do switching process at high power ratings so that it will be the required output changes.

6. Controller Area Network (CAN)

Controller Area Network (CAN) a great innovation invented by Bosch, in 1985 and it is implemented in the electric vehicle network. At the earlier stage, manufacturers of the automotive sector started by the implementation of point-to-point wiring technology. Due to the technology growth, the fact of maintaining huge wires not only end up in consuming huge space, high in weight moreover, importantly led to increasing in cost. CAN bus technology is implemented instead of traditional wiring, as CAN bus technology helps to reduce cost, easy interface, lower in weight, majorly it has high-integration of serial data communication between CAN bus and other peripheral devices that help to control and integrate in the standards of the vehicle system.

7. Thermal Management System (TMS)

The thermal management system observe the temperature variance in the battery using battery technology and to carry out certain essential tasks such as heating or cooling of the battery according to their state. The mileage and the life of the battery are increased by at least 20% by using a thermal management system which is proven by the test conducted in the laboratory. Thermal management system plays an important role while carrying out the process of fast charging. At the time of charging, a huge amount of current is distributed over the battery pack, therefore the temperature of the battery pack increases drastically. All the individual cells of the battery pack are kept isolated to provide insulation. Thus the insulation will help to maintain the stable temperature of the battery during various environments. At the same time, the battery design and the airflow has been evenly distributed to ensure minimum temperature so that the temperature reaches an equilibrium level between the battery pack and the surrounding temperature.

8. Regenerative System

The implemented regenerative braking system consists of an electric motor that also acts as an electric generator. The principle of a regenerative braking system is the same as the working principle of an electric motor, which is a major component of the vehicle. The electric motor is energized when electric power is applied through it. When some additional force is passed to energize when the brake is applied, then the motor transforms into a generator and helps to produce electricity. Thus the electric motor operates using the battery power, the power from the battery pack gets converted into mechanical energy, that helps to operate or accelerate the vehicle and whenever the motor is not activated, it switches over to a generator, that changes the mechanical energy into electrical energy, that helps to use the driving force of axle to accelerate electric motor, which transfers regenerating electric power to storage in the battery and continuously reduce the acceleration of the vehicle as the battery load acts to the motor Figure 3.
This obtained electricity is sent to the battery pack that undergoes the recharging process. The regenerative braking helps in braking purpose moreover, it results in improvement of output power proportional to the input power of the vehicle. The major outcome of this test-bed prototype to study the various type of braking technology that can convert vehicle kinetic energy into electrical power. Regenerative braking technology transfers entire kinetic energy into electrical power, analysing various methodologies and research in braking technology, it is proven that it can play a major role in producing a non-renewable source of energy.

9. Dual Battery Pack:

While using the single battery for both the charge and discharge process at the same time the life cycle decreases excessively. The dual battery pack is mainly focused to improve the lifetime of the entire pack.

To overcome this problem, the battery pack of the vehicle is split up into two parts. One battery pack will be discharging meanwhile the other battery pack will be on the charging process. The decision between the charge or discharge of the battery will be decided by the microcontroller by analysis of battery voltage in
the individual battery pack. The decision between the charge or discharge of the battery will be decided by the microcontroller by analysis of battery voltage in the individual battery pack. The microcontroller will swap the battery pack from discharging to charging whenever the battery level reduces to a specified limit Figure 5,6 and 7.

10. Hardware:

![Image](image1.png)

Figure 5. Piezo output setup.

![Image](image2.png)

Figure 6. Dual battery technology.

11. Graph:
12. Conclusion:

When compared to normal vehicle transportation, the piezoelectric vehicle can travel twice the distance. Electric vehicles can also be used for long mode transportation, not only for short mode transportation. Although the vehicles do not need any external source of energy because of the self-charging system. So it's an eco-friendly, pollution-free green vehicle. In upcoming days petrol prices hikes to the sky, the only solution for petrol - diesel vehicle needs to replaced by the electric vehicle. The transportation mode at a low cost. Moreover, the electric vehicle gives us safe driving.

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