SHODH SANGAM -- A RKDF University Journal of Science and Engineering

An electric vehicle energy storage system with hybrid source

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Abstract:

A hybrid electric vehicle energy storage system is being investigated for development. Monitoring and more frequent regulation are necessary because of the rising demand for power, and specialised procedures must be developed to satisfy it. Initiatives to minimise energy use in several sectors, such as building, transportation, and commerce, are good examples. More and more people are turning to computer and smartphone-based entertainment, or portable PCs. The ability to store energy using renewable resources for extended periods of time must be distinguished from energy conservation technologies. Because of the complexity and breadth of this topic, a substantial quantity of research is necessary. An in-depth understanding of the role that electric vehicles play in hybrid energy storage systems would be included in a more concentrated understanding of their separate viewpoints PI and neural networks are applied in this thesis to develop enhanced distortion-free outputs utilising a new approach based on neural networks and PI.

Keywords- Electric Vehicle, Neural Network, PI, Hybrid Energy.

I. Introduction

Until a few years ago, oil was the only source of long life on the globe, but that has changed. Modern living resources have multiplied all over the globe thanks to oil [1]. Due to their greater fuel economy, hybrid electric vehicles (HEVs) will likely become the dominant form of transportation in the future. Therefore, energy storage devices are required for hybrid electric vehicles (HEVs). Energy storage technologies have yet to be analysed in terms of their best composition. The weight-to-energy ratio of the power storage solutions in this scenario has to be realistic in order to get improved performance [2-6].

Automobiles like hybrids, plug-in hybrids, and electric cars (EVs) are becoming more popular due to rising oil prices and ongoing initiatives to decrease greenhouse gas emissions [7]. Toyota Prius' launch in 1997 led to a flood of new hydrogen-powered cars (HEVs) being developed to meet government regulations and/or the desires of customers.

The majority of hybrid electric vehicles (HEVs) on the market now are equipped with Ni-MH batteries, but lead-acid battery technology is still attractive and is used in mild HEVs, which have restricted functionality and must consider cost efficiency in their construction. Because of their cheap cost and long lifespan, lead-acid batteries are an excellent option for automotive applications [9]. In terms of cycle life, power, and weight, however, they have a number of limits. Research on how to improve their performance is ongoing [10-15], and a variety of viewpoints have evolved that go beyond just increasing the battery.

The term "hybrid energy storage system" refers to the use of several energy storage devices to increase cycle life, power characteristics, and operational efficiency of an ESS (HESS). It is shown in Figure 1: a hybrid energy storage system. High-power storage devices such as ultracapacitors and lead-acid batteries are part of the system. [16-19] In addition, an enhanced Hybrid Energy Storage System, which may be referred to as a storage device that is used selectively depending on the charging status and the driving conditions of the vehicle, may achieve significant improvement (advanced HESS).

An improved HESS with a BMS-provided storage device selection function is detailed in this work, which also includes experimental testing to see how much energy efficiency has increased for moderate HEV uses. [20].

The standard mild HEV needs the construction of a more sophisticated energy storage system because of its relatively high current operating at a low working voltage range. The idle stop and start function, for example, significantly increases the number of engine starts, which results in a larger number of high current discharge occurrences.

A reduction in performance and cycle life might be caused by an initial current rate of between 10 and 15 kilohertz. One of the most critical factors impacting performance is the vehicle's ability to generate electricity when braking, which results in a very high charging current being applied to the battery in a short amount of time. Batteries are put under a great amount of stress as a consequence of this [15] Even though batteries are often utilised in vehicles as energy storage, the chemical reactions that occur during energy input and output restrict their ability to charge or discharge at high currents for lengthy periods of time. This study demonstrates the use of a NNPI controller to construct a hybrid energy storage system for an electric car.

II. Implementation

People's personalities are characterised by their brain processes when they are studied using generic procedures. An estimate puts the number of neurons in the human brain at around 100 billion. One thousand and one hundred thousand ten-thousandths of an inch separates each neuron's stage of association (0.1 mm or 0.01 m). Individual brains store information to be used as reference resources, and this information may be accessed by removing one component at a time rather than sequentially, in accordance with this theory..

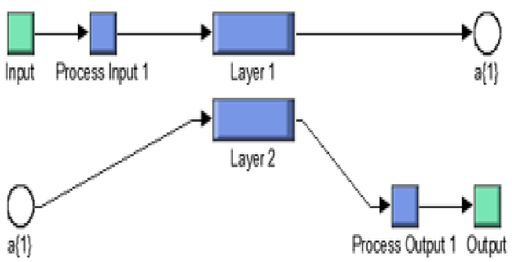

Fig. 1: Artificial Neural Network layer network

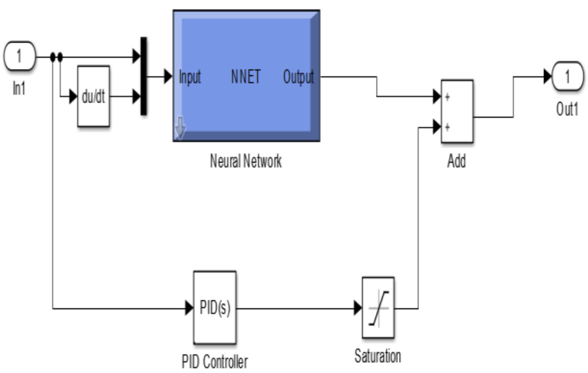

Fig. 2: NNPI Subsystem

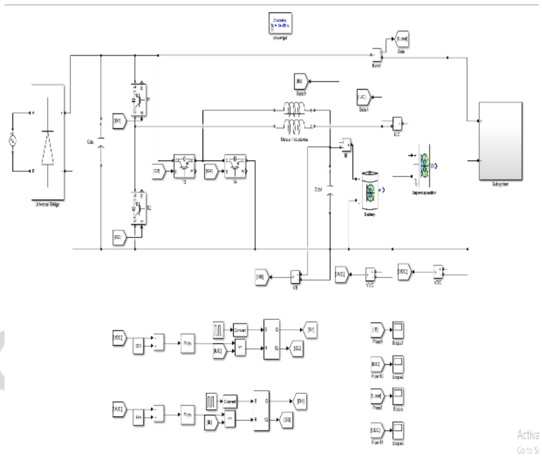

Fig. 3: HESS Energy Storage applied to electric vehicles in PI model

According to the aforementioned PI model, electric cars are equipped with the HESS Energy Storage device; An integral proportional controller is integrated into a bridge rectifier super capacitor battery-and-subsystem..

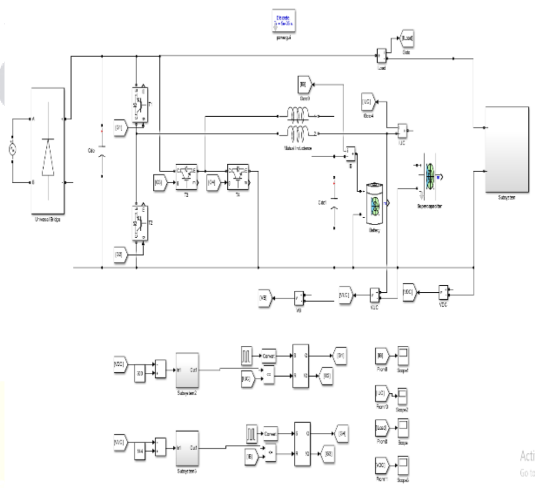

Fig. 4: Proposed HESS Energy Storage applied to electric vehicles in NNPI

Figure 1 shows the HESS Energy Storage system for electric cars presented in NNPI, where an artificial neural network (ANN) is used in conjunction with PI. There are many benefits of using NNPI instead of PI.

III. Results

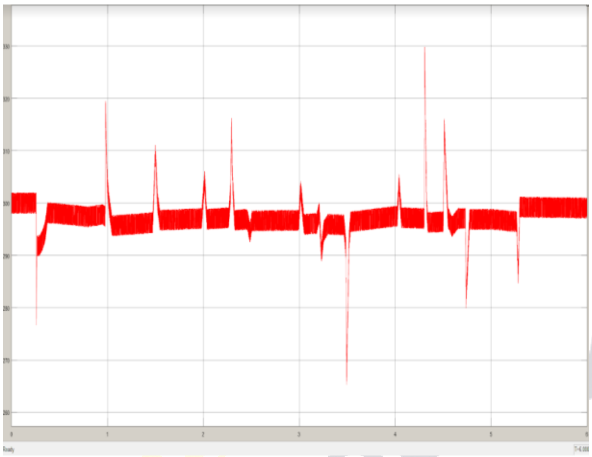

Fig. 5: Vdc for PI controller

High fluctuating output for PI controller result is shown above.

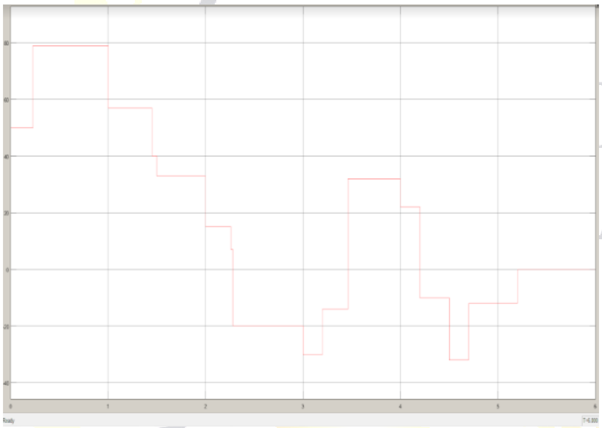

Fig. 6: Battery Load Current PI based

PI based load current is shown above.

Fig. 7: PI controller base ultra capacitor current

It shows high fluctuations in PI controller based ultracapacitor current.

Fig. 8: PI controller battery current

Battery current for PI controller is shown above.

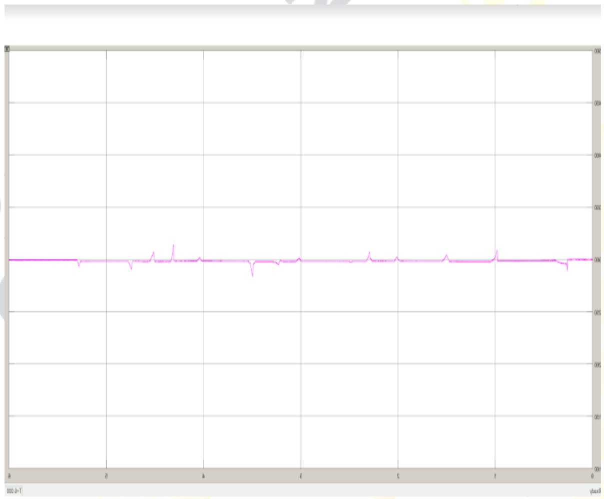

Fig. 9: NNPI based output voltage

Ann-PI based output for voltage DC is shown in above figure.

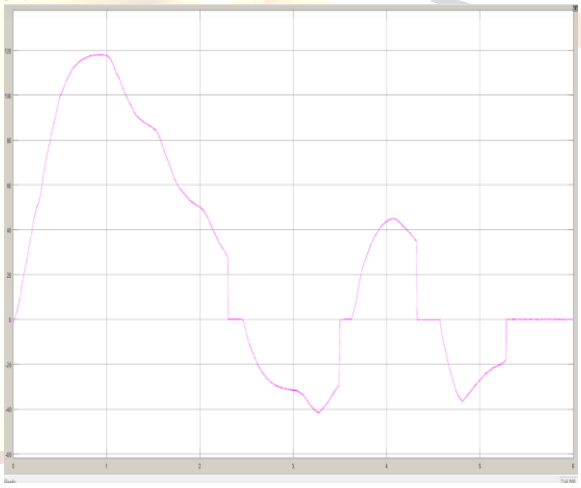

Fig. 10: NNPI controller based Battery Current

Above figure shows the battery current output.

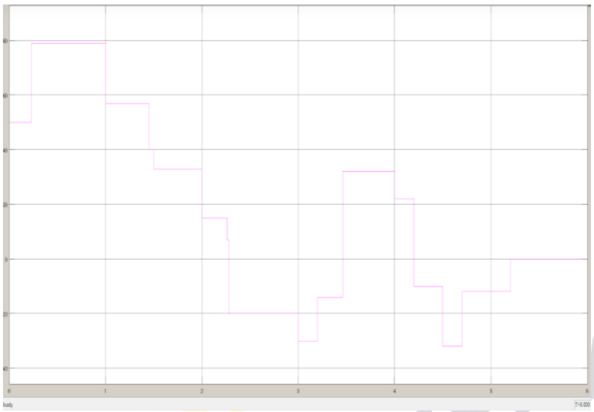

Fig. 11: Load Current

Above figure shows the load current is similar to the existing one.

Fig. 12: Iuc using NNPI

The above diagram shows the current for ultracapacitor with lower distortions.

IV. Conclusion

An NNPI controller was shown to improve the performance of a hybrid energy storage system, while simultaneously reducing the amount of distortion. Electric vehicles (EVs) produce much less carbon dioxide emissions than traditional gasoline-powered automobiles. They are seen as a possible replacement for internal combustion engines. ' Though their specific effects are uncertain, decreasing emissions may help improve energy quality in a wide range of ways. Carbon emission benefits of electric cars are considerably reduced when they are charged with energy from petroleum power plants because of power loss during production, as well as during transmission, transfer, and charging. A direct transfer of energy from a spinning tyre to a stationary battery is one of the most essential strategies for an electric vehicle that consumes more electricity to enhance its energy consumption. Using a hybrid energy storage device (HESS), supercapacitors may receive enormous quantities of current instead of batteries' low-rate capacity, which might save as much as 50% of power during regenerative braking.

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