

ESTIMATION OF STATE OF CHARGE(SOC) AND STATE OF HEALTH(SOH) IN BATTERY FOR ELECTRIC VEHICLES USING MACHINE LEARNING

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Abstract - Estimating State of charge(SOC) and State of Health(SOH) will help the user to know about battery status so that he/she will take the possible action according to the status. Estimation of the parameters of a battery is the main objective for all researches which focus on storage energy. SOC to Determine percentage of useful energy left inside the battery.

SOH to detect deterioration of battery in comparison to a new battery.

Key Words: Estimating State of charge, State of Health.

1.INTRODUCTION

- With increasing concerns about global warming and fossil fuel depletion, the automobile industry is facing a transition from internal combustion engines (ICEs) to electric vehicles (EVs).
- As a result, the focus of people is again turning toward new energy vehicles, especially electric-powered vehicles, which will be the new trend in the future.
- The SOC of a battery, which is used to describe its remaining capacity, is a very important parameter for a control strategy.
- The estimation of SOH is important for the vehicle energy management system to adjust its controls to keep the vehicle performance and safety.

2. Body of Paper

- Batteries are a combination of electro-chemicals, which empower a large number of devices around us.
- These batteries require proper care using management systems having specialized monitoring features.
- The state of health (SOH) estimation often requires capacity measurement from battery's full charge or discharge profile.
- The state of charge (SOC) of a battery is defined as the ratio of its current capacity to the nominal capacity.

2. System Architecture:

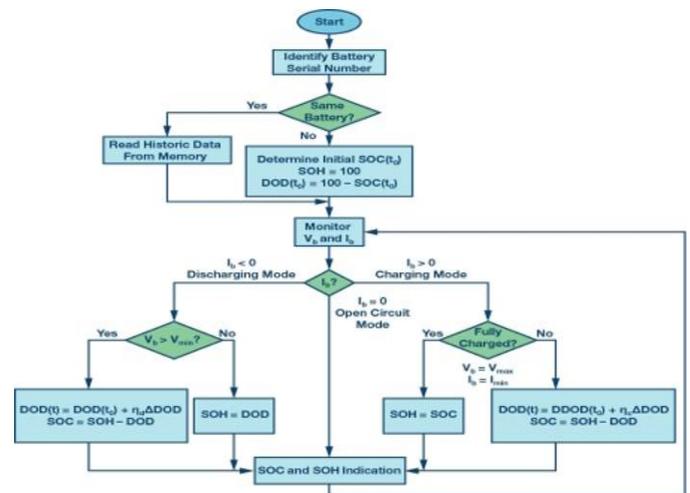


Fig -1: Figure

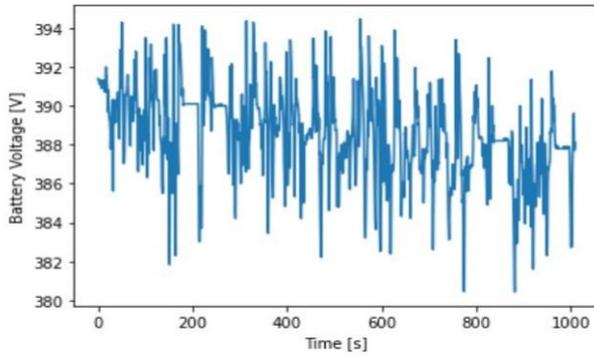
3. Implemente Work Dataset Values:

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df.head()
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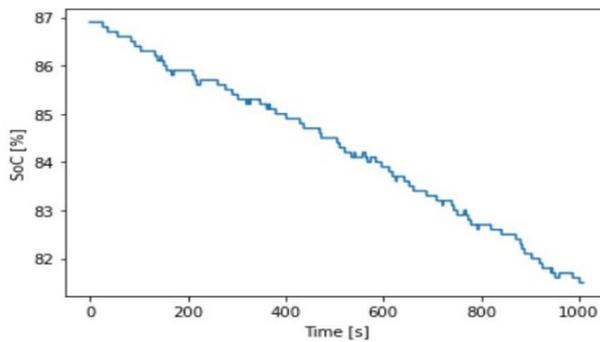
Time [s]	Velocity [km/h]	Elevation [m]	Throttle [%]	Motor Torque [Nm]	Longitudinal Acceleration [m/s ²]	Regenerative Braking Signal	Battery Voltage [V]	Battery Current [A]	Battery Temperature [°C]	AirCon Power [kW]	Heater Signal	Heater Voltage [V]	Heater Current [A]	Ambient Temperature [°C]		
0	0.0	0.0	574.0	0.0	0.0	-0.03	0.0	391.4	-2.20	21.0	...	0.4	1	0	0	25.5
1	0.1	0.0	574.0	0.0	0.0	0.00	0.0	391.4	-2.21	21.0	...	0.4	1	0	0	25.5
2	0.2	0.0	574.0	0.0	0.0	-0.01	0.0	391.4	-2.26	21.0	...	0.4	1	0	0	25.5
3	0.3	0.0	574.0	0.0	0.0	-0.03	0.0	391.4	-2.30	21.0	...	0.4	1	0	0	25.5
4	0.4	0.0	574.0	0.0	0.0	-0.03	0.0	391.4	-2.30	21.0	...	0.4	1	0	0	25.5

5 rows × 28 columns

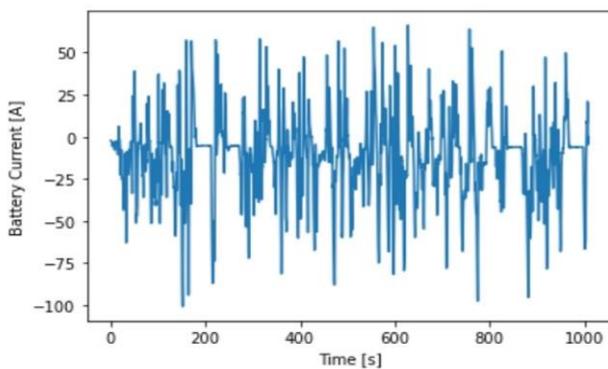
Graph of Battery Voltage vs Time:



Graph of Soc vs Time:



Graph of Battery Current vs Time:



PORPOSED APPROACH:

- The State Of Charge (SOC) has an important role in determining the remaining capacity of battery pack.
- Its provide accurate estimation of SOC cannot only protect battery, prevent overcharging or discharging and improve the battery life.
- The State of Health (SOH) is an important indicator of the battery life.
- Its provides accurate knowledge battery performance that can help manage the energy distribution and improve their consumption and lifetime.

LITERATURE SURVEY:

Luis D. Couto, Julien Schorsg, Marco M. Nicotera, Michel Kinnaert, "SOC and SOH estimation for Li-ion battery based on an equivalent hydraulic model"., American Control Conference(ACC) 2016, pp. 4029-4034,2016.

This article focuses majourly on developing a management system for a lithium-ion battery in order to monitor its SOC and SOH. The aim of this article is estimate the diffusion coefficients.

TOOLS / TECHNOLOGIES USED:

- Jupyter
- Google Colaboratory
- Git
- GitHub
- Language used: Python

3. CONCLUSIONS:

The objective of this study is to Design and implementation of SOC and SOH estimation of electrical vehicle using Machine learning.

This innovation was made more desirable and economical. It was made by the hope that it was very economical and useful.

A review of the main battery SOH estimation methods suited for automotive real time applications, and especially hybrid electric ones, is given.

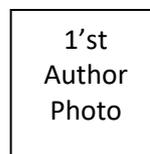
ACKNOWLEDGEMENT

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REFERENCES:

1. Luis D. Couto, Julien Schorsg, Marco M. Nicotera, Michel Kinnaert, "SOC and SOH estimation for Li-ion battery based on an equivalent hydraulic model"., American Control Conference(ACC) 2016, pp. 4029-4034,2016.
2. Ambrose Jillian UK Plans to bring forward ban on fossil fuel vehicles to 2030The Guardian (2020) <https://www.theguardian.com/environment/2020/sep/21/uk-plans-to-bring-forward-ban-on-fossil-fuel-vehicles-to-2030>
3. J. Schorsch, L. D. Couto and M. Kinnaert, "SOC and SOH estimation for Li-ion battery based on an equivalent hydraulic model. Part II: SOH power fade", 2016 American Control Conference, 2016.

BIOGRAPHIES (Optional not mandatory)



Description about the author1 (in 5-6 lines)

