

# ***Mathematical Modelling of Lithium-Ion Battery Applied to Electric Scooter Utilizing State Of Charge Estimation***

Ihsan Bayu Juliyadi  
Mechanical Engineering of Automotive Study Program  
Engineering Department

## ***ABSTRACT***

*Mathematical modeling is one of the methods which is accurate for analyzing battery efficiency. Also, it has been done by comparing a real running test on the 20 degrees incline road and horizontal road and utilizing the main material as Mr. Jackie Vizio 2017. Provided five weight intervals for each driver. For incline road and coulomb counting condition, obtained the results of capacity and State Of Charge as: 0,5Ah/90,62%, 0,99Ah/86,56%, 1,42Ah/82,9%, and 0,49Ah/90,62%. The same subjects had been researched for horizontal road and coulomb counting conditions. In a row, obtained the results of the highest and the lowest current as 2,57A/1,32A, 2,38A/1,82A, 3,76A/1,44A, and 2,53A/1,16A. Whilst, it also had been obtained trend line accuracy above 50 percent. There are significant differences in the SOC values for Open Circuit Voltage and incline road condition in a row each weight class of subjects as 84,21%, 71,58%, 68,42%, and 54,74%. For the horizontal one, had been obtained as: 66,32%, 45,26%, 38,95%, and 37,89%. The reduction of SOC's value influences the scooter performance as velocity reduction, power, and capacity of the battery, then the SOC's value and current flow transformation during the battery in the discharged state.*

**Keywords:** *State of Charge, Lithium-ion, Estimation, Mathematical Modelling, and MATLAB/Simulink*