



K2DM – LIL Experiment Outline

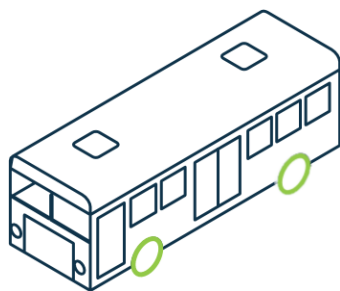
Electroad – Virtual testing & operation of electric buses

Sensitivity Analysis of energy consumption for higher precision on range estimation

THE CHALLENGE

Driving simulation is an important asset in the early development steps of the automotive industry, but also for service providers. For electric buses both charging times and range issues must be considered, leaving a dangerous balance act between cost optimization and empty batteries. To avoid the latter, a range forecast with the highest possible precision is desirable.

Some input parameters in the simulations have a high influence on energy consumption and need to be monitored closely, others appear



less critical and may be disregarded.

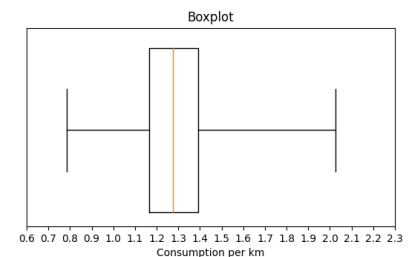
The impact of the various input parameters on the energy consumption is investigated.

SOLUTIONS AND METHODOLOGY

Python's SALib package as well as some self-implemented methods from sensitivity analysis are used to generate representative input and analyze the results on energy consumption with the input generated beforehand. Sobol's variance decomposition and Delta moment-independent measure turn out to be the most reliable methods from sensitivity analysis. One difficulty found is the factor "passenger number" which is known not to be uniformly distributed. The distribution of the passenger number is approximated by a Gaussian. Mean and standard deviation

comes from Tirn Technology s.r.o. and differ between weekdays and weekends. The choice of the distribution has a significant impact on analytical results.

RESULTS AND IMPACT



Input parameters are classified into three groups each for level of influence (high, moderate, and low) and effect on the response (increasing, none or decreasing) to give a flavor of the underlying dynamics. The model appears to be highly non-linear. With this, future simulations on electric buses may be realized with higher precision by putting special focus on the highly influential input.

Project Duration	06.04.2021 - 12.06.2021	Project Partners	Tirn Technology s.r.o.
Experiment No.	A5335st	Dept./Group	Dept. E/Co-Simulation and Software

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