Methodology

1) Vehicle Characteristic Parameters: For Electric Vehicle modelling, vehicle characteristic parameters are taken of Tesla Model S as used in this paper[x1]. The vehicle is taken up to be a front wheel drive. The vehicle uses parallel braking. So regenerative braking is only possible on front wheels, rear wheels use mechanical brakes. There are mechanical brakes on front wheels as well, which are used in case of immediate stoppage or motor can’t provide enough braking force on the front wheels. The vehicle mass is taken to be 2200kg this includes car+driver weight. As the project compares three different motors, the weight of these motors might not be same. This issue will be resolved in the next project term. The wheelbase of the car is not explicitly given in the paper, the value used in the code is taken from vehicle listing/vendor website. The code initially defines all the vehicle constants and is reproduced here for clarity. We couldn’t find the value for inertia coefficient for acceleration resistance, so it is assumed a value.

wheel\_radius=0.318; %%Tesla model S https://www.errolstyres.co.za/content/tyre-overall-rolling-diameter

grade\_deg=0; %%maybe grade change

roll\_coef=0.01; %%Car tyre on smooth tarmac road

area=2.4; %%from tesla S

aero\_coeff=0.24; %%from tesla S

inertia\_coeff=0.04; %% assumption

vehicle\_mass=2200; %%from tesla S mass(car+driver)

drive\_eff=0.88; %% from tesla S

wheel\_base=2.959;

la=1.4795;

lb=1.4795;

cg\_height=0.4572; %%http://www.roperld.com/science/TeslaModelS.htm

Assumptions: The car is assumed to be running on tarmac which has rolling coefficient of 0.01. The vehicle path is assumed to be a straight road with zero grade and no wind resisting the motion of the vehicle. These assumptions shouldn’t really impact the underlaying study of regenerative braking energy recovery.

References

[x1] An Investigation into the Induction Motor of Tesla Model S Vehicle Grzegorz Sieklucki