



**Michigan  
Technological  
University**

# **MEEM 5812: Automotive Control Systems**

**Spring, 2023**

**Project – 7**

## **Hybrid Electric Vehicle Power Split Control using Dynamic Programming**

**By**

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1. The optimal state of charge trajectory.

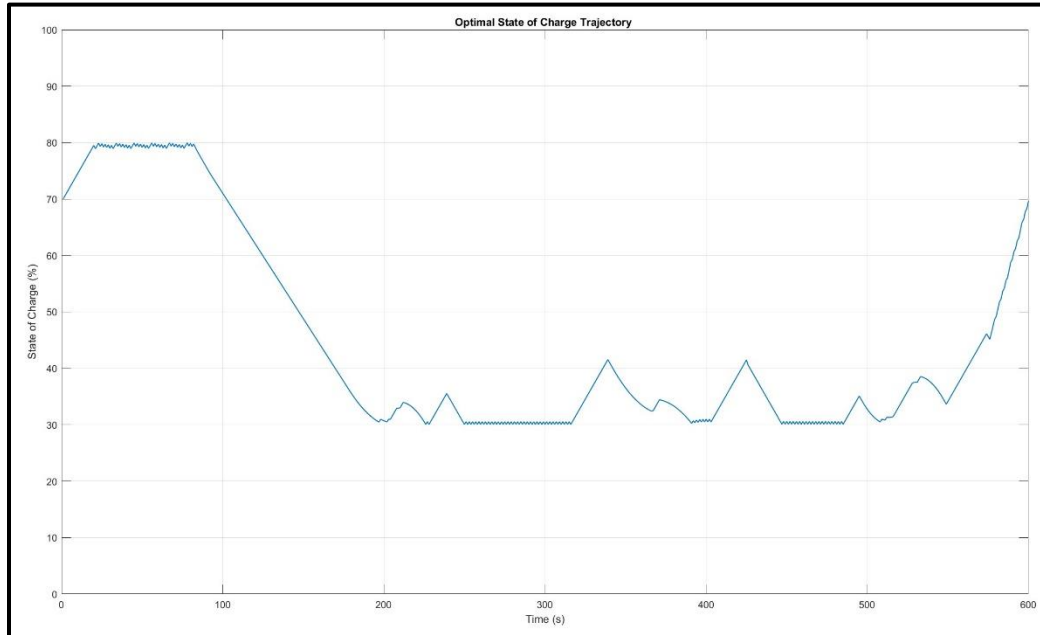


Figure 1: Optimal State of Charge Trajectory

2. The optimal power of the electric motor trajectory.

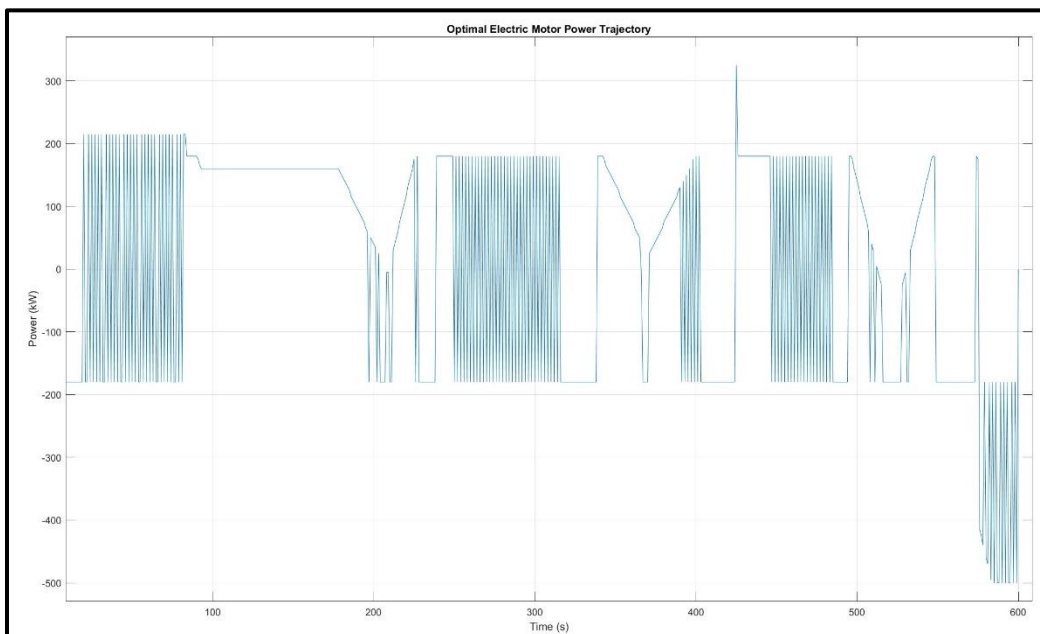


Figure 2: Optimal Power of the Electric Motor Trajectory

3. The optimal power of the engine trajectory.

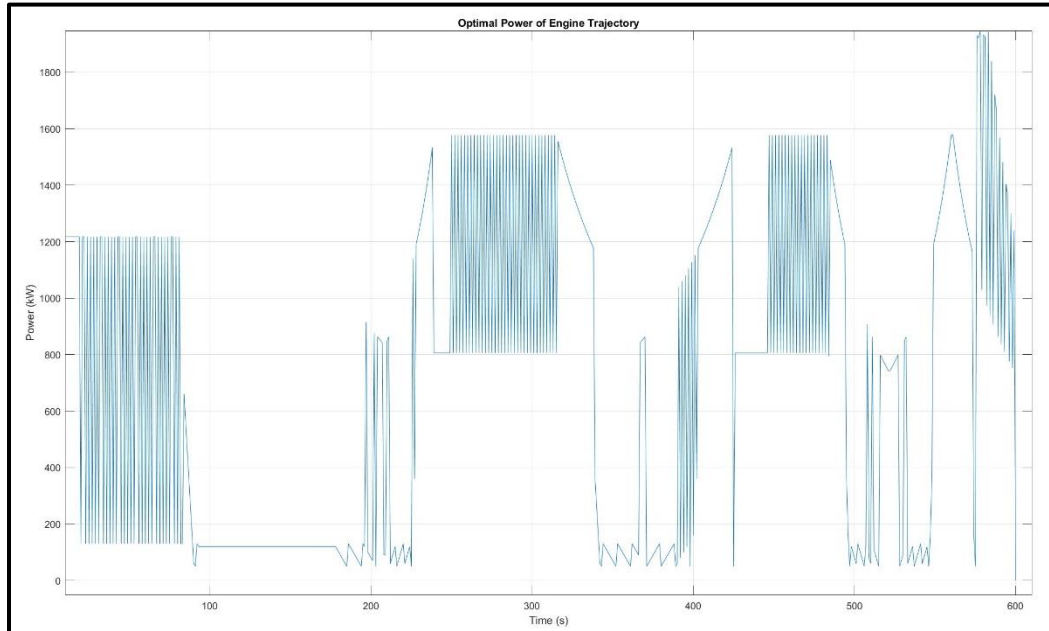


Figure 3: Optimal Power of Engine Trajectory

4. The cost associated with the optimal trajectory.

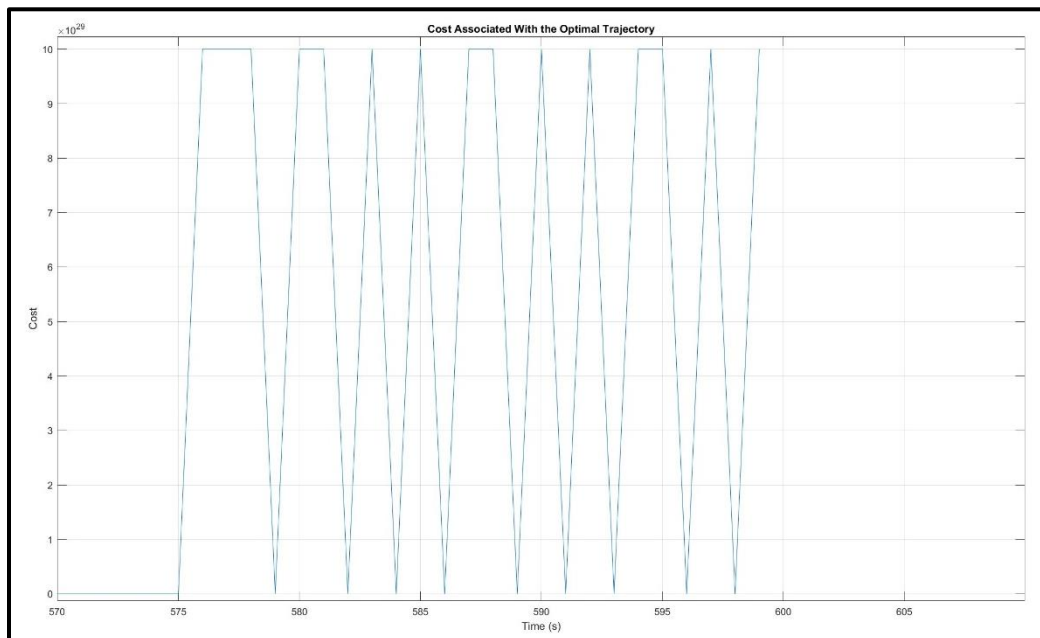


Figure 4: Cost associated with the Optimal Trajectory

5. Brief comments you wish to make about the trajectories.

We can observe that in Figure 4 when the Electric motor power goes to a negative value at approximately 575 seconds, the optimal State of charge in Figure 1 starts to back up to the value of 70. This means when the vehicle is decelerating, the regenerative action starts to take place. When there is a straight patch for the vehicle observed in figure 3 from approximately 110 seconds to 170 seconds, we can observe that there is switching of power transmission from Engine to the motor and hence the SOC starts decreasing which can be observed in Figure 1 in the same time frame.