**System Modeling**

Vehicle Dynamics:

Motor Dynamics

Power Balance

Battery Power Balance (with Sandia PV model)

Sandia (complicated):

NOCT (simpler (no wind) but needs tests if parameters not available)

**System ID**

Vehicle Dynamics:

* (air density) -> weather data
* Cd (drag coefficient) -> aCe
* A (frontal car surface) -> aCe
* (effective frontal wind velocity) -> weather data
* m (mass) -> aCe
* (gravity constant) -> 9.81 m/s2
* (angle of street) -> data available
* Cr (roll friction coefficient) -> aCe
* (number of front bear rings) -> aCe
* (number of rear bear rings) -> aCe
* (friction torque in one front bear ring) -> aCe
* (friction torque in one rear bear ring) -> aCe

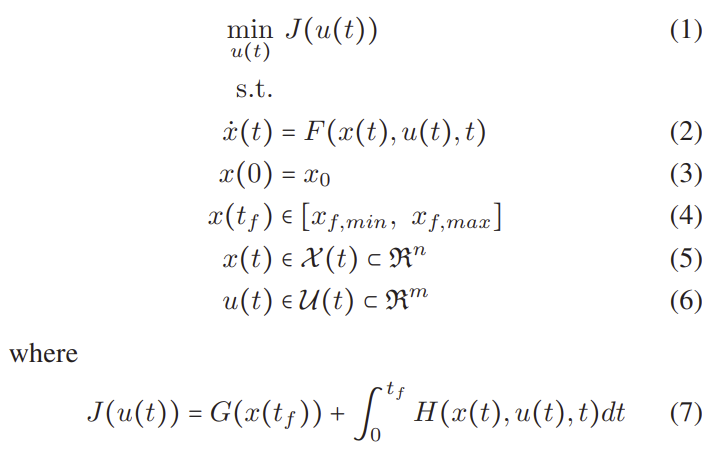
Motor Dynamics:

* emot (motor efficiency) -> aCe (motor efficiency map)
* P0 (idle losses) -> aCe (need to get current value)

PV:

* APV (PV area) (aCe) -> 4 m2 (competition)
* G(x,t) (global irradiance) -> weather data
* (solar panel efficiency) -> aCe
* (wire efficiency) -> aCe (looking into it 98-99%)
* (MPPT efficiency) -> aCe (looking into it 98-99%)
* (mismatch efficiency) -> aCe (looking into it 98-99%)
* (power loss coefficient) -> aCe
* (standard condition temperature) -> 25 C
* , , (sandia model parameters) -> tricky (some values available)
* (effective wind speed) -> weather data
* (ambient temperature) -> weather data
* (reference global irradiance) -> 1000 W/m2
* (nominal operating cell temperature) -> aCe
* (insolation coefficient) -> aCe (might be tricky to calculate)

**Optimal Control Problem Definition**



Time domain (t):

Space domain (x):

Initial conditions:

End conditions:

Constraints: