Data Analysis and Optimization

Project Plan

Project Goal: Optimize the mechanics of a solar car and develop a winning race strategy.

To solve this problem, a model will be developed in stages, each to account for a new variable/constraint.

**Stage 1**: Defining the known and unknown variables and empirically find their values.

* “Variables”: parameters that define the car’s motion
* Construct a data sheet and procedures for testing for these values

**Stage 2**: Construct a flow model of power flow in the car and quantify energy consumption.

* Understand the mechanics of the car (including gear brake, aerodynamics, etc.)
* Take into account the efficiencies of each piece (solar panels, battery, traction, etc)

**Stage 3:** Optimize the mechanics of the car based on data from Stage 2.

* Gear ratio, aerodynamics

**Stage 4:** Derive a function that models the car’s motion on a level, straight path with given parameters, assuming maximal irradiance

* Create a simple program that takes input values and outputs this maximal distance.
* Corollary: Maximize he distance travelled in this case.

**Stage 5**: Add to the program an irradiance factor, making the model more realistic.

* This is just saying “If its \_% cloudy, how does the input energy change? How does the car’s motion change?”

**Stage 6:** Extend the irradiance factor to a dynamic one that accounts for the sun’s “motion” through the day.

* Consider optimal start times, how to consume energy, etc.

By this stage, we would have an understanding of how to model and predict the car’s motion. Now we have to focus on the race strategy.

**Stage 7:** Understand the rules of the solar car race, the conditions, the format, etc.

* This also includes the constraints on the car itself during the race (how long can we charge, when, etc.).

**Stage 8:** Devise a race strategy with the race conditions in mind.

**Stage 9:** Implement an algorithm to find the optimal race strategy with the parameters.

* Should be dynamic