Optimization for Road Data

Least Squares Optimization

With

Where

Road Curvature Model

Road Sampled Curvature Data (GPS Data and Google Earth Data)

Linear Models to be investigated:



Piecewise-Linear Model to be investigated:

Where

Unit Step Function

Note: The model is technically a “linear spline” that is restricted to always follow a linear behavior, followed by a constant behavior and a decreasing linear ending part. Also, this model would constitute the Ideal Model as per AAHSTO Regulations.

Non-Linear Models to be investigated:



Note: This model is known as signed curvature, originally, the parameters involved are derivatives of a function. However, here the evaluations of this derivatives are being found, such that the road curvature data matches the signed curvature formulation.

Constraints to be investigated (for both Linear and Non-linear Models)

* Unconstrained Cases
* Ackerman Angle Constraint

Where L = Vehicle Length (Constant)

Speed (Constant, but might be a constraint)

Understeer Gradient (Constant, but might be a constraint)

Curvature Model

Note: The Ackerman Angle is stable for understeer behavior at different speeds when degrees.