Notes in Dynamics and Manuevering
ECEN 5008

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1 Trajectory Exploration

System=Sliding Car

$$\begin{pmatrix} a_{\text{long}} \\ a_{\text{lat}} \end{pmatrix} = \begin{pmatrix} \dot{v} \\ v(\omega + \dot{\beta}) \end{pmatrix} = R_z(-\beta) \begin{pmatrix} u_1 \\ F_y(\beta) \end{pmatrix}$$

$$\dot{\omega} = u_2$$

Convient Set of trajectories: constant trajectories (aka Equillibrium Points)
Equilibirum Manifold:
Sliding Car - constant speed circles
parameterize by (v, a_{lat})

$$\begin{pmatrix} \dot{v} = 0 \\ a_{\text{lat}} \end{pmatrix} = R_z(-\beta) \begin{pmatrix} u_1 \\ F_y(\beta) \end{pmatrix}$$

Interesting that this doesn't depend on velocity
Equillibrium Manifold can be largely parameterized by a_{lat}.

$$\bar{\beta}(a_{\text{lat}}), \bar{u}_1(a_{\text{lat}}$$

by setting the derivatives equal to zero, you can get $\dot{\omega} = u_2$ trivially and then solve the two equations for $\dot{v}$ and $\dot{\beta}$ easily.

Like to use continuation (homotopy) start with an easy problem and morph it into a hard problem.

quasi-static approach: design things so curvature doesn't change too fast. If they aren't changing to fast, at each instance of time your just going around a constant speed circle.