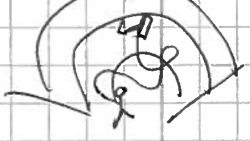
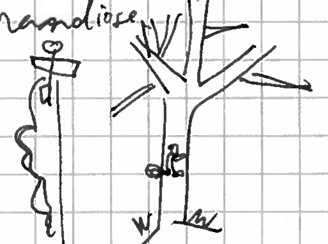
Run Down from my Meeting w/ Russ, interspersed w/ comments from Dad.
(In **NO** particular order)

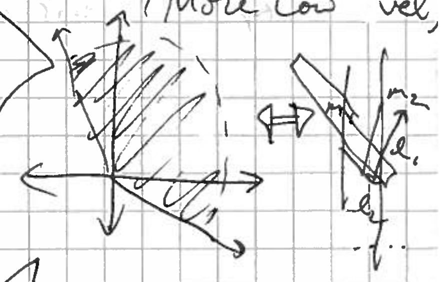
Storyline Suggestion:

Grandiose Vision → Slightly Less Grandiose → ~~Less~~ ~~Eve~~ Grandi (More Low vel)





This is a hybrid sys



Sample-based versus SOS verification of Lyapunov candidates:

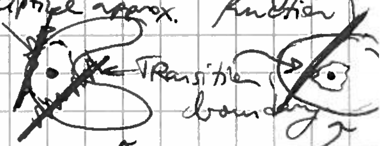
- error of poly approx/ trig approx of dynamics can be limited. - can verify that all points in level set are in ROA
- sample-based uses full nonlinear dynamics but can only say that the points inside ~~the candidate~~ sampled ~~& levelset result~~ satisfy $\dot{V}(x)$ (but many are ~~not in~~ in ROA because)

but can be used to estimate ROAs for controllers like MPCs! (optimization at each step)

Hard to plan for Hybrid Systems (~~friendly~~ ~~[illegible]~~ sensor uncertainty, etc.)

☆ Russ, is there a doc that clarifies the major contributor to its hardness?

How limiting is an elliptical ROA? (Quadratic Lyap function)



What if elliptical ROAs **are** too limiting?

So many ways to ~~gener~~ate Lyap functions ~~which are~~ whose level sets aren't elliptical because the Lyap function isn't quadratic ($x^T S x$)
(~~Need~~ can use SOS to produce higher order Lyaps candidates)

Check ☆ This! Read Learn more!

MUST DO:

☆ Compare to exhaustive simulation results of Alexis
(- project it into f_n, f_s space)

- depends on Body collision constraints (need Alexis)
- but could do it w/o those first, as a dry run
- as Russ pointed out, I can just sample and throw out samples that violate the boundary constraints, rather than sampling on the boundary as I have been doing

FACT: ~~Lyap~~ $\dot{V}(x) \leq 0$ is not the only necessary condition. The boundary has to be a level set.

IMPORTANT NOTE On Generalization and Sample based Verification
The more complicated the dary, the more samples are needed ~~[illegible]~~ is a danger of overfitting the levelset boundary more complicated.