UtahState University
Department of Electrical and Computer Engineering

Back-mounted Jetpack Thrust Vector Control

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Introduction

Project is based on the 4MM Projec that has been developed at ASU.

YouTube Video

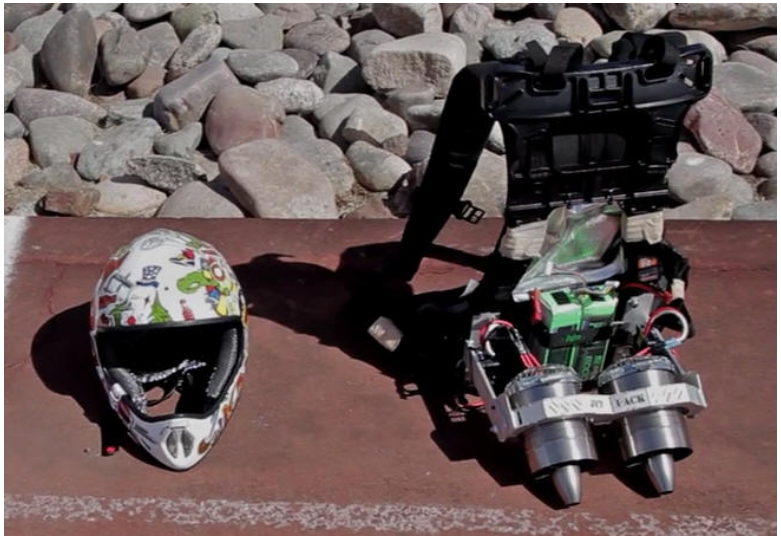

Figure : Backpack Jetpack

Main Difficulties of Project

- Equations of motion for human running are not available/tractable (at least not to us!)
- We don't have a rocket, and thus don't have a model for how it reacts.

Motion Capture Data

We needed to be able to see what the back of a person that was running was like.

We were able to find a few different research databases with Motion Capture information of a person running.

Motion Capture databases:

- ACCAD at OSU
- MoCapClub
- CMU MoCap database

Assumptions and Simplifications

- Flat ground
- Simplified model
  - 2nd order
  - No coupling between angular coordinates
- Placement of sensors
- Simplification of body model
  - Runner exhibits sinusoidal movements
  - Back plane based at hips

Controller

We used a pole placement state feedback controller to provide the control to the rocket thrust.

- Used a 2nd order system for the rocket model

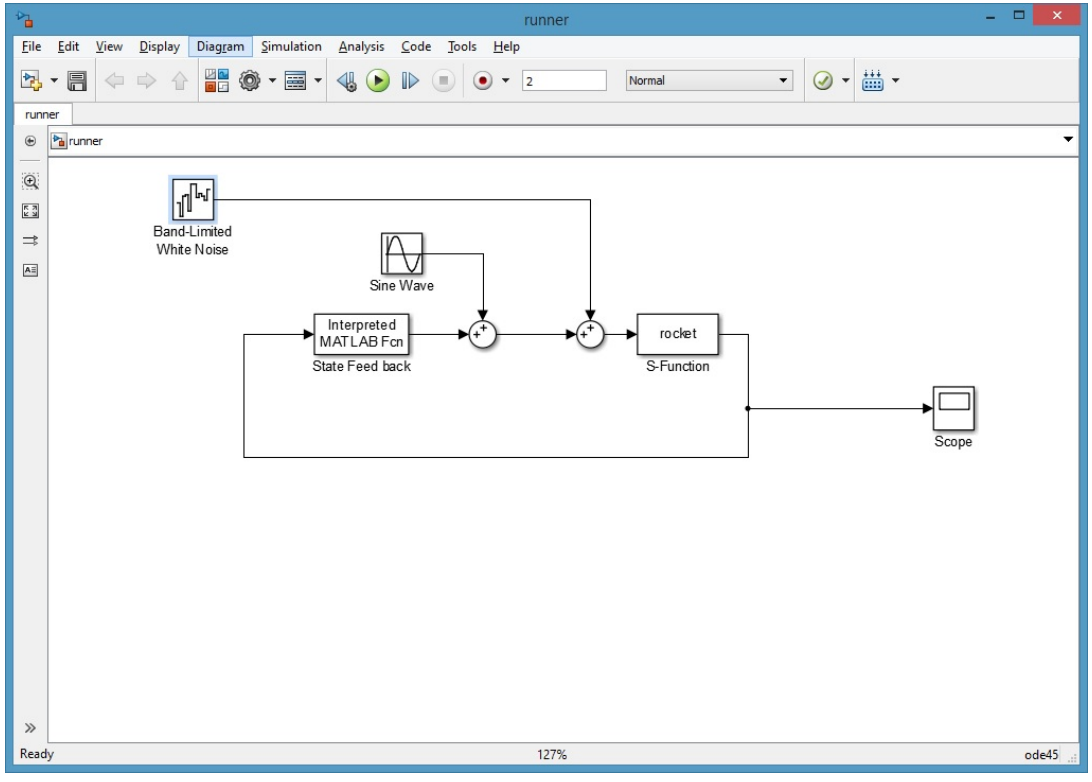

Figure : Simulink model

Results

Simulation time!

Future Work

Conclusions

- Controlling the thrust vector works!

Future Work

- Calculation of efficiency gain
- Better specification of rocket model
- More accuracy of back movements
- Explore different state-space representations