

# Making Innovative Designs

**Los Angeles FIRST Tech  
Challenge Kickoff 2019**

Me!

Fletcher Porter

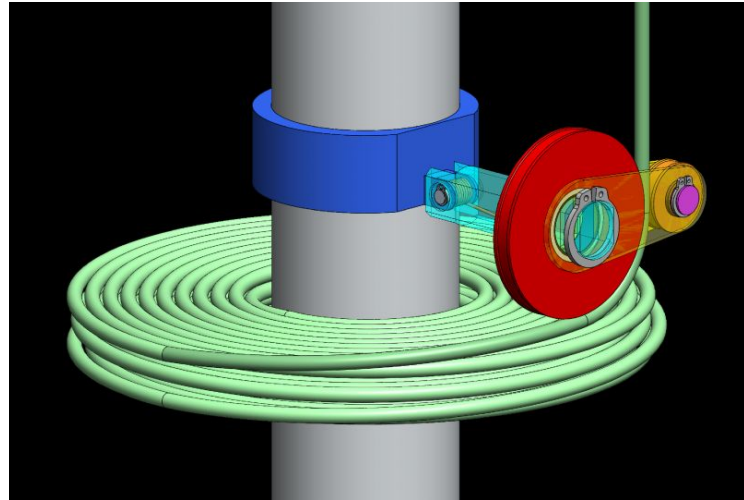
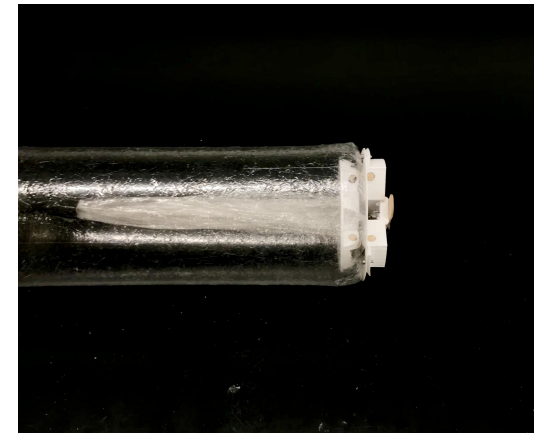
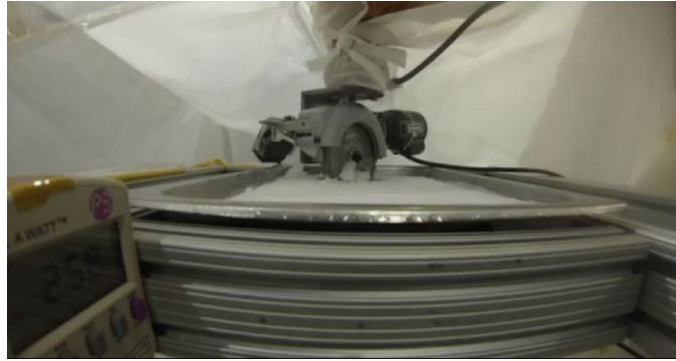
[me@fletcherporter.com](mailto:me@fletcherporter.com)

Suit Bot 2011–2015

FTC Mentor 2015–infinity probably

Bachelor's degree in Mechanical  
Engineering from UC Santa Barbara

Worked at NASA Jet Propulsion  
Laboratory, UCSB Robotics Lab, UCSB  
Soft Robotics Lab



# This Presentation

Creating a design specification

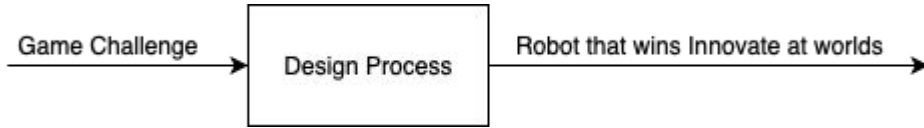
Defining "Innovation"

Identifying *when* you should innovate

Showing off neat design tools

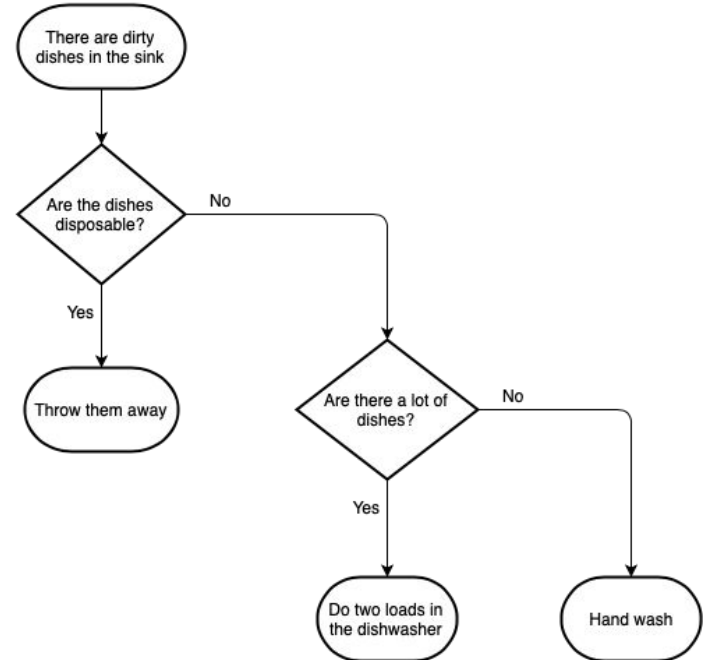
Motivating why you should innovate

# Creating a Design Specification

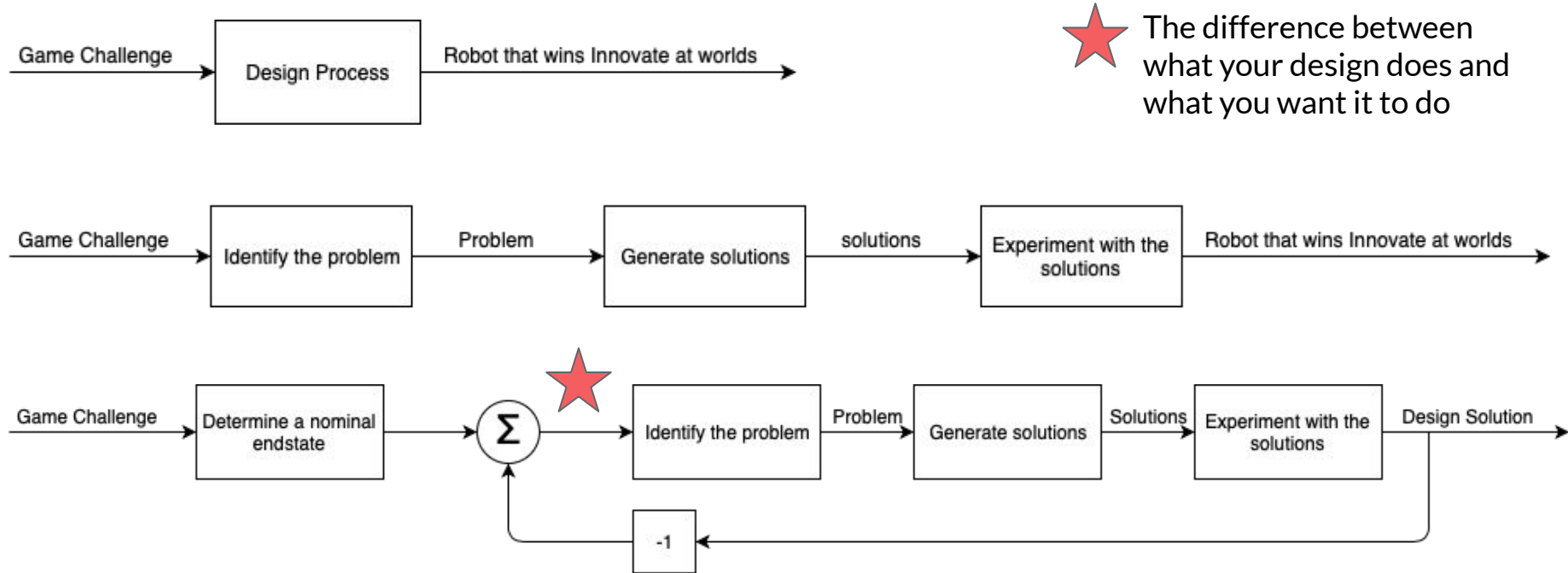


## Design Problem

There are dirty dishes in the sink and the dishwasher is full



# Creating a Design Specification



# Defining "Innovation"

## Common definition

"a new idea, method, or device" (Merriam-Webster Dictionary, 2019)

## Definition for the FTC Collins Aerospace Innovate Award

- Robot or robot sub-assembly must be creative, elegant and unique in its design.
- Creative component must be stable, robust, and work reliably.
- Robot design is efficient\* and consistent with team plan and strategy.

## To FTC Judges

Your robot is not literally exactly the same as every other robot (for ILTs at least)

\*this is going to be changed to *effective* in the first revision of the Game Manual Part 1

# Defining "Innovation"

## Functions

- Do the game challenge

## Objectives

- novel
- distinct
- creative

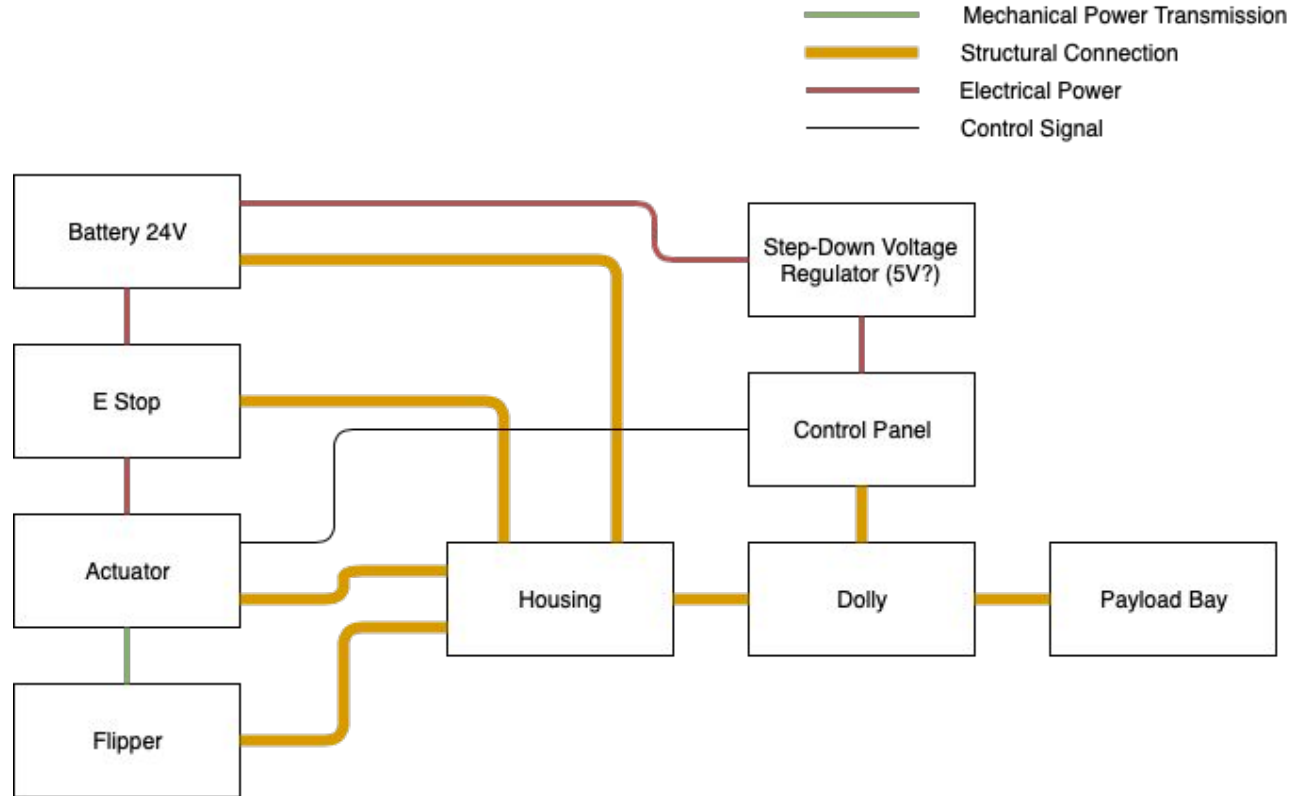
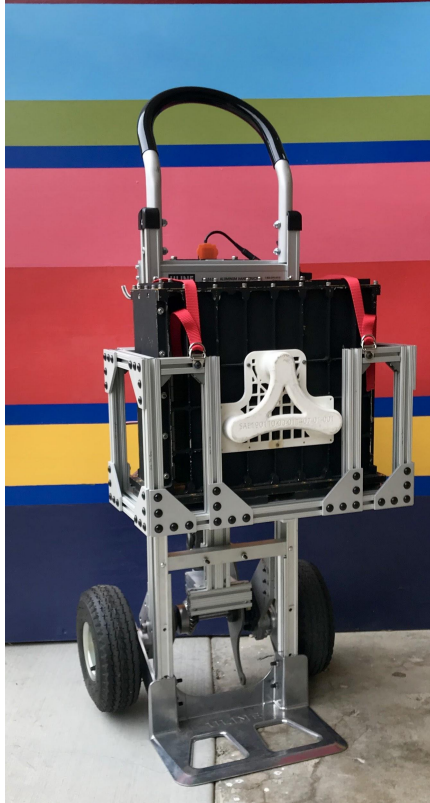
## Constraints

- stable
- robust
- reliable
- effective
- consistent with team strategy
- time limit (Sept.–Feb.+)

## Means

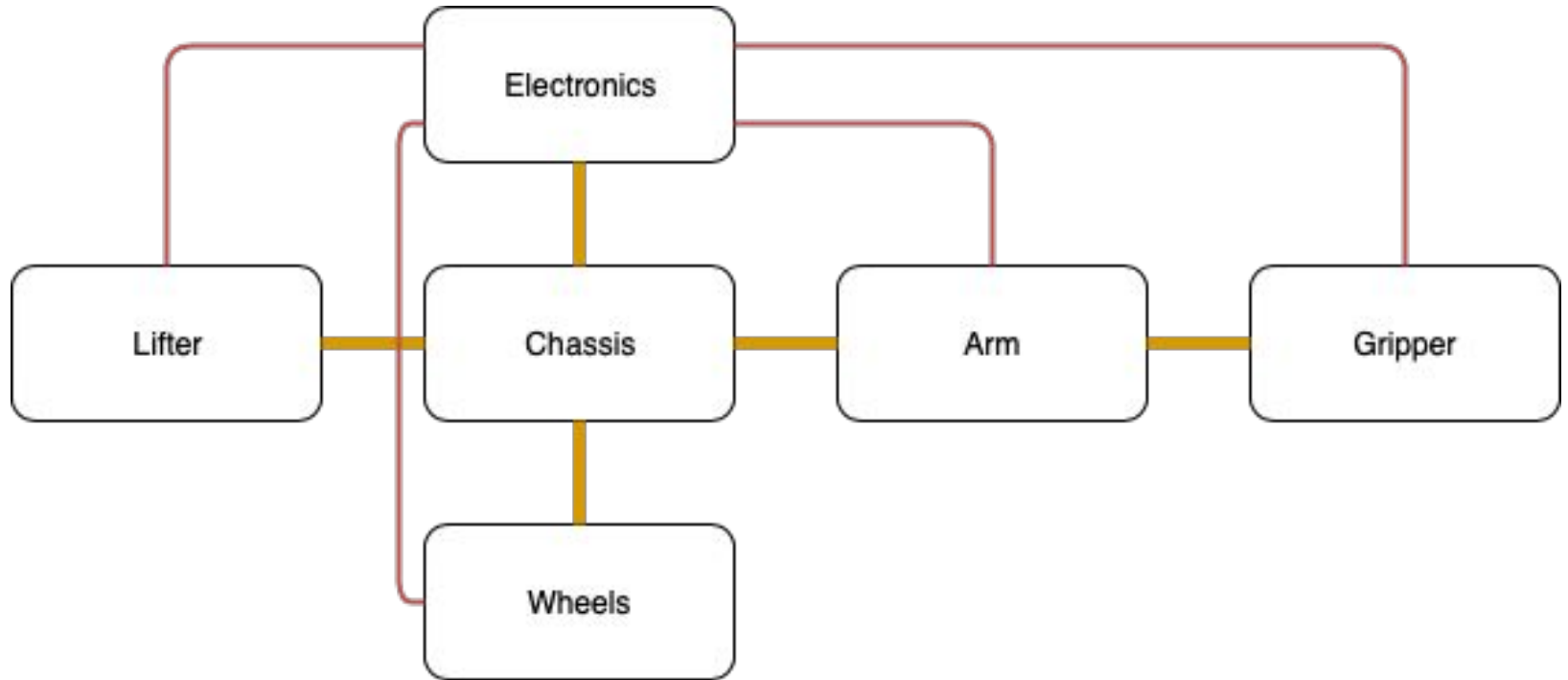
- study real-life engineering solutions
- observe the world around you
- study other FTC teams
- biomimicry

# Identifying *When* You Should Innovate





# Identifying *When* You Should Innovate



# Identifying *When* You Should Innovate

What is your team good at?

What is your team interested in?

What does your team have the resources to make?

What does your team have the skill to make?

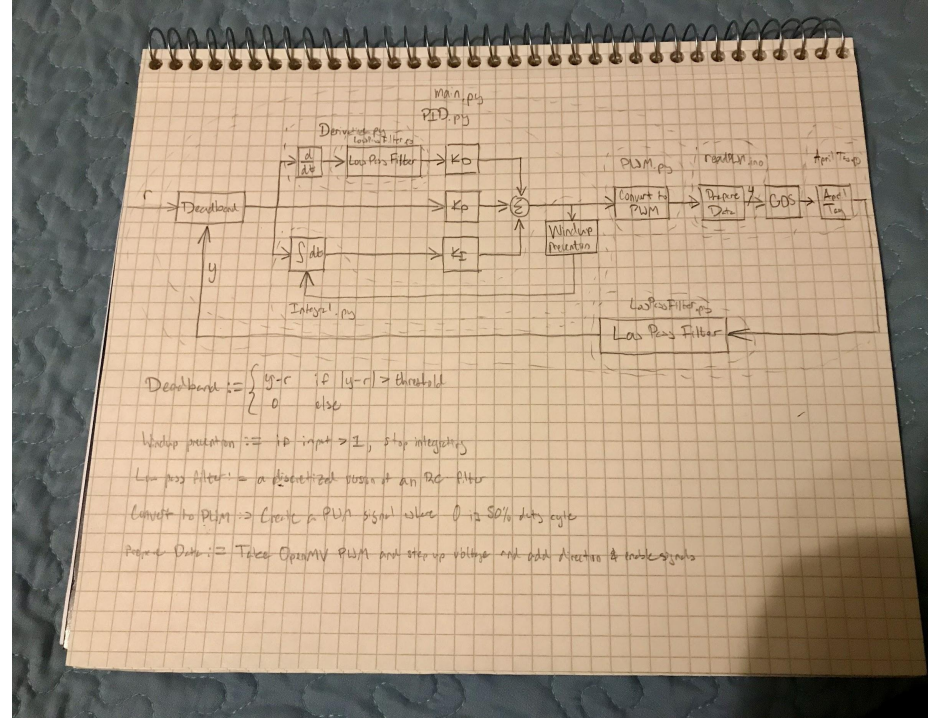
What can your team get mentors to help with?

# Showing Off Neat Design Tools

## Block Diagram

Good for understanding how  
systems change

[https://www.tutorialspoint.com/  
control\\_systems/control\\_systems\\_block\\_diagrams.htm](https://www.tutorialspoint.com/control_systems/control_systems_block_diagrams.htm)

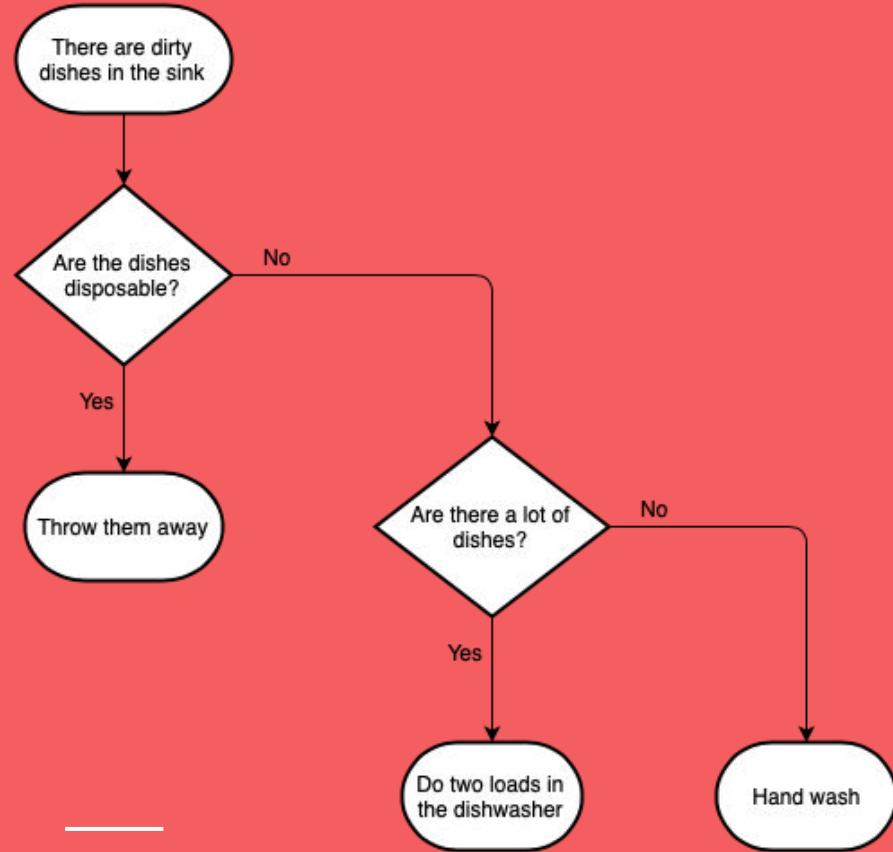


# Showing Off Neat Design Tools

## Flow Chart

Reveals system logic

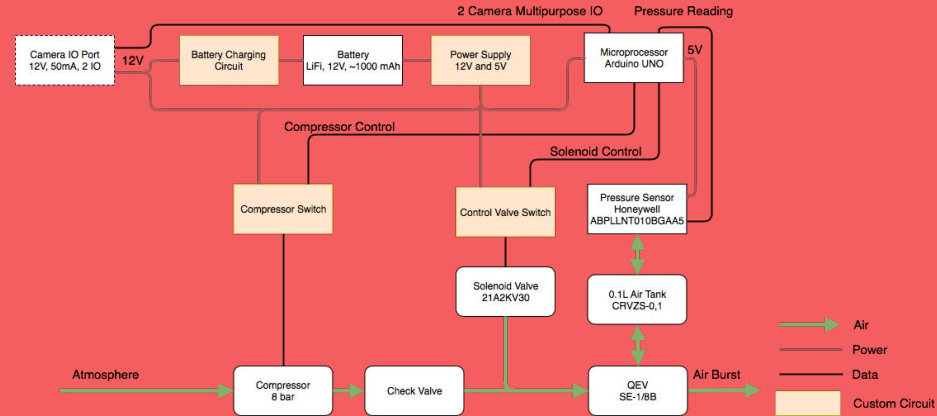
<https://en.wikipedia.org/wiki/Flowchart>



# Showing Off Neat Design Tools

## Connection Diagram

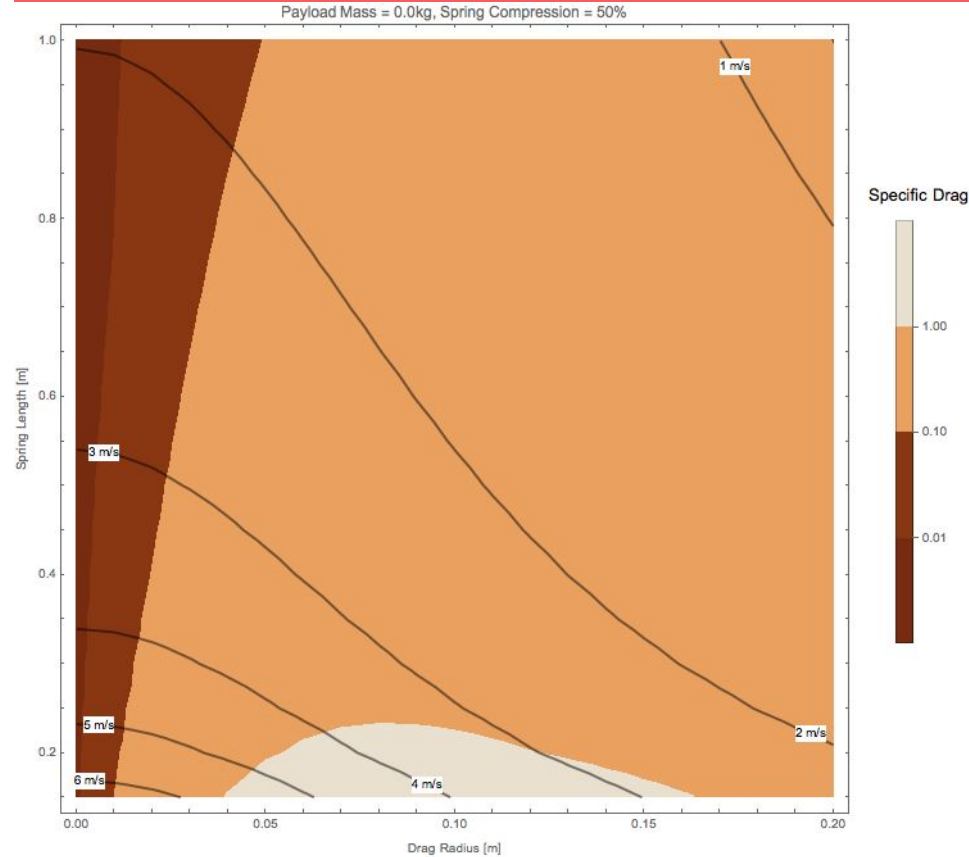
Shows dependencies in a system,  
also can help for managing  
maintainability



# Showing Off Neat Design Tools

## Plotting

Shows how performance changes with respect to design variables, requires math though



# Why bother innovating?

It's fun

You can get a trophy for it

Other people will think you're cool if you do

# Thank you





