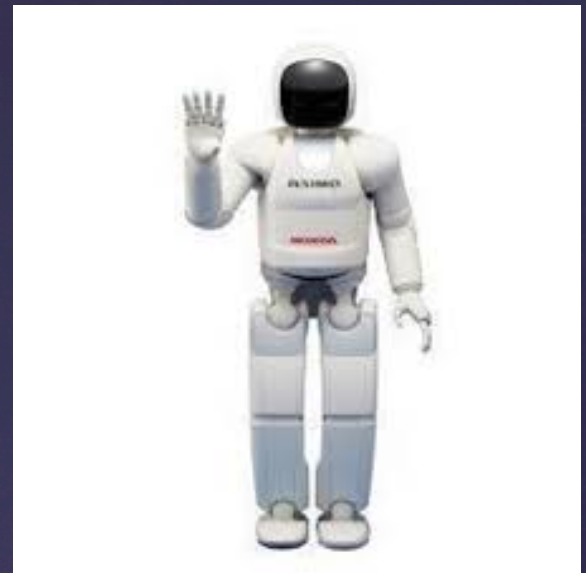


Development of Vibrationally Actuated 3D Printed Soft Robots

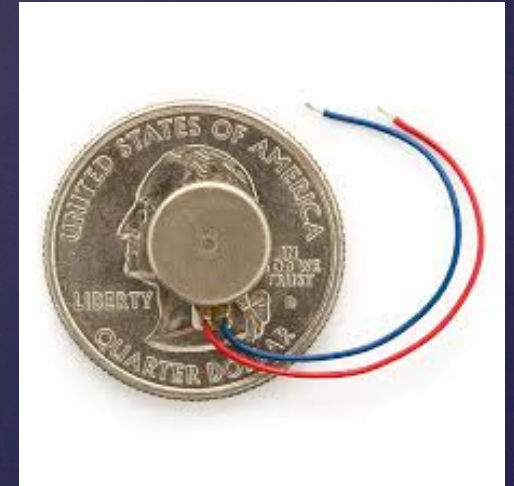
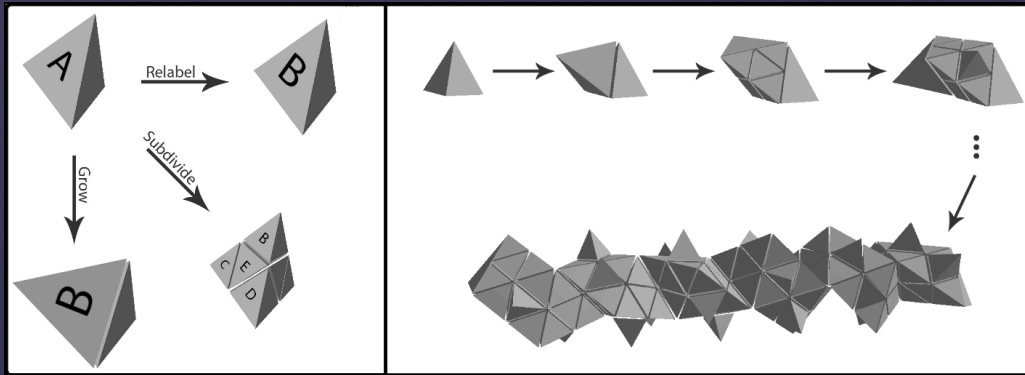
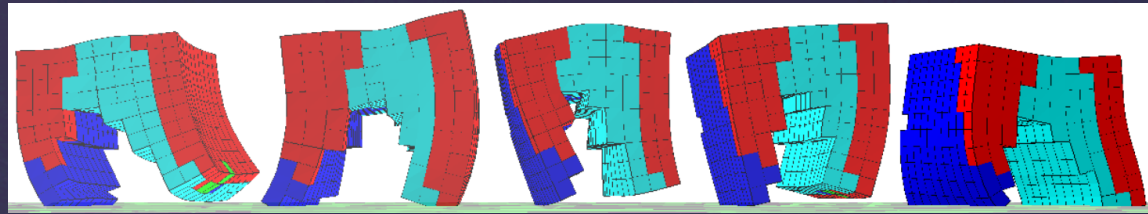
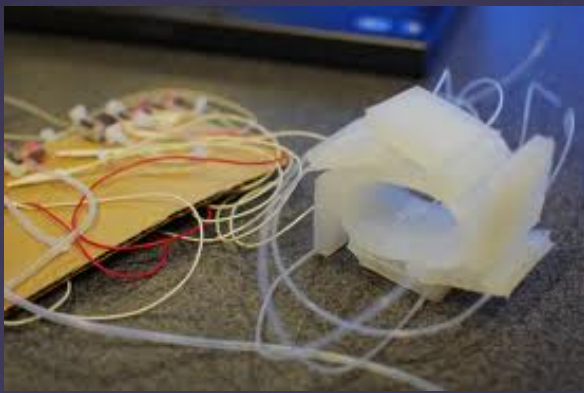
{ Alvin Andino. Advisor: John Rieffel



Not this ^



What are Soft Robots and why use them?

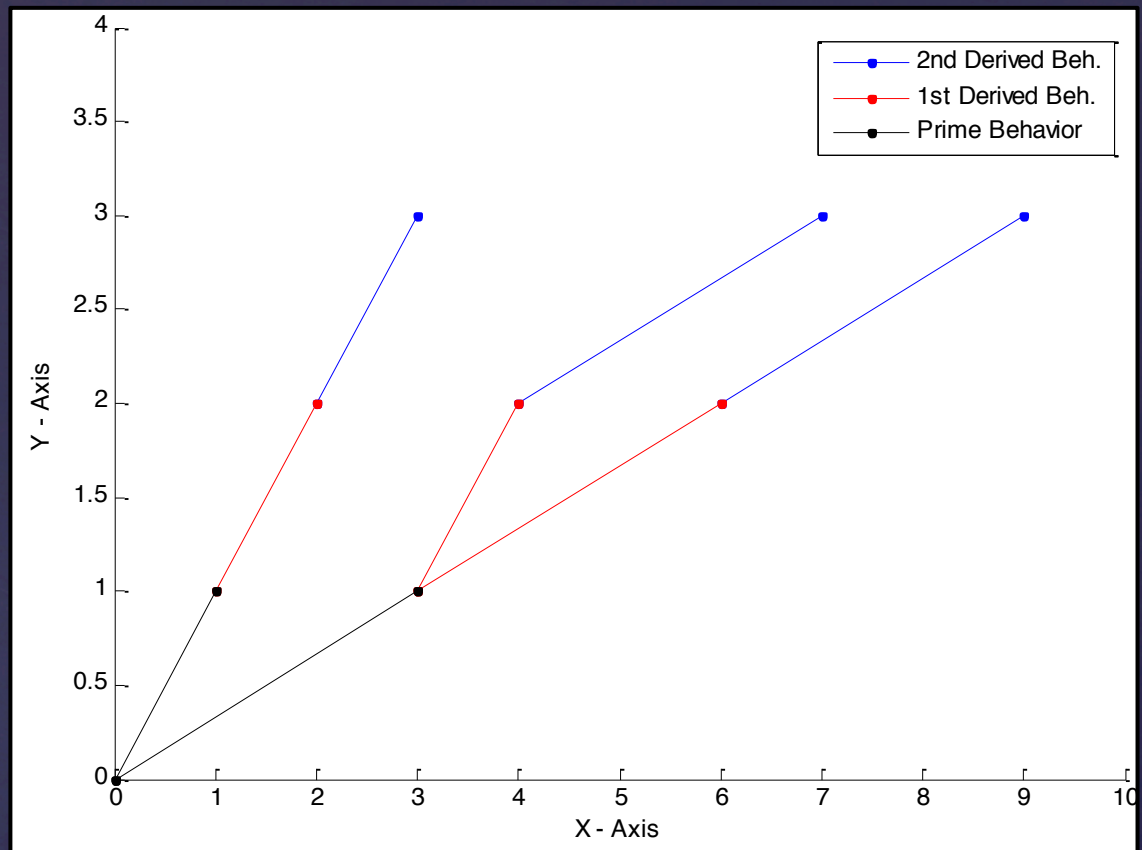


Two Problems: Design and Motion
Two Solutions: Grammars and Vibration

⌘ Given a soft robot, How many trials do we need to figure out how to fully drive it to any location?

My Thesis

Envelope	
Location	Behavior
(1,1)	A
(3,1)	B
(2,2)	AA
(3,3)	AAA
(6,2)	BB
(9,3)	BBB
(4,2)	BA
(7,3)	BAB



Approach

```
initial Envelope:  
Location- x: 0 z: 0 theta: 0 Behavior-  
  
grammar: iaddbsdaadgcbddrccbcgdaba numTests: 10  
Envelope:  
Location- x: 0 z: 0 theta: 0 Behavior-  
Location- x: 1 z: 3 theta: 0 Behavior- 2  
Location- x: 2 z: 2 theta: 0 Behavior- 1  
Location- x: 2 z: 6 theta: 0 Behavior- 22  
Location- x: 3 z: 5 theta: 0 Behavior- 21  
Location- x: 4 z: 4 theta: 0 Behavior- 11  
Location- x: 5 z: 0 theta: 0 Behavior- 3  
Location- x: 5 z: 7 theta: 0 Behavior- 211  
Location- x: 6 z: 3 theta: 0 Behavior- 23  
Location- x: 6 z: 6 theta: 0 Behavior- 111  
Location- x: 7 z: 2 theta: 0 Behavior- 13  
Location- x: 7 z: 6 theta: 0 Behavior- 223
```

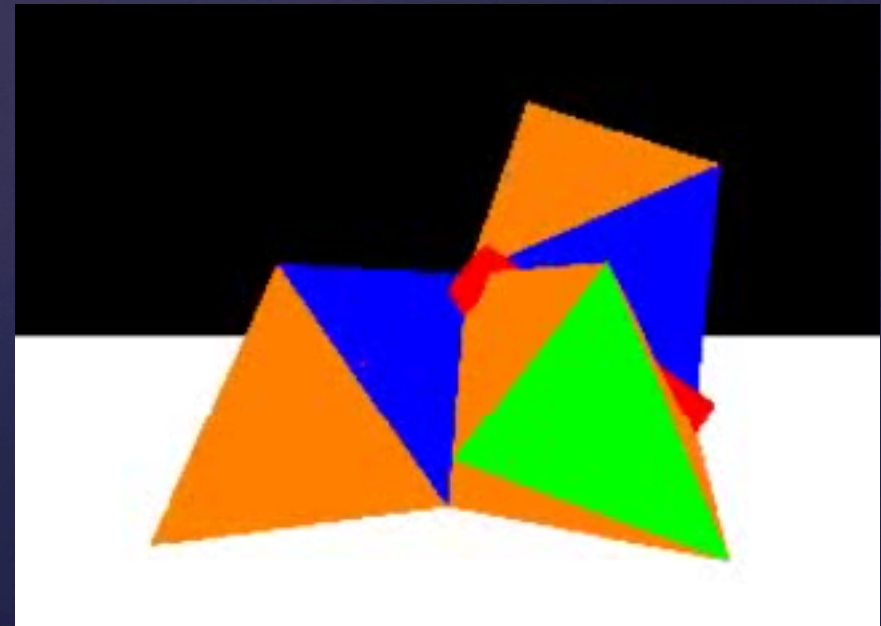
Output from behavior finder
with simulation input

Current Work

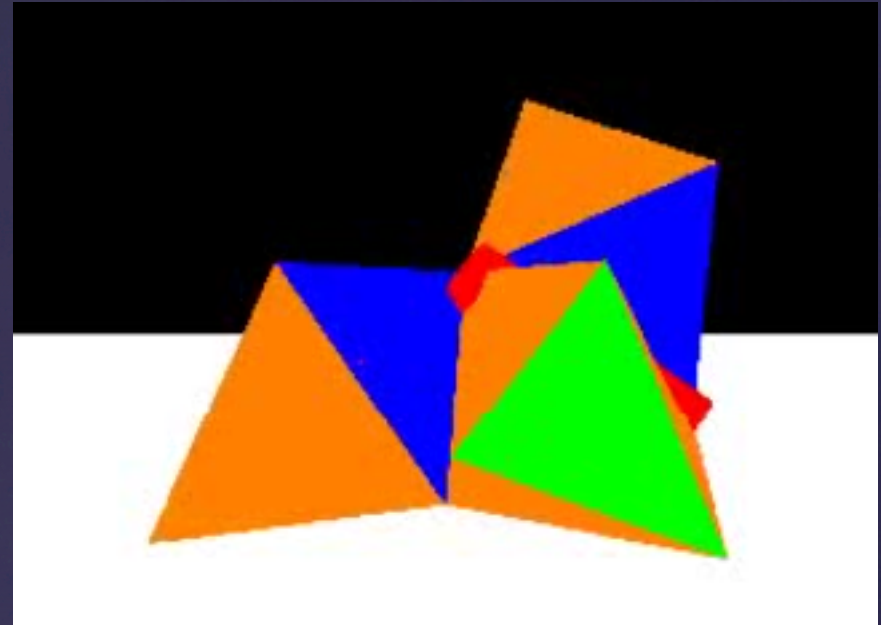
& C++ Bullet Physics
Simulation

& Breadth First search
Algorithm

Bullet Physics
simulation of grammar



- ⌘ Fix motor function in simulation
- ⌘ Track 3D rotation in simulation using quaternions
- ⌘ Run real world experiments with a chosen soft robot with a motor inserted inside



Future Work

Thank you. Questions?