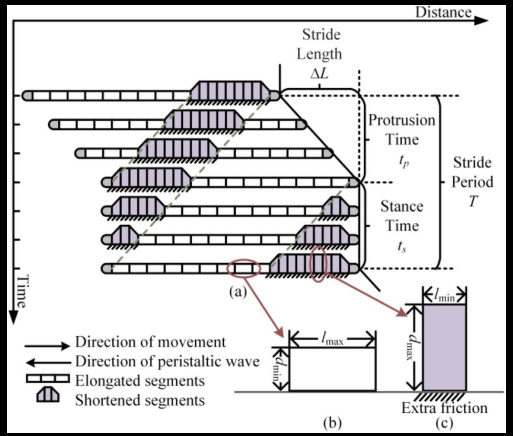
263F Project Midterm Report

NATHAN GE

Worm Simulation

Objective: soft-body simulation of a worm-like robot

- Replicate biologically inspired locomotion patterns (peristaltic crawling, lateral undulation, and inching), to study forward locomotion.
- Simulate interactions with the environment: frictional contact with surroundings

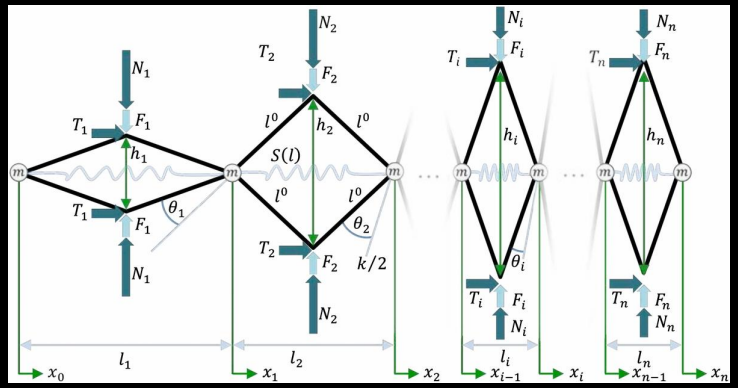


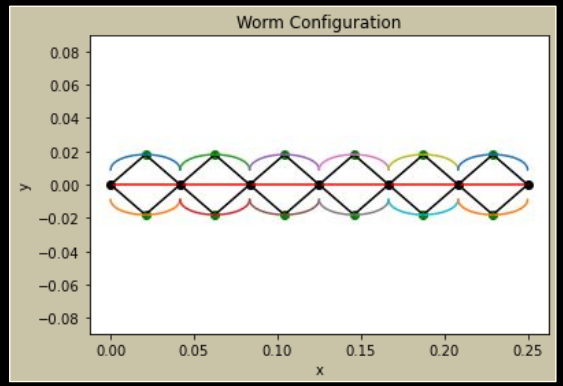
https://iopscience.iop.org/article/10.1088/1748-3190/ab8af6

Worm Modeling

2D planar soft-worm model viewed from the side (discrete segment approach)
Spring Network

- Rhombic segment. coupled length and height change
- Horizontal spring to return worm to rest length
- Torsion spring at the nodes resists differences in height between adjacent segments





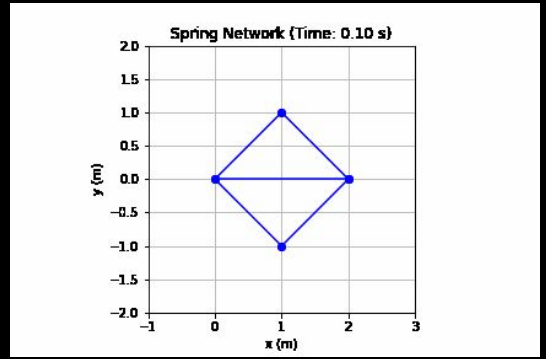
https://iopscience.iop.org/article/10.1088/1748-3182/8/3/035003

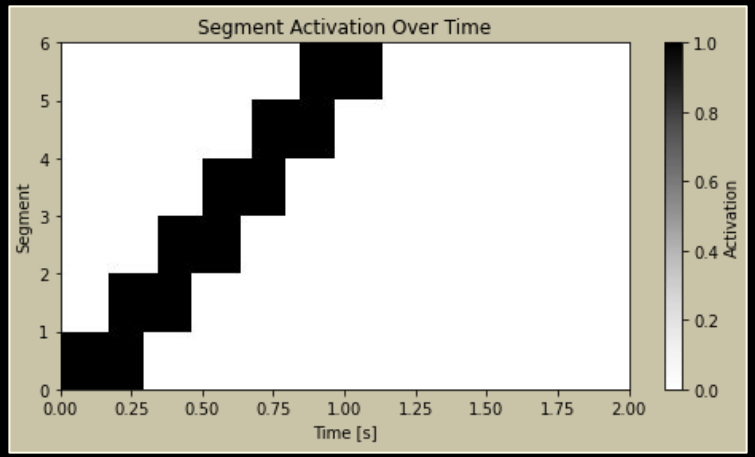
Contraction

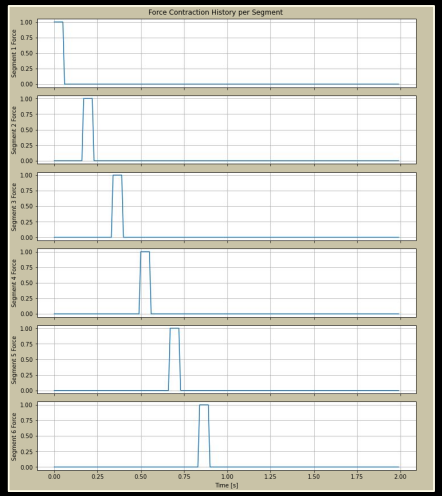
Implement control strategy + performance measuring framework

- Changing speed of contraction.
- Pathing with directed contraction patterns.

Retract → passive return.



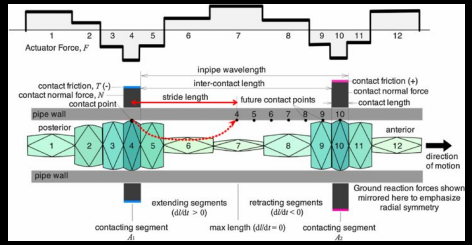




Next Steps

Contraction

Real peristalsis requires *all segments simultaneously having contraction levels determined by a traveling wave function*.



Solver

- Implement Predictor corrector to simulate ground contact and subsequently frictional anchoring

Model

- Nonlinear Soft-Body Mechanics
- Directional friction

Implement control strategy + performance measuring framework

- Changing speed of contraction
- Pathing with directed contraction patterns
- Stable Heteroclinic Channels
- Neural intent