

# Soft-body simulation

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# Why soft-body simulation?

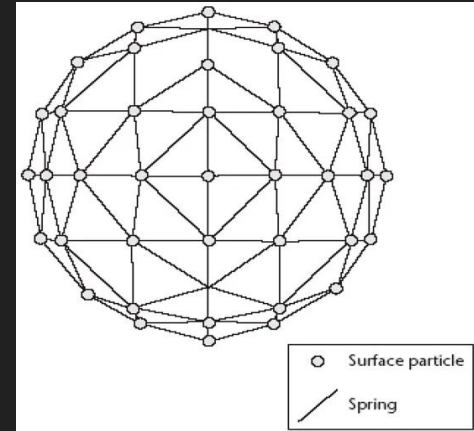
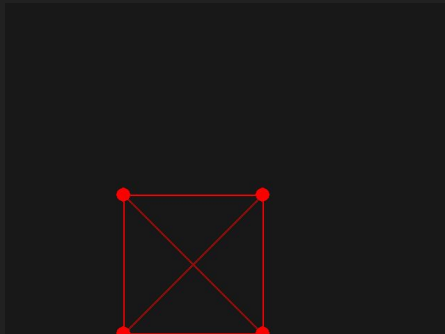
Objective:

To simulate what rigid body lack, the ability to represent shapes that are elastic, can be deformed and can be compressed.

# Initial goal:

1. The ability to give what rigid body lack, the ability to represent shapes that are elastic, can be deformed and can be compressed (Creating a softbody).
2. Being able to create sphere soft body (2D)
3. Ability to interact with softbody

**ULTIMATE GOALS:** Being able to create a 3-dimensional soft body (if have enough time)



# Resource/Libraries

- Pymunk
- Pygame
- Some python youtube tutorials about Pygame (drawing particles)
- Research Paper (for the algorithms)
- Pymunk documentation

# Algorithm

The algorithm for soft-body is quite simple, but the math behind it is poof. So I decide to use Pymunk for 2d Physics simulation

Algorithm:

- Create an initial body shape from small particles.
- Fill the inside of the body evenly with small particles.
- Connect each body component with its neighbors using flexible springs.
- Perform physics simulation of the internal particles of the body.

# Constraints

Deformable Constraints

Over-stretching Compensation

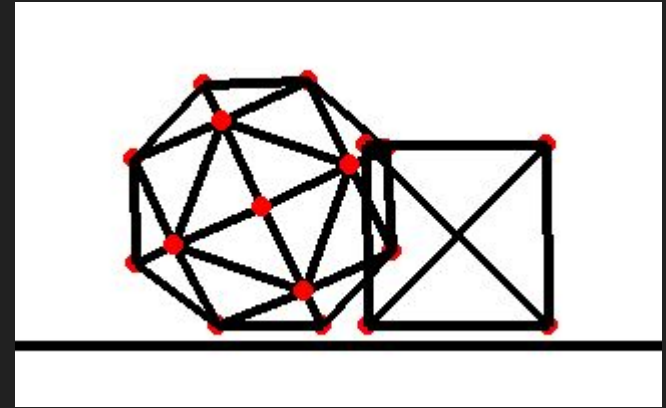
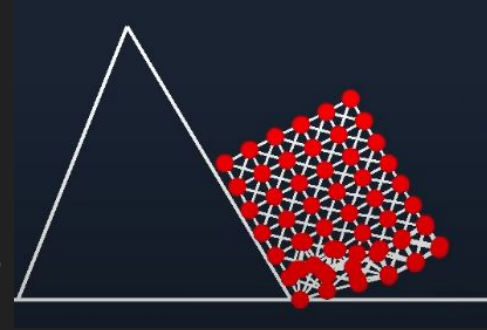
Over-compressing Compensation

- Spring Direction Correction:
- Spring Length Correction

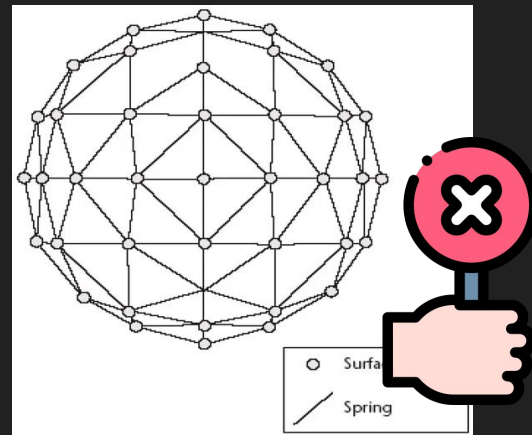
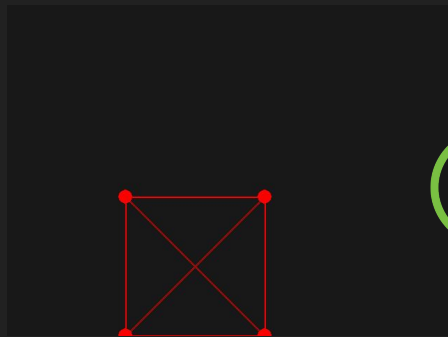
Hooke's Law constraints: The only limitation on this law is if the spring is stretched beyond its elastic limit

# Problems:

- Learn pygame/pymunk
- Pygame bugged (or maybe Im just dumb)
- Cannot come up with proper math to structure the shapes
- Time management
- Self-collision issues
- Pymunk Constraint/Joint does not collide



# Result





# Code walk-through & Small Demo

<https://github.com/ikkyusan193/ssm-project/blob/main/simulation.ipynb>

# Thank you

