Progress Report

Bongjun Kim

2021-11-14

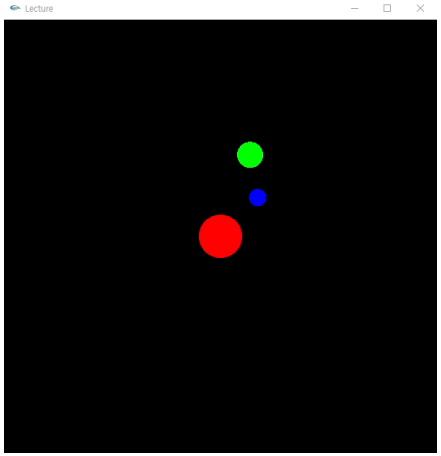
Computer Graphics @ Korea University

KOREA UNIVERSITY

KUCG

Previous Work

- OpenGL Study
  - Hierarchical Transformation



- Numerical Analysis
  - Iteration Methods

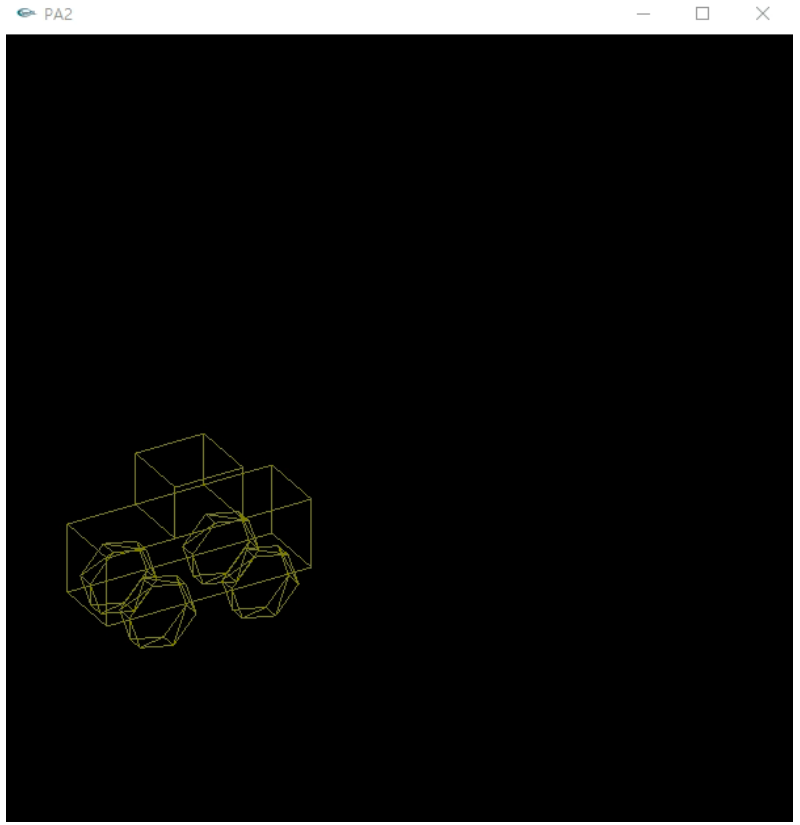
```
matrixA
~~~~~~~~~~~~~~~~~~~~~~~~~~~~
  -2.000000   -2.000000   -2.000000   -2.000000
  -2.000000   -2.000000    1.000000    0.000000
   1.000000   -1.000000    2.000000    1.000000
   2.000000   -1.000000   -2.000000   -1.000000
~~~~~~~~~~~~~~~~~~~~~~~~~~~~

Gauss-Seidel iteration
spectral radius = 2.243216
~~~~~~~~~~~~~~~~~~~~~~~~~~~~
   0.000000   -1.000000   -1.000000   -1.000000
   0.000000    1.000000    1.500000    1.000000
   0.000000    1.000000    1.250000    0.500000
   0.000000   -5.000000   -6.000000   -4.000000
~~~~~~~~~~~~~~~~~~~~~~~~~~~~

Jacobi iteration
spectral radius = 0.942692
~~~~~~~~~~~~~~~~~~~~~~~~~~~~
   0.000000   -1.000000   -1.000000   -1.000000
  -1.000000    0.000000    0.500000    0.000000
  -0.500000    0.500000    0.000000   -0.500000
   2.000000   -1.000000   -2.000000    0.000000
~~~~~~~~~~~~~~~~~~~~~~~~~~~~
```

Jacobi Iteration	Gauss-Seidel Iteratio
20th iteration	20th iteration
1.383707	2.137951
-5.851765	-4.427698
7.417470	5.449589
1.264368	-4.804421
40th iteration	40th iteration
-0.793920	221.284963
-7.031240	181.635212
6.967031	94.763225
1.321973	-78.408264
60th iteration	60th iteration
-1.111550	-2075.324671
-6.831541	-1296.095527
6.499744	2375.342730
1.257114	7598.239274
80th iteration	80th iteration
-1.023884	-330377.498733
-6.743138	-275175.003120
6.473672	-98314.641594
1.246730	188943.711158
100th iteration	100th iteration
-0.998347	-516996.747194
-6.744653	-1040003.193890
6.497116	-4305274.731156
1.249239	-8616566.161814

Current Work

- 연구 목표
  - Tensegrity Structure Modeling 구현
  - Control Model 적용을 통한 원하는 움직임 구현

- Structure Modeling을 위한 OpenGL 공부



Current Work

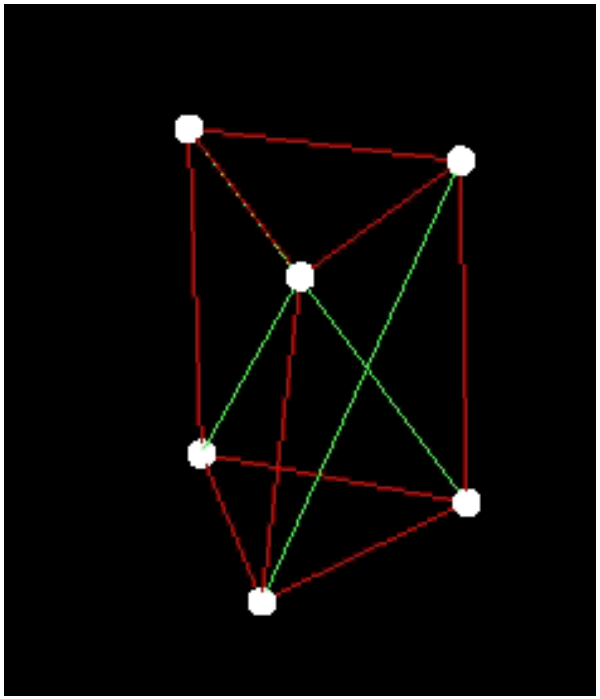
Tensegrity Paper Survey

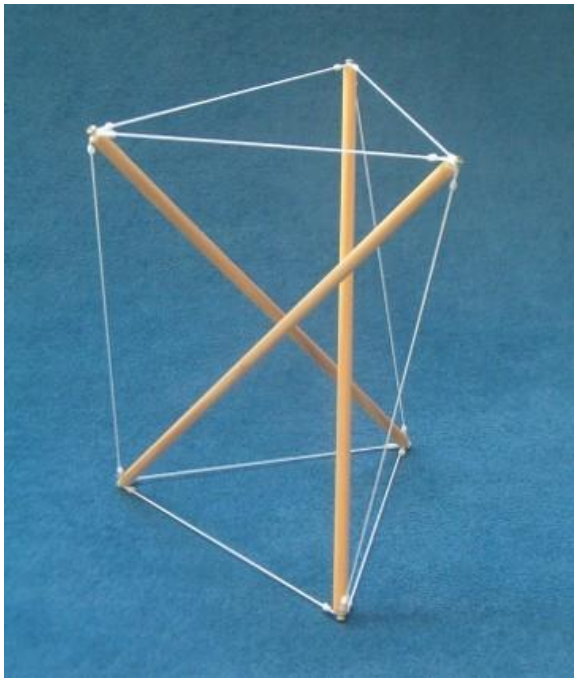
- "Locomotion Without a Brain: Physical Reservoir Computing in Tensegrity Structures"
  - [K. Caluwaerts (Ghent University) *et al.* / Artificial Life 2013]

  - Tensegrity Structures
  - Central Pattern Generators
  - Physical Reservoir Computing
  - Experiments

Tensegrity Structure

- Simplest Tensegrity Structure 구현
  - Bar
  - Spring

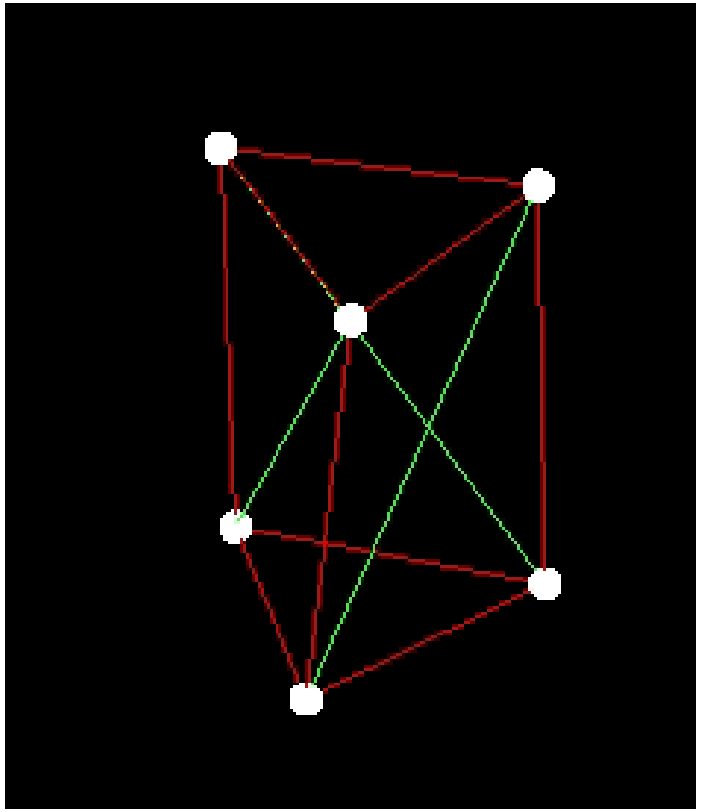




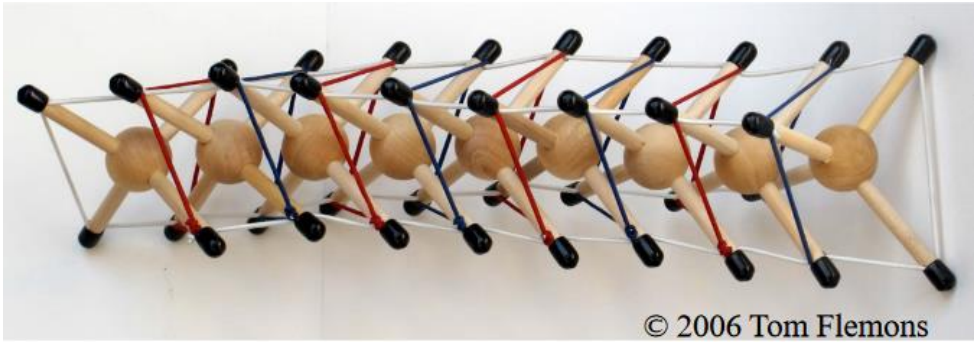
http://www.tensegriteit.nl/e-simple.html

Future Work

- Structure
  - Implement Realistic Physics
  - Implement Control Module



- Complex Bodied Robot



"Design and Control of Modular Spine-Like Tensegrity Structures"
[Brian T. Mirletz (Biologically Inspired Robotics Lab) *et al.* / 6th World Conference on Structural Control and Monitoring 2014]