ASSIGNMENT: 3D Projections

Due Apr 13 by 10pm **Points** 60 **Submitting** a text entry box or a website url
Available Mar 28 at 8:15am - Apr 13 at 10pm 17 days

This assignment was locked Apr 13 at 10pm.

Assignment 2

3D Projections

Task

Implement 3D line drawing by projecting models onto the view-plane. You will use HTML's Canvas 2D API.

3D Projections (to earn a C: 45 pts)

- Implement perspective projection for 3D models: **35 pts**
  - Transform models into canonical view volume
    - Implement the matrix functions in transforms.js
  - Implement Cohen-Sutherland 3D line clipping
  - Project onto view plane
  - Draw 2D lines
- Implement camera movement to change the view of a scene: **10 pts**
  - A/D keys: translate the PRP and SRP along the u-axis
  - W/S keys: translate the PRP and SRP along the n-axis

Additional features (to earn a B or A)

- Implement parallel projection for 3D models: **5 pts**
  - Follows same steps as perspective
- Generate vertices and edges for common models: **5 pts**
  - Cube: defined by center point, width, height, and depth (1 pt)
  - Cone: defined by center point of base, radius, height, and number of sides (1 pt)
  - Cylinder: defined by center point, radius, height, and number of sides (1 pt)
  - Sphere: defined by center point, radius, number of slices, and number of stacks (2 pts)
- Allow for models to have a rotation animation: **5 pts**
  - Can be about the x, y, or z axis
  - Defined in terms of revolutions per second

- Left/right arrow keys: rotate SRP around the v-axis with the PRP as the origin: **5 pts**

Scene

Scenes will be defined as a JavaScript object. The scene will contain both view parameters and a description of the models.

view:

- type (perspective / parallel)
- prp
- srp
- vup
- clip (array - left, right, bottom, top, near, far)

models (array):

- type = generic
  - vertices (array of Vector4)
  - edges (array of lines)
    - line: array of vertex indices
- type = cube
  - center (Vector4)
  - width
  - height
  - depth
- type = cone
  - center (Vector4)
  - radius
  - height
  - sides
- type = cylinder
  - center (Vector4)
  - radius
  - height
  - sides
- type = sphere
  - center (Vector4)
  - radius
  - slices (think number of longitude lines on a globe)
  - stacks (think number of latitude lines on a globe)
- All modes also optionally may have an 'animation' field

- animation
  - axis (x, y, or z)
  - rps (revolutions per second)

*Note: sample models can be found in the starter code.

Starter Code

Starter code is available on GitHub: **cg-3dprojections (https://github.com/tmarrinan/cg-3dprojections)**. Please **fork** your own version of the code, then enable GitHub Pages in the project's settings (change *Source* from *None* to *master branch*).

Groups

Section 01

• Ben F. • Terence L. • Emma T.	• John G. • Zak N.	• Zack H. • Patrick R.	• Joe H. • Peter S.
• Tucker J. • James S.	• Alina K. • Shido S.	• Abdullahi M. • Nathan S.	

Section 02

• Erik A. • Ben M.	• Tianzhi C. • Jessica O.	• Sarah C. • Kim N.	• Nolan F. • Noah P.
• Michael F. • Cole P.	• Jackson G. • Joe S.	• Tanya H. • Ryan S.	• Sierre J. • Sam S.
• Hieu L. • Nate R.	• Mackenzie M. • Mike T.	• Peter M. • Kong Pheng T.	• Matt W. • Owen X. • Tseng Y.

Submission

Code should be saved in a repository on GitHub while working on the project. In order to submit, ONE group member should enter the the project's live website URL for the assignment (in Canvas).

ALL group members should also submit a checklist of what you feel you have accomplished from the rubric above (**including who worked on what**), and include your total expected score. This can be

made as a comment once you submit the URL.

Deadline

This assignment is due Wednesday, April 13 at 10:00pm.