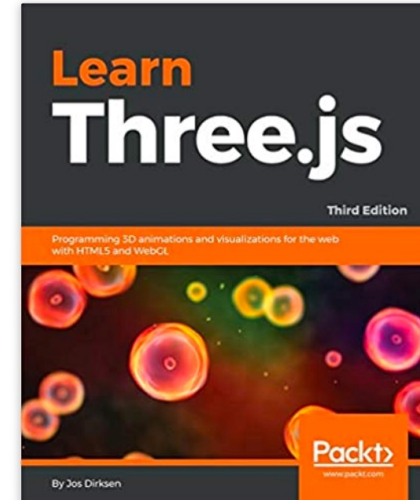


# COMPUTER GRAPHICS

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\* Based heavily on CISC 3620 material by Prof. Michael Mandel

# USER INTERACTION

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**Keyboard and GUI Controls**

# This course so far

- Introduction
  - Setting up the environment
    - Editor, Codepen, etc.
- Introduction to ***Javascript***
  - Programming fundamentals
    - Variables, functions, conditionals, loops, data structures
    - Object-oriented concepts: using objects, classes, methods

# This course so far

- HTML5 ***Canvas 2D*** drawing
  - The HTML5 <canvas> element
  - Drawing rectangles
  - Drawing paths
  - Drawing arcs in paths
  - Setting properties of path segments
  - Transformations and saving and restoring state

# This course so far

- API's:
  - OpenGL/WebGL, Three.js, and TW
    - the three APIs we'll use in this class
- Geometrical objects
  - Drawing using OpenGL and Three.js
- Creating a simple scene
  - using Three.js and TW

# This course so far

- User Interaction
- Keyboard controls
- GUI controls

# Topics for Today

- Exercises: Adjusting steeple height with keyboard and GUI controls

# EXERCISES

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# Exercise: Keyboard Controls

- To implement a new keyboard control, you need to have:
  - one or more global variables, used by the scene modeling code
  - a callback function that modifies the global variable(s) and then rebuilds and redraws the scene
  - a binding of the callback function to a key
    - using `TW.setKeyboardCallback(key,function,docstring)` (call this function after `TW.mainInit()`)

# Exercise 1: Adjusting the Height of the Steeple

- Start from [this pen](#). The important part is:
  - `var steepleHeight = 36; /* global variable to be controlled */`
  - `var steepleWidth = 6;`
  - `var steepleMesh;`
  - `//`
  - `function placeSteeple(steepleHeight, steepleWidth) {`
    - `var half = steepleWidth * 0.5;`
    - `var steepleGeom = createSteeple(steepleWidth, steepleHeight);`  
`steepleMesh = TW.createMesh(steepleGeom);`  
`steepleMesh.position.set(barnWidth*0.5, barnHeight+barnWidth*0.5-half, -half);`
    - `scene.add(steepleMesh);`
  - `}`

# Exercise 1: Adjusting the Height of the Steeple

## Implement

Implement a function to

- remove the current steeple
- increment the height
- create a new steeple and place it on the barn
- redraw the scene

## Add

Add a keyboard callback to your code that allows you to grow the steeple by entering the '+' key

## Add

Add a second keyboard callback that makes the steeple shorter when you enter '-'.

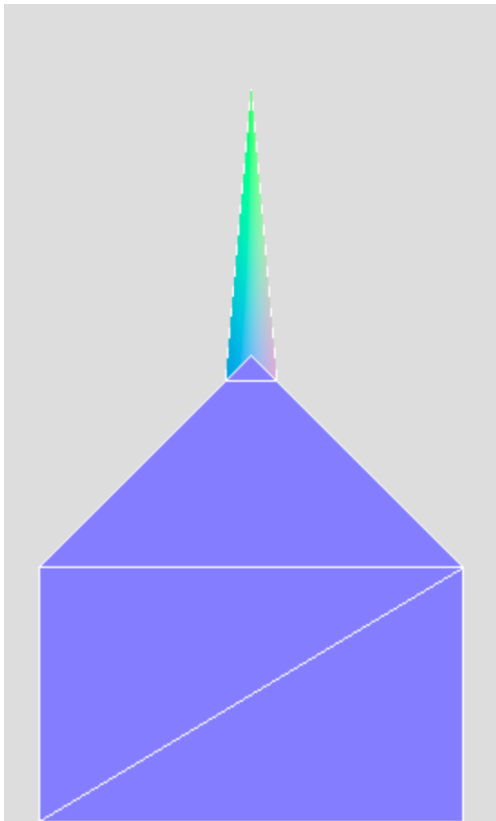
# Exercise

- Your result may use a growSteeple function:
  - `function growSteeple() {`
  - `scene.remove(steepleMesh);`
  - `steepleHeight++;`
  - `placeSteeple(steepleHeight, steepleWidth);`
  - `TW.render();`
  - `}`

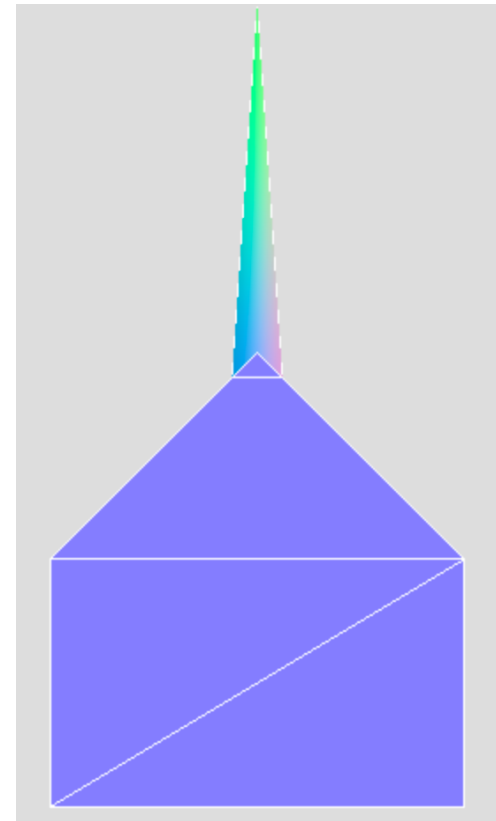
# Exercise 1: Adjusting the Height of the Steeple

- Your result may look like this:

- Before



- After steeple grows:



# Exercise 2: GUI Controls

- To implement a new GUI control, you need to have
  - one or more global object variables
    - contain parameters to be controlled, with initial values
  - one or more callback functions that are called when the user modifies one of the parameters
    - The functions rebuild and redraw the scene
  - a new `dat.GUI` object
  - calls to the `add()` method and `onChange()` event handler
    - specify a global object variable, parameter, range of values for the slider, and callback function

## Exercise 2: GUI Controls

- Your solution may include the following code:
  - `var steepleHeight = 36;`
  - `var sceneParams = {steepleHeight: steepleHeight};`

...

- `var gui = new dat.GUI();`
- `gui.add(sceneParams,'steepleHeight',20,40).onChange(  
redrawSteeple);`

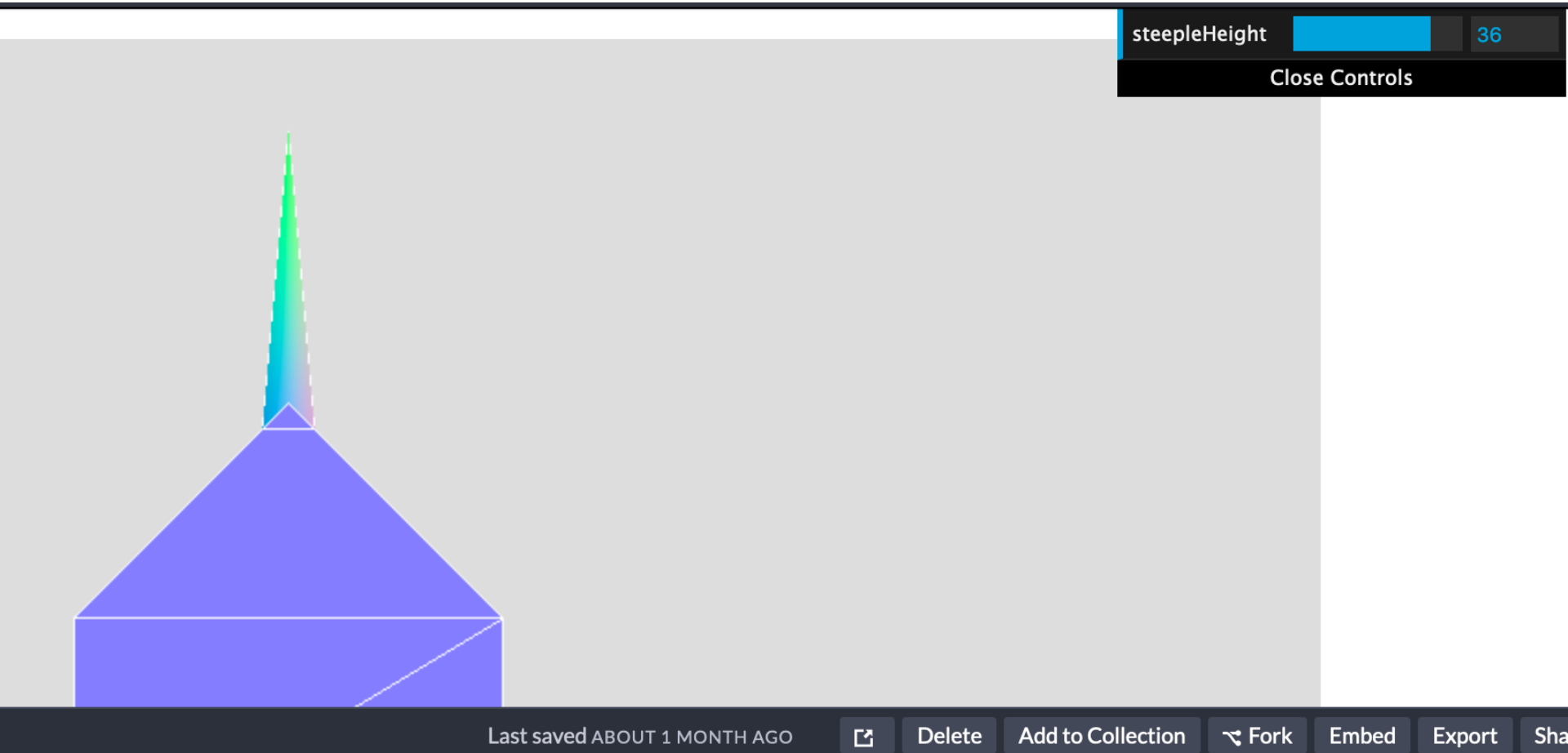
## Exercise 2: Adjusting the Steeple Height with a GUI

- Modify your code from the previous exercise to *use a GUI control instead of a keyboard control*
  - to adjust the height of the steeple



# Exercise 2: Adjusting the Steeple Height with a GUI

- Your result may look like this:



# Summary

- TW library provides usable keyboard controls functionality
- The dat.GUI library provides usable GUI controls
- The .position.set() function can be used to move objects on the screen
- The steeple can be adjusted with keyboard controls or GUI controls

Questions?

