Lab 4

CS 418: Interactive Computer Graphics

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Goals

In this lab you will implement code to read a mesh from an OBJ file

Things you will need to do include:

- Learn how to asynchronously fetch a server side file
- Handle an asynchronous event
  - So you don’t try to draw before you have the mesh ready
- Parse the OBJ text file using JavaScript
  - So you can populate the vertex and face buffers for the mesh

All of this code will be used in MP3

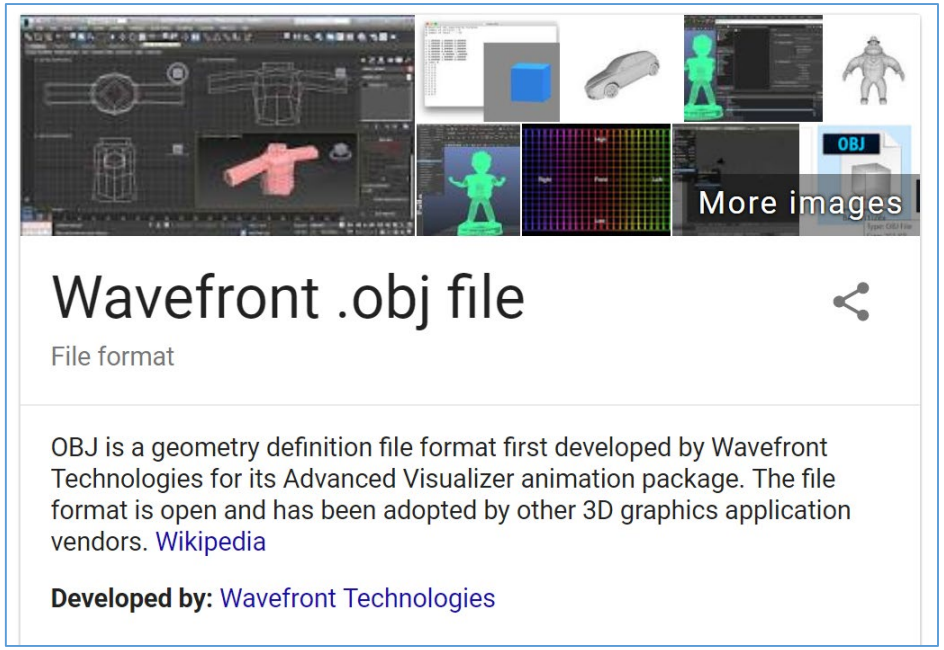
OBJ File Format

It is a text (ASCII) file format for 3D surface models

You will implement a parser for a subset of the format

...and render a cow

For details on the file format:
https://en.wikipedia.org/wiki/Wavefront_.obj_file



Asynchronously Read a File

It would probably be more useful to read and render a file on the client side…but for this MP, grading will be e easier if we read a server side file…

To start, we need to be able to read a text file

We will write code to fetch an obj file kept on the server side

The only slightly tricky part is that the fetch is done *asynchronously*

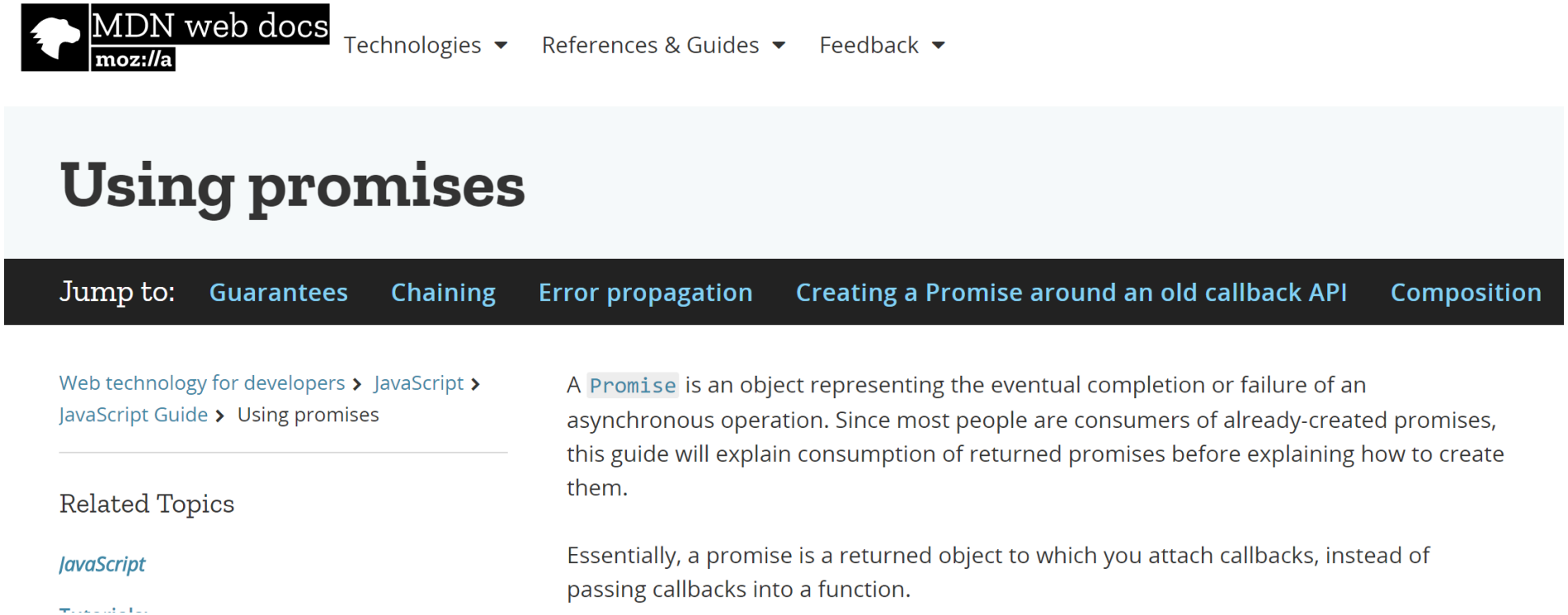
- Since the file read is asynchronous…
- We need to not try to draw the mesh before the data is ready

function setupMesh(filename)

To get the text asynchronously from the server we will use a JavaScript promise

You can read about them:

https://developer.mozilla.org/en-US/docs/Web/JavaScript/Guide/Using_promises



function asyncGetFile(url) in HelloMesh.js

Add this code:

```
//-------------------------------------------------------
/**
 * Asynchronously read a server-side text file
 */
function asyncGetFile(url) {
  console.log("Getting text file");
  return new Promise((resolve, reject) => {
    const xhr = new XMLHttpRequest();
    xhr.open("GET", url);
    xhr.onload = () => resolve(xhr.responseText);
    xhr.onerror = () => reject(xhr.statusText);
    xhr.send();
    console.log("Made promise");
  });
}
```

Function setupMesh in HelloMesh.js

Now use that asyncGetFile function you wrote to fetch the cow.obj file

…and give it to the TriMesh object to be parsed…

```
//--------------------------------------------------------------------------------
/**
 * Populate buffers with data
 */
function setupMesh(filename) {
    myMesh = new TriMesh();
    myPromise = asyncGetFile(filename);
    // We define what to do when the promise is resolved with the then() call,
    // and what to do when the promise is rejected with the catch() call
    myPromise.then((retrievedText) => {
        myMesh.loadFromOBJ(retrievedText);
        console.log("Yay! got the file");
    })
    .catch(
        // Log the rejection reason
       (reason) => {
            console.log('Handle rejected promise ('+reason+') here.');
        });
}
```

function draw() in HelloMesh.js

You need to stop `myMesh` from being drawn before it is ready

…add an if statement to prevent this

Which TriMesh function will be useful?

loadFromOBJ(fileText) in TriMesh.js

Finally…write code to parse the text file….

```
/**
* Populate the JS arrays by parsing a string containing an OBJ file
* @param {string} text of an OBJ file
*/
loadFromOBJ(fileText)
{

    //Your code here









    //-----------------
```

Parsing the OBJ File

You just need to parse a subset of the OBJ file format…

- Lines starting with # are comments…log these to the console
- Lines staring with v are vertex coordinates

```
v 0.123 0.234 0.345
```

- Lines starting with f are triangles

```
f 1 2 3
```

- **NOTE..obj vertex indices start at 1…**

  you need to subtract 1 from the vertex because your arrays will start at 0

To make things easier, assume faces have only 3 numbers in each record
…not true for full OBJ format

Read those lines and fill this.vBuffer and this.fBuffer

Useful JS functions

- String method split()

  The `split()` method splits a `String` object into an array of strings by separating the string into substrings, using a specified separator string to determine where to make each split.

  https://developer.mozilla.org/en-US/docs/Web/JavaScript/Reference/Global_Objects/String/split

- parseFloat

  The `parseFloat()` function parses an argument and returns a floating point number.

  https://developer.mozilla.org/en-US/docs/Web/JavaScript/Reference/Global_Objects/parseFloat

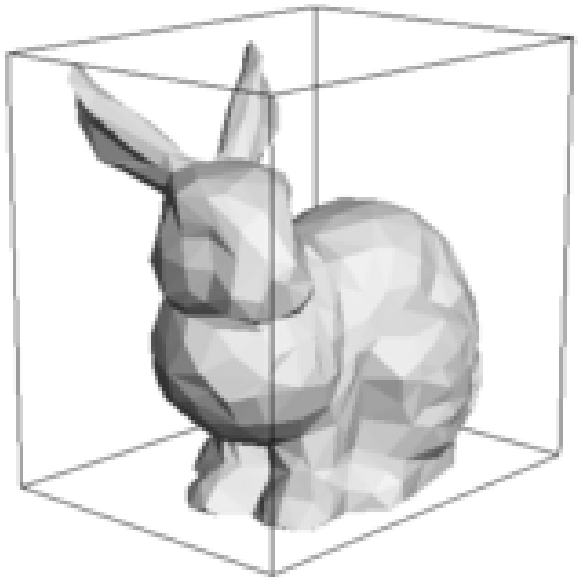
- parseInt

  The `parseInt()` function parses a string argument and returns an integer of the specified radix (the base in mathematical numeral systems).

  https://developer.mozilla.org/en-US/docs/Web/JavaScript/Reference/Global_Objects/parseInt

Axis Aligned Bounding Box

- Box is defined by
  - min point $p_0=(x_0,y_0,z_0)$
  - max point $p_1=(x_1,y_1,z_1)$
- Box is $[x_0, x_1] \times [y_0, y_1] \times [z_0, z_1]$
- How can we efficiently compute the box?
  - Imagine you are given a bunch of triangles
  - What is the bounding box for all those triangles?



Model Size and Position

The cow mesh AABB:

```
TriMesh: Loaded  5804  triangles.
TriMesh: Loaded  2904  vertices.
AABB:
-0.5221959948539734,-0.3198379874229431,-0.17014099657535553
0.5221959948539734,0.3198379874229431,0.17014099657535553
```

The view and projection matrices are set up to see that geometry

Other meshes might not naturally be located in your view volume

- May need to be translated and scaled

In TriMesh.js complete the functions shown here

…you can use that information to determine how a mesh should be transformed

TriMesh.js:

Complete `computeAABB()` and `getAABB(minXYZ,maxXYZ)`

- You can then use these functions in code that
  - Determines if the geometry should be scaled
  - Determines if the geometry should be translated
  - You would apply those tranformations to the MVMatrix before drawing

Final Result