CSE 4300 Project: Voxel Game Engine

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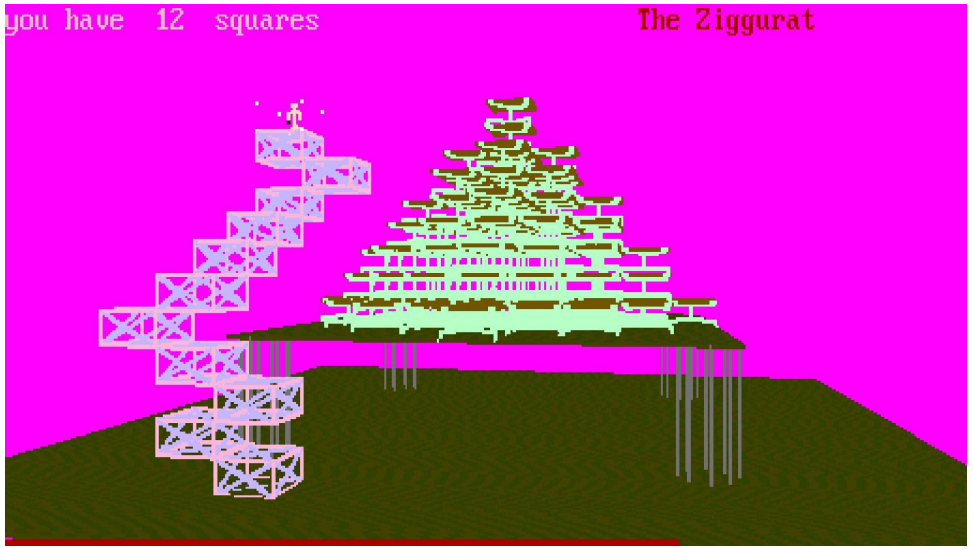
Specification:

- Render 3D scenes using single-colored volumetric pixels (voxels)
- Small objects (<32*32*32 voxels) should be rendered in real time (~50 fps)
- Large backgrounds can be rendered once, and then saved as a 2D image which can be displayed every frame
    - This means that the background should only be updated periodically
- Objects should be stored in files separate from the source code which can be edited by other programs (.csv format used)
- All object files should be loaded into RAM before gameplay because this is an expensive process which cannot be completed with any regularity (without sacrificing performance)

Projection

- In order to convert 3D coordinates into a 2D space, the following transformation is used (where (0,0) is the center of the screen):

```
new_x=old_x/old_z
new_y=old_y/old_z
```



Occlusion

- A Z-Buffer was used in order to implement occlusion
- Every time a voxel is rendered, its distance from the camera is saved to a 2D array called a Z-Buffer
- A voxel is only rendered if the value in the Z-Buffer at that screen position is not lower than the value of the voxel to be rendered.

3D Object File Format

- Each row of the .csv file contains one voxel
- There is a column for X, Y, Z, and color.
- There is a small editor program which makes it easier to edit these files.