Moderovacie a renderovacie techniky

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9. novembra 2023

https://github.com/frantisekdracek/Prezentacie/tree/main

Obj file

```
# List of geometric vertices, with (x, y, z, [w]) coordinates, w is optional and defaults to 1.0.
v 0.123 0.234 0.345 1.0
v ...
...
# List of texture coordinates, in (u, [v, w]) coordinates, these will vary between 0 and 1. v, w are optional
and default to 0.
vt 0.500 1 [0]
vt ...
...
# List of vertex normals in (x,y,z) form; normals might not be unit vectors.
vn 0.707 0.000 0.707
vn ...
...
# Parameter space vertices in (u, [v, w]) form; free form geometry statement (see below)
vp 0.310000 3.210000 2.100000
vp ...
...
# Polygonal face element (see below)
f 1 2 3
f 3/1 4/2 5/3
f 6/4/1 3/5/3 7/6/5
f 7//1 8//2 9//3
f ...
...
# Line element (see below)
l 5 8 1 2 4 9
```

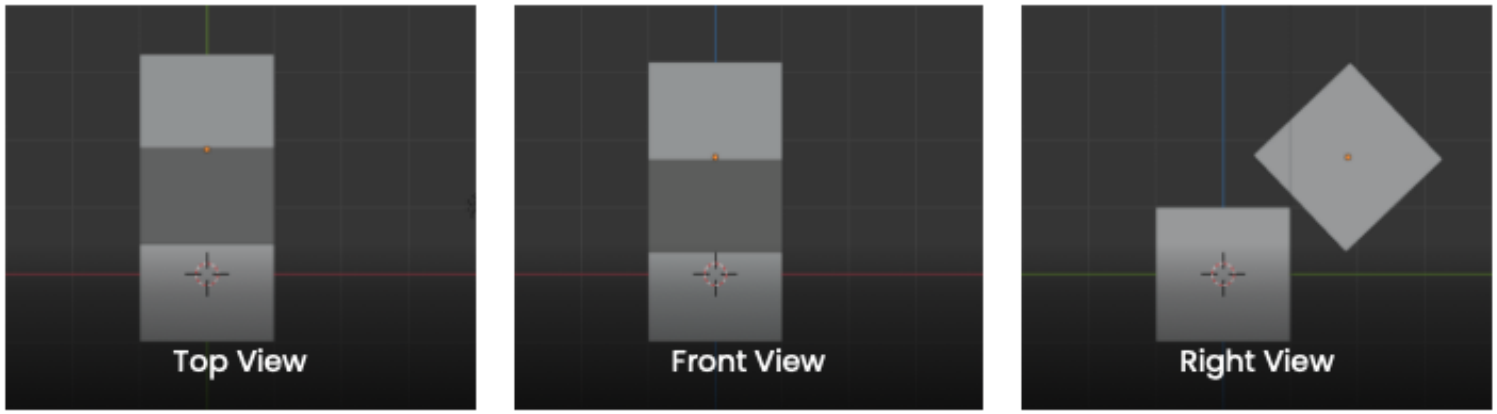
- $fv1//vn1v2//vn2v3//vn3$

Voxelization

- Triangular mesh (with normal)
- subdivide entire space into cubes
- for every triangle $((x_1, y_1, z_1), (x_2, y_2, z_2), (x_3, y_3, z_3)$, find its bounding box as $(\min_i(x_i), \min_i(y_i), \min_i(z_i))$, $(\max_(x_i), \max_i(y_i), \max_i(z_i))$
- for every voxel in triangle's bounding volume, check for intersection with triangle
-

Triangle-cube 3D intersection

Separating Axis theorem



- need to check projection against 13 axes
- cube normals: $e_1 = (0, 0, 1)$, $e_2 = (0, 1, 0)$, $e_3 = (1, 0, 0)$.
- triangle normal $f_1 \times f_2$
- croos product of triangle's egde vectors with cube normals
  - $a_{ij} = e_i \times f_j$, where $f_j = v_{j+1} - v_j$.

Triangle-cube 3D intersection

Separating Axis theorem

- move both triangle and cube so that cube's center sits origin
- calculate "projected radius of cubeön axis a as $r = c|a_1| + c|a_2| + c|a_3|$, where c is cube extent.
- project triangle vertices v_i on the axis: $p_i = v_i \cdot a$
- if $\max(-\max(p_i), \min p_i) > r$ then objects are separated
- sufficient if objects are separated on one axis

Thank you!