

TSBK07 Computer Graphics Project

NQ (Not Quite) Sokoban Game

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Outline

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Sokoban & Inspirations

- *Sokoban* was invented in Japan, 1982 by *Thinking Rabbit*
- *EDGE* developed by *Mobigame* in 2008 for *iOS* devices
- *NQ Sokoban* is based on *Sokoban*, has *EDGE*'s looks
- *Not* only a 3D clone, introduces *new mechanics* too

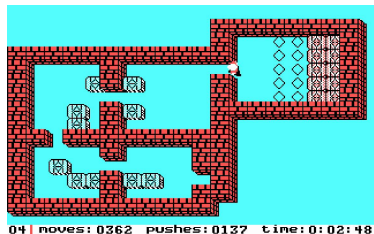


Figure 1: Sokoban

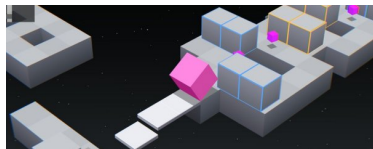
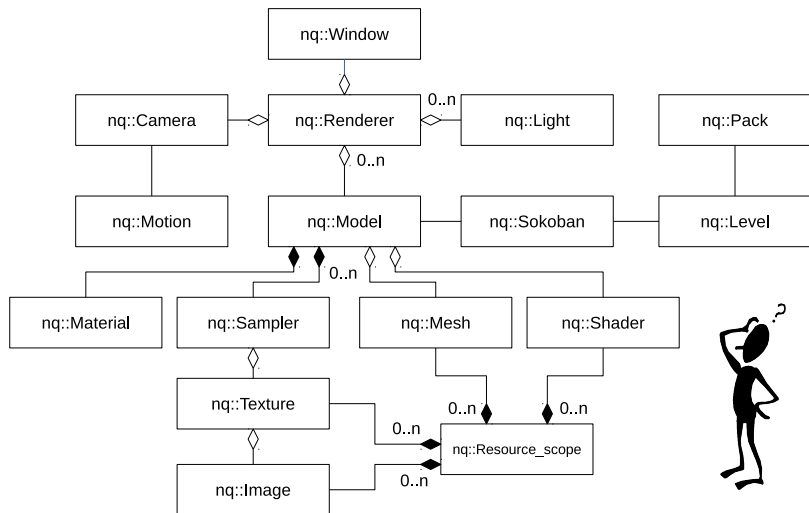


Figure 2: EDGE

Requirements & Technologies

- 1 *Rules of Sokoban and NQ*
 - 2 *Voxel world representation*
 - 3 *Color blocks based on type*
 - 4 *Blinn-Phong reflection model*
 - 5 *Flat shading for the voxels*
 - 6 *Loading levels via JSON*
 - 7 *Movement animations*
- *C/C++*
 - *OpenGL 2.1*
 - *GLFW, GLEW*
 - *JsonCpp, libPNG*
 - *libVorbis, OpenAL*
 - *FreeType, GLM*
 - *tinyOBJLoader*

Game Architecture Overview



Level Packs & Game Logic

```
1 {
2   "title": "Hello World!",
3   "author": "Erik S. V. Jansson",
4   "width": 5, "depth": 6, "height": 5,
5   "palette": {
6     "empty": [0, 0, 0],
7     "player": [0, 0, 255],
8     "moveable": [255, 0, 0],
9     "objective": [0, 255, 0],
10    "background": [48, 48, 48]
11  },
12
13  "directory": "hello/",
14  "layers": [
15    "00.png",
16    "01.png",
17    "02.png",
18    "03.png",
19    "04.png"
20  ]
21 }
```

0	0	0	0	0
0	1	1	1	0
0	1	2	2	0
0	2	1	2	0
0	0	0	0	0
0	0	0	0	0

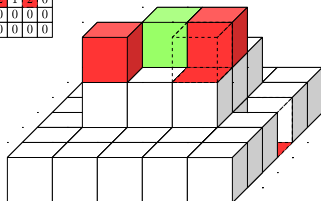


Figure 3: "Hello World!" Level

Listing 1: Level File Format

- Voxels are *chunked*
- Only $n + 1$ *draw calls*
- $n =$ non-static meshes
- Lighting calculations, done in vertex shader
- Almost 100% portable with OpenGL ES 2.0

- Robert Penner's Easing
- Exists around 30 of them

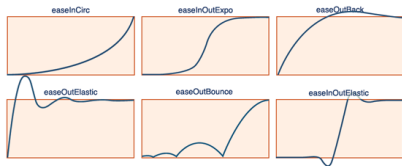
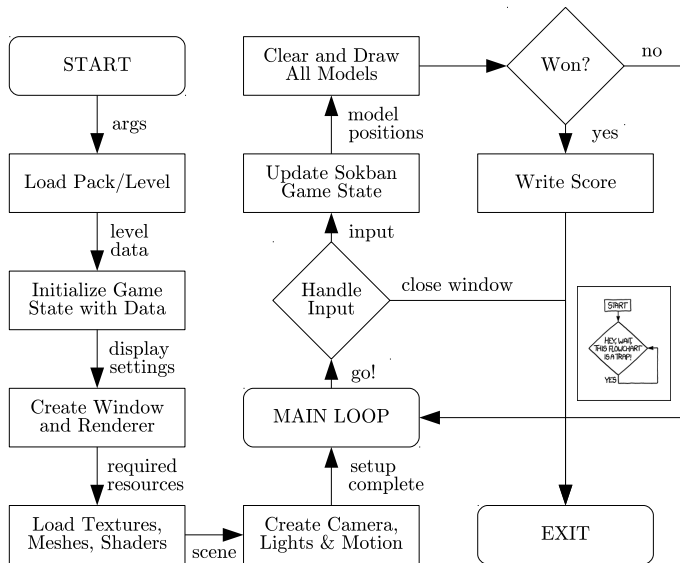


Figure 4: E.g. Easing Functions

Software Flowchart



The Conclusions

- Most requirements have been implemented
- Animation of objects haven't unfortunately
- *Results*: game is playable, needs some polish
- *Results*: runs on 8yr old hardware @ 60fps
- *Future*: load SOK file formats too?
- *Future*: graphical main menu?
- *Future*: dynamic shadows?
- *Future*: user interface?
- *Future*: sound effects?

Bibliography



Scott Lindhurst.

History, levels, and other implementations.

sneezingtiger.com/sokoban/docs.html, 1998.

Sokoban for the Macintosh Documentation.



Ingemar Ragnemalm.

Polygons feel no pain.

Bokakademin, 2008.