CG SS19
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Documentation
Melting Manfred
Submission 2
19.06.19

Implementation and features

1. Basic gameplay (11P) & Win/Lose Condition (3P)

You are playing Manfred the snowman. Move around and try to find Donald Trump's life-saving helicopter. You melt while walking around in the desert, so collect Ice to cool yourself down. Keep your distance from enemies like spiders or cactus. If your body temperature reaches 100 degree celsius, you will be nothing but air.

2. (Intuitive) Camera (2P)

To enable free camera movement, you have to set the 'free'-attribute in the settings.ini file to 'true'. The camera is the controlled as described in section 7.

The common setting is "false" which results in the camera following the main character with a fixed offset.

3. Moving objects (2P)

Our main character (the snowman) is loaded via Assimp and is supposed to be the main movable object. If free camera is set to false, the camera follows the character with a certain offset. Spiders and maybe our particle winds will be added for the presentation.

4. Texture Mapping (2P)

The textures are loaded via the stb_image loader class. The image data will be loaded to the texture units on the GPU.

5. Simple lighting and materials

We have a single light source in the game, which is the 'sun'. It is a directional light, being far far away and hitting all objects from the same direction (directly using the light direction vector 1,-1,1). The ambient, the diffuse and the specular part are being calculated (including material attributes) by the shaders (lightning.vert/frag) and the final color is returned.

We are also using Light maps and specular maps with a second light source on a single object, see section 12.

6. Cel Shading (4P)

In addition the simple static directional light, we implemented Cel shading. This is done by the toonShader, it maps the diffuse colors to 4 discrete shades and the specular part into 2 shades. It can be toggled by a hotkey. It is applied to every model except for the rock.

7. (Intuitive) Controls (2P)

Controls have been implemented via keyboard_callback and mouse_callback functions.

Key	Effect
W,A,S,D	Move the character/camera
Mouse	Move the camera (if free mode)
ESC	Close game
F2	Toggle FPS
F3	Toggle wire frame mode
F4	Toggle HUD
F5	Toggle Cel Shading
F6	Toggle a different diffuse map
F7	Toggle particle animation

8. Adjustable Parameters (1P)

In our settings.ini file, you are able to set all the parameters which are required. We used the INIReader.h class provided by the course to extract those information from the file.

9. PhysX (12P)

PhysX was implemented and is primarily used for spawning snowballs and controlling the snowballs. There are 2 fixed snowballs (and some more over the map) spawning right in front of the character to show the physics interaction.

10. HUD (4P)

We implemented a simple HUD using FreeType. For now, we display the body temperature of the main character as well as the fps. It can be toggled.

11. 3D Geometry (6P)

We are loading more complex 3D models using Assimp (e.g. our snowman, helicopter etc).

12. Lightmaps using seperate textures (8P)

Our rock right to the left consists of different textures. He has some diffuse and a specular one which is loaded into buffers and the applied to the model.

13. CPU Particle System (8P)

We implemented a particle system using instancing to create sand winds. It consists of 10000 small sand corns that are instantiated and drawn with a single glDrawElementsInstaced. We might animate the tornado for the presentation.

14. Hierarchical Animation (4P)

The Hat of our snowman is animated. It moves while walking (translate + rotate).

15. Specular map (4P)

Our rock is using a specular map (and more). There is a 2nd light source right above the spawn point of the snowman which is only used for the stone. The unique specular highlights faint red for better visibility. None of us did this in ECG and we need those points ;)

16. Documentation (1P)

You are reading it right now.

Additional libraries

GLM (mathematics library)

→ http://glm.g-truc.net/0.9.8/index.html

GLFW (OpenGL library)

→ http://www.glfw.org/

GLEW (extension loading library)

→ http://glew.sourceforge.net/

STB_IMAGE (image loader)

→ http://nothings.org/stb

ASSIMP (model loader)

→ http://assimp.sourceforge.net/

INIREADER (*.ini reader)

→ https://github.com/benhoyt/inih

NVIDIA PHYSX (physics library)

→ https://developer.nvidia.com/physx-sdk

GLAD (OpenGL loader)
→ https://github.com/Dav1dde/glad

FreeType (Font renderer)
→ https://www.freetype.org/

Sources

1. **Models**

Snowman: done with blender by ourselves
Cactus: done with blender by ourselves
Snowball: done with blender by ourselves
Helicopter: https://www.blendswap.com/blends/view/74349
Desert/World: https://www.blendswap.com/blends/view/74830

2. **Textures**

Sand:
https://www.google.at/search?sa=G&hl=en-AT&q=beach+sand+high+resolution&tbm=isch&tbs=simg:CAQSkAEJJ9N-sJBWrUsahAELEKjU2AQaAAwLELCMpwgaXwpdCAMSJdoHAtkH0QEOjgnkAgX9AtsH3inlJ9co6yfpN-012iHqJ-Ah6jcaMJdTaxO20woDj4KldVrIKVsvKoltiwDz3a85srVZYyGap1M21VEoMG9rOqXFUTeBZyAEDAsQjq7-CBoKCggIARIETTumRAw&ved=0ahUKEwjwysGeqYniAhVMdJoKHVbyCs0Qwg4IKygA&biw=1440&bih=821#imgrc=I9dMi5Co9PoKDM:
Snowman:
https://www.google.at/search?sa=G&hl=en-AT&q=ivory&tbm=isch&source=iu&ictx=1&tbs=simg:CAES3gEJxIXjx8-dl3Ma0gELELCMpwgaYQpfCAMSJ7ABtQGxAaQH7QK0AesF7gKMExDrJ9YoiCflJ9co0yfgIe01xiGeNxowP-Aw0c9CdtLAdsfxUqgrSVrUcchYWHpaqmWytTrUQvY38m0p8WLqbFfrF-0j0ChTIAQMCxCOrv4IGgoKCAgBEgR9_1g8UDAsQne3BCRpMChgKBWl2b3J52qWI9gMLCgkvbS8wZzIyeHMKGAoFYmVppZ2XapYj2AwsKCS9tLzAzaHpjcwoWCgNza3napYj2AwsKCS9tLzAxYnF2cAw&fir=N8AxfR6D9avsIM%253A%252Ch2LR28H8i1UdEM%252C_&vet=1&usg=AI4_-kRY-DsCx5_6TnvFxTrOe_0PQ3CE2A&ved=2ahUKEwjOlfzHqYniAhWKwcQBHeleCnoQ9QEwAnoECAUQBA#imgrc=8gxKA1noxd8IOM:&vet=1
Carotte:
https://www.google.at/search?q=carotte+texture&source=lnms&tbm=isch&sa=X&ved=0ahUKEwiUIqriqYniAhUxzqYKHRYlC8MQ_AUIDigB&biw=1440&bih=821#imgrc=ft_vRJrSQ1NJGM:
Hat:
https://www.google.at/search?biw=1440&bih=821&tbm=isch&sa=1&ei=dG3RXNWpLKnylwTP9Z7QAw&q=black+texture&oq=black+texture&gs_l=img.3..35i39j0l9.21780.22223

..22662...0.0..0.107.445.4j1......1....1..gws-wiz-img.......0i7i30.YJy2cTqJMkc#imgrc=VtQFmEfMgmmX6M:

Helicopter:

https://www.google.at/search?q=helicopter+texture&tbm=isch&source=iu&ictx=1&fir=CV7eUb5MS4IjwM%253A%252CVrj47S4Bvn8_KM%252C_&vet=1&usg=AI4_-kQTNEJChbThP43-exyUicu7vb-waQ&sa=X&ved=2ahUKEwjzn6z4qYniAhUL7KYKHUGlCPEQ9QEwAHoECAYQBA#imgrc=CV7eUb5MS4IjwM: