CSC 155 – Assignment #4

Spring 2023
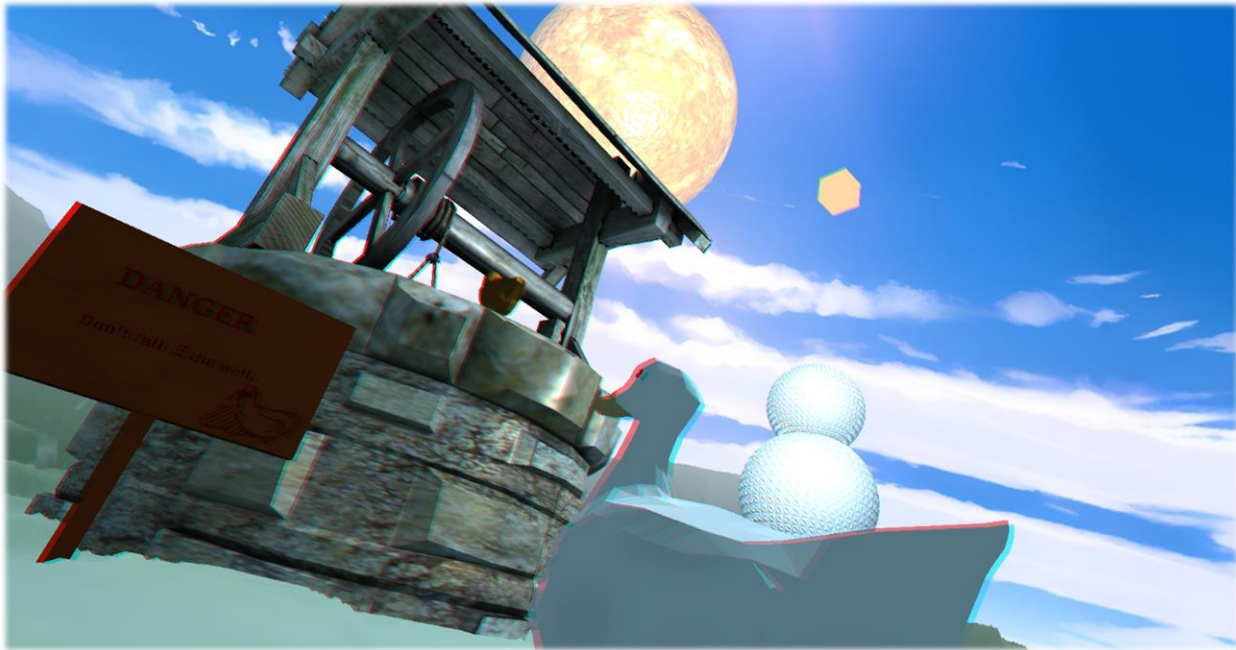**Student:** Ethan Ha | **Date:** 05-12-2023

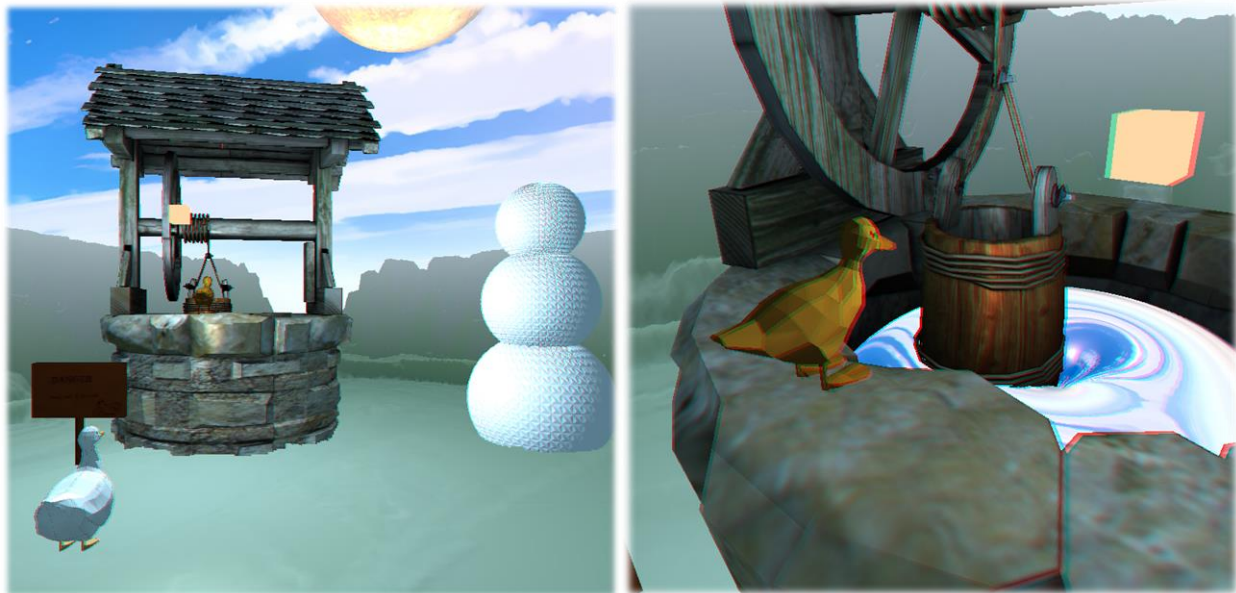- Screenshots:

Figure 1: Starting Camera View

Figure 2: Close-Up of Well with Env-Mapped Object

- Brief Description of Scene:

In winter, on a snowy terrain, a mother duck and its duckling visit an old well with a sign which displays the well as dangerous for ducks. Unknowingly to the mother, the duckling already went on top of the well. There is also a snowman on the right, left unfinished and a sun that looks bigger than usual.
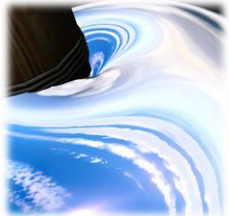
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- **List of which objects participate in shadow-mapping:**

  N/A, could not get shadow mapping to properly work for objects.

- **List of Five Features Implemented:**

  1. Bump/Normal Mapping
     - The Sun uses image-based normal mapping to create bumps aligned with its texture
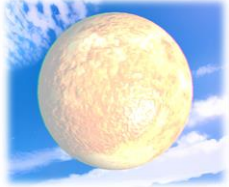
  2. Tessellation Shader with Height Mapping
     - Custom terrain tessellated with a height map, in which I made both
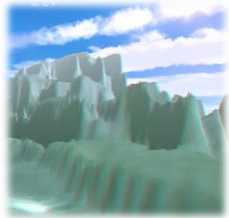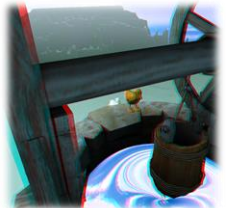
  3. Environmental Mapping
     - Object inside of well is env-mapped with skybox, to act like water (although solid)

  4. Geometry Addition Modification
     - Snowman on the right is created with geometry addition modification
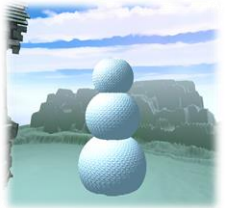
  5. Stereoscopic Anaglyph Render
     - Every single thing is rendered in red and cyan (tested with 3D glasses)

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- List of User Controls:
  KEYBOARD:
  Moving the Camera
  - o W = Move camera forward
  - o A = Move camera left
  - o S = Move camera backward
  - o D = Move camera right
  - o Q = Move camera upward
  - o E = Move camera downward
  - o UP ARROW = Pitch camera up
  - o LEFT ARROW = Turn/pan camera left
  - o DOWN ARROW = Pitch camera down
  - o RIGHT ARROW = Turn/pan camera right

  Moving the Light
  - o I = Move light forward
  - o J = Move light left
  - o K = Move light backward
  - o L = Move light right
  - o U = Move light upward
  - o O = Move light downward

  Other Controls
  - o SPACEBAR = Toggle world axes render ON or OFF
  - o F = Toggle positional light render ON or OFF
  - o G = Toggle 3D anaglyph filter render ON or OFF

  MOUSE CLICK AND DRAG:
  Moving the Light Horizontally
  - o LEFT OR RIGHT = Move light cube across X-axis
  - o FORWARD OR BACKWARD = Move light cube across Z-axis

  MOUSE WHEEL:
  Moving the Light Vertically
  - o UP = Moves light upward
  - o DOWN = Moves light cube downward

- List of Requirements NOT able to get fully working
  Only requirement NOT able to get fully working is Shadow Mapping.

- List of Features Implemented that went beyond assignment requirements
  N/A, none that I know of.

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- List of Assets Used (i.e., models, textures, normal maps, height maps, etc.), with citation and permission/licensing information about those sources
  (ALL ASSETS USED ARE FREE)

  ## CUBEMAP:
  - **XN.jpg, XP.jpg, YN.jpg, YP.jpg, ZN.jpg, ZP.jpg** = All images excerpted from AI Skybox generation at Blockade Labs ([Link to Website](#))

  > Licenses
  >
  > By using Skybox AI, you give Blockade Games, Inc. and 330AI Innovations, Inc. the ongoing permission to use any images you create with the tool for any purpose, including commercial and non-commercial use. This permission is perpetual, which means it lasts indefinitely, and non-exclusive, which means you still own the images and can use them yourself. This permission also allows us to improve our models and algorithms using the images you create, and to use the images for promotional materials, such as in social media or marketing campaigns.
  >
  > Skybox AI uses a modified version of Stable Diffusion. Stable Diffusion is open access and available to all, with a CreativeML OpenRAIL-M license further specifying rights and usage.
  >
  > The CreativeML OpenRAIL License specifies:
  >
  > You can't use the model to deliberately produce nor share illegal or harmful outputs or content.
  >
  > CompVis claims no rights on the outputs you generate, you are free to use them and are accountable for their use which must not go against the provisions set in the license. You may re-distribute the weights and use the model commercially and/or as a service. If you do, please be aware you have to include the same use restrictions as the ones in the license and share a copy of the CreativeML OpenRAIL-M to all your users (please read the license entirely and carefully).
  >
  > Please read the full license here:
  > https://huggingface.co/spaces/CompVis/stable-diffusion-license

  According to Stable Diffusion, CompVis allows free use of these generated image outputs.

  ## MODELS:
  - **well.obj** = Object file (No changes made) by [Glowbox 3D](#) on SketchFab ([Link to Creation](#))

  By [CC Attribution License](#), free to adapt and use as long as I give credit.

  > License: CC Attribution ⓘ Learn more
  > 🕐 Published 6 years ago

  - **duck.obj** = My creation through Blender
  - **duckling.obj** = My creation through Blender
 - **sign.obj** = My creation through Blender

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TEXTURES:

- o **blinn4_baseColor.jpg** = Used with well.obj, according to CC Attribution License mentioned previously, free to use with attribution
- o **sun.jpg** = From Solar System Scope (Link to Website)
  sun_normal.jpg = Created from sun.jpg using free online site NormalMap-Online (Link)

By CC Attribution License, free to use, adapt, and share for any purpose, even commercially.

> Credit
>
> Textures in this pack are based on NASA elevation and imagery data. Colors and shades of the textures are tuned according to true-color photos made by Messenger, Viking and Cassini spacecrafts, and, of course, the Hubble Space Telescope.
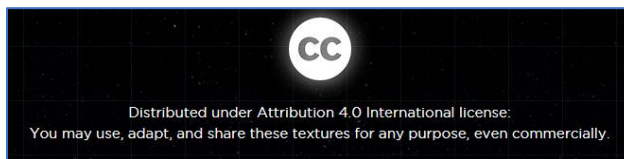
- o **terrain.jpg** = My creation through paint software
- o **terrain_bump.jpg** = My creation through paint software
- o **terrain_normal.jpg** = Created through free online site NormalMap-Online (Link)

> NormalMap-Online
>
> This website lets you create normal maps from height maps **for free**.
> All normal map textures you create are **your own**.
> Textures are **not** saved on the server and all scripts are running on your Browser.
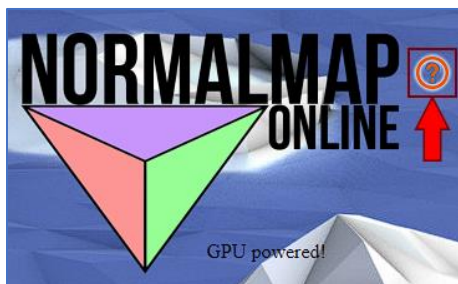
- o **duck_uv.png** = My creation through use of Blender UV export and paint software
- o **duckling_uv.png** = My creation through use of Blender UV export and paint software
- o **sign_uv.png** = My creation through use of Blender UV export and paint software

- The RVR-5029 (remote) machine used to test program
  Tested program in RVR-5029 machine, ECS-HALO.