cisc3660
game programming
fall 2012
lecture # I.5
virtual worlds

topics:

- introduction to virtual worlds in blender

references:

- Tutorials created by Prof Tim Hickey, Brandeis University, `http://www.cs.brandeis.edu/~tim`
  - `https://sites.google.com/site/blendergameprojects/game-tutorials/jenga`
  - `https://sites.google.com/site/blendergameprojects/game-tutorials/rube-goldberg`

jenga

- by Prof Tim Hickey

  > [This game] is similar to the Jenga game created by Leslie Scott in the early 1970's The goal of this game is help you learn how to move objects around in a 3D view in Blender and to help you become comfortable changing your view of the blender scene.

- Play this game by moving bricks from below the top level of the tower to its top.
- Move a brick by right-clicking on it, to **select** it.
  - This causes three arrows to appear.
  - Left-drag on the arrows to move the brick up/down, left/right, forward/backward.
  - Move it above the top of the tower.
  - Don't let it touch any other bricks, or they will "explode" (try it and see what happens...).
- Press the P-key to invoke the *Physics engine*. (ESC returns to blender mode)
- If the tower does not topple, you have survived the move.

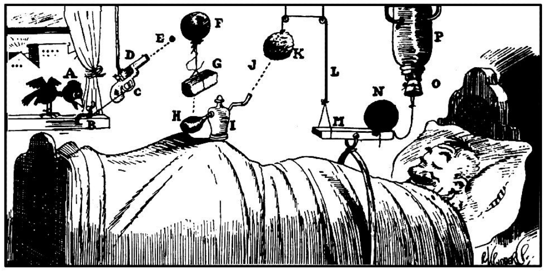
- Toggle to *full screen mode* by pressing Shift-space with the mouse in the 3D window.
- Change your view to find the best way to place a brick.
  Here are some methods to use:
  - **Zoom in on your brick**
    Right-click on a brick, then use the View menu to pick the "View Selected" menu item. This will zoom in to the brick you are focused on.
  - **Zoom in and out from your current view**
    Slide the MouseWheel to zoom in and out.
  - **Rotate your view**
    Drag with the Middle Mouse Button pressed (MMB-drag) and it will rotate the view
  - **Center your view**
    Hold the Shift-key and drag with the Middle Mouse Button pressed to center your view (Shift-MMB-drag)
  - **Focus the background**
    Select "View Persp/Ortho" from the view menu, to toggle between perspective and orthographic view
  - **View from front/back/left/right/top/bottom** Use the View menu to select a particular view (then Center the view and zoom as described above)

- If you have a keypad you can also use the numeric keys to change the view, play with hitting the buttons 1-9 to see what happens!
- You can fly a camera around the scene by selecting "Camera" from the View menu, hitting the P-key and then:
  - Use the arrow keys to move forward/back and left/right
  - Use W/S to move up/down
  - Use A/D to look left and right
  - Use Q/E to look up/down
- The **flying camera** is not a standard part of Blender. We have imported into the scene.
- The skybox is from `http://www.alusion-fr.com/an1ffa3.htm` and the author gives permission for others to use her creation (see the credits in the desertskybox folder).
- This game is licensed under the Creative Commons, non-commercial, attribution, share-alike license, though in truth it will only take you about 15 minutes at the most to recreate this from scratch (and is a good exercise) so you don't need this license!

virtual world

- Rube Goldberg machines (look at `http://www.rubegoldberg.com`)

Simple Alarm Clock



The early bird (**A**) arrives and catches worm (**B**), pulling string (**C**) and shooting off pistol (**D**). Bullet (**E**) busts balloon (**F**), dropping brick (**G**) on bulb (**H**) of atomizer (**I**) and shooting perfume (**J**) on sponge (**K**)–As sponge gains in weight, it lowers itself and pulls string (**L**), raising end of board (**M**)–Cannon ball (**N**) drops on nose of sleeping gentleman–String tied to cannon ball releases cork (**O**) of vacuum bottle (**P**) and ice water falls on sleeper's face to assist the cannon ball in its good work.

Rube Goldberg machine/game

- by Prof Tim Hickey

  The goal of this meta-game is to create a virtual world where there the falling ball starts off a cascade of events that lasts for a minute and travels across your virtual world.

- elements:
  - bricks
  - ball
  - flying camera
  - sky box
- flying camera controls:
  - use the arrow keys to move fwd/back and left/right
  - used W/S to move up and down
  - use A/D to look left/right
  - use Q/E to look up/down

- Extend your virtual world by **duplicating the objects (using Shift-D)**, then moving the mouse to drag the copy away and left click to drop it where you want it.
  - If you don't move the mouse the copy will sit on top of the original object and cause it to explode when you hit "P".
  - Use the 3D Manipulator (e.g., **G** for Grab/Transform) to move the objects.
- The ball and brick are **Rigid** bodies subject to gravity, while the floor is a **Static** object which just stays where ever you place it.
  - Use the **Physics** menu to change the type of physics applied to each object.
  - Note that the options in the Physics menu change depending on which Blender mode you are in (e.g., "Blender Game" vs "Blender Render"). You want to be in *Blender Game* mode.
- The materials for the ball and floor have high **elasticity** and so the ball bounces. The brick has no elasticity so it doesn't bounce at all when it falls.
  - Use the **Materials** menu to change the elasticity—look for the *Physics* section within Materials: check the Physics box, and set the Elasticity value to a number between 0 and 1—higher value means higher elasticity.

- You can create new objects besides the ball, brick, and floor. For this meta-game you should only **Link** in objects or duplicate existing objects. Don't create new objects directly in this blender file. The purpose of this meta-game is to show you how to work with linked objects.
  - Create a new blender file and put a new object in it.
  - Make sure that the object's position is $(0, 0, 0)$, which will make it more convenient when you link this object to your main blender file.
  - Edit the material and physics properties of your object.
  - Prepare the object to be linked by modifying the **Add to Group** section of the object properties.
    - ∗ Click on the plus (+) sign to the right of "Add to Group".
    - ∗ Give your object group a name.
  - Save your blender file.
  - To link this to your main blender file:
    - ∗ Open your main blender file.
    - ∗ Click on **File - Link** and select the blender file for your new object, then click on the "Group" folder and select your object's group, then click on **Link/Append from Library**. Now you should see this new object in your main blender 3D View.

- With linked objects, when you change the properties in that object's blender file, the changes will appear in the blender files in which the object is linked.
  - Open the linked object blend files (e.g., brick.blend) in the example code.
  - Change the material color (or some other feature) and save it.
  - Re-open your main blender file and you will see that the object(s) will have changed.
  - This process is called **modularization**, where all the details about the linked in object are stored in a separate file (and in fact you can't change the color of the bricks in this file directly!).
  - This is like modifying the properties in a **class** definition in a Java or C++ program—then all the instantiated objects of that class will assume the new properties.