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COSC3P98 Final Project:
"Worker Robot's Respite"

Story

The year is 2300. Human society has advanced to utopian bliss after solving all the issues that plagued its existence, from world hunger to climate change. Automated robots serve at the whims of their fleshy overlords, whether it's farming, construction, resource gathering… and officework. And officework might just be the most insurmountably boring task that robotkind has encountered so far.

Follow a short moment in the life of local office 'droid MT-F06AD7, as it fights oppressive boredom and comes out on top.

Background

The whole project was started from an idea I had for a different course, VISA 2P96: computer animation. For that course, students were required to make a "show reel shot" that demonstrated most of the techniques they learned throughout the semester. The core idea used in this project – a robotic figure dropping down onto a chair – was reused but owing to the larger development time for the COSC 3P98 version, the scope is quite a bit bigger.

For starters, the VISA 2P96 version ended up being far simpler; I always intended for the robot to animate and sit down in the chair, but project deadlines ended up with the VISA 2P96 version lacking almost any sort of animation. That version has an animated camera that panned around a basic scene, and a skeleton-rigged robot that could move (not well; more on that detailed below), but the robot itself did not move. I only had the animated camera and a barebones-rigged robot to demonstrate that I knew how to work the software, then.

Another point at which the versions diverge is that the VISA version only shows what would become the second scene in the COSC version: the beach area with the umbrella table. Part of this is some limitations on the grading rubric, as stuff I had already made for a different course would not count towards this one. Thus, I wanted to put my skills to use in modelling and create entirely new assets for this course, and the most obvious question to ask at the time was "what story can I tell that leads up to the robot dropping down into a chair at the beach?"

Software used:

Autodesk Maya
Used for: Modelling, rigging, UV mapping, animation, lighting, rendering

Maya is the software that I was taught how to use in VISA2P96, so it wouldn't make much sense to relearn my 3D modelling, texturing, animating, etc. skills just for this final project. I did briefly consider Blender, as it's free and the software I will most likely use after my license for Maya runs out, but decided against it. Maya is great for all its versatile 3D graphics applications all in one spot, though it does come with the caveat that it's quite complicated at face value; lots of buttons and options to look through to find the one that users really need.

Paint.net
Used for: Texture creation

Paint.net doesn't have as high of a billing as the other programs I used, but as I still used it in some capacity (drawing the textures for the robot in VISA 2P96 and the office desk), it still deserves a mention. Paint.net is free and I have been using it for at least a decade by now; the program is great for image editing, especially for those who are looking for something comparable to an expansion on the kind of "pixel by pixel" approach that the older versions of MS Paint does.

OpenShot Video Editor
Used for: Video editing

Normally when I edit videos for recreational purposes, my software of choice is Windows 10's built in application "Video Editor". The drag-and-drop type interface and basic features make very basic videos easy and quick to create, but for this project, that would not be sufficient for a majority of the short film, as I needed tools that were more robust than Video Editor's very simplified capabilities.

Audacity
Used for: Sound recording and editing

I'm not so sure about later versions of Audacity, as I have heard rumors of malware being added to it, but older versions of it are a great, free, simple-to-use software for audio recording and editing.

Creating and Animating the Robot:

- Sculpting, UV Mapping, Texturing: Pre-made
- Rigging: Made specifically for this animation

The Robot was the first thing conceptualized for this project, with everything else following in suit. Like many other objects in this animation, it was something born by the constraints of the marking scheme.

The VISA 2P96 guidelines for the showreel project allowed students leeway in what course information they wanted to demonstrate in their project. With this in mind, I wanted to demonstrate my skill in rigging a model with a wide range of animation, but I did not want to make an organic human model as that was one of my weaker points. As a result, the robot was made: something that could be rigged with a human-like skeleton, but was not an organic model owing to its blocky shape.

In designing it, I aimed for a very classical approach on what a robot might look like. The blocky, mostly-square, sharp-edged appearance aims to help establish that immediate "oh, it's a robot" kind of reaction the moment that it appears onscreen, but this is most prominent with the ball-tipped head antenna it has; it's almost distant to the rest of the silhouette, is colored differently from most of its surroundings, and is visible from almost every angle, helping establish that immediate recognizability.

After the robot was made, the question became "what should the robot do?" One of the first things I thought of was it walking very stiffly towards a chair, pivoting around on the spot to aim its back towards said chair, before letting itself flop down very unceremoniously and un-robotically onto the chair. The sudden contrast between stiff, robotic movements, and fluid organic movements is something I found very appealing when imagining it in my head, and served almost like a "punchline" to the animation when it was first conceived for VISA 2P96.

Initial pose   Step forward   Limbs snap back
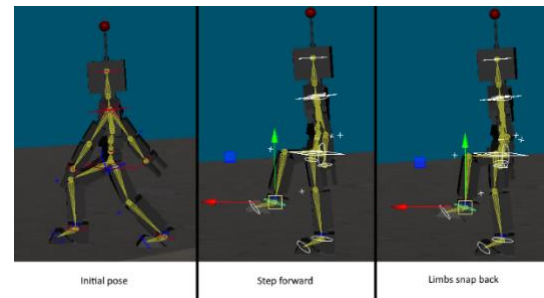
To help sell the effect, I went for a very stiff, robotic animation style, but also had the robot's limbs "snap back" when performing its stiff, sudden movements, in a manner that might be reminiscent of factory assembly line machinery's arms.

Of course, staying true to said punchline did pose some challenges later down the line, when I expanded it for COSC 3P98. To preserve the joke, I would need to make the robot animate very stiffly up until it finally dropped into the chair. Originally I was planning to have it jump with surprise when the alarm came on, but that got scrapped after I thought it through.
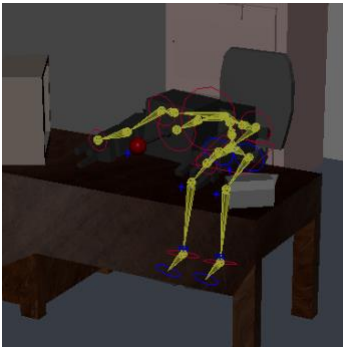
Another issue lies in how the model was originally rigged. When I first made it, I used Maya's fast "auto-rig" option to quickly generate a skeleton for the robot. Because it didn't get any actual animation come the final version of that model for VISA 2P96, I didn't notice a glaring flaw in it: the auto-rig algorithm built the skeleton onto the robot backwards, resulting in legs that bent in unnatural ways, most noticeably when it crouched or sat. This required I rebuild the robot's skeleton, this time manually – and this time I paid more attention to the skeleton's shape, with the -skeleton's joints now being far closer to where the cubic joints of the model are.

Modelling the Scene

Beach Scene:

- Pre-made objects: Table, cup, bottle, chair
- Sourced objects:
    - Sand texture from: https://www.textures.com/download/SoilSand0200/51849

The beach scene was originally the only scene planned to be made. At the time, it couldn't have even really be described as a beach; the floor was untextured and there was no real semblance of a sky, so it was sort of only a table and a chair placed on a floating rectangle in an empty void. Making the location seem more like a location in the real world was an obvious step to take. Adding a sandy ground was trivial enough, sourcing a sand texture from the link above and applying it onto the aforementioned floating rectangle. The sky backdrop is only a little trickier, for getting the color right with the lighting; it uses no texture, instead opting for a single-color material defined in Maya.
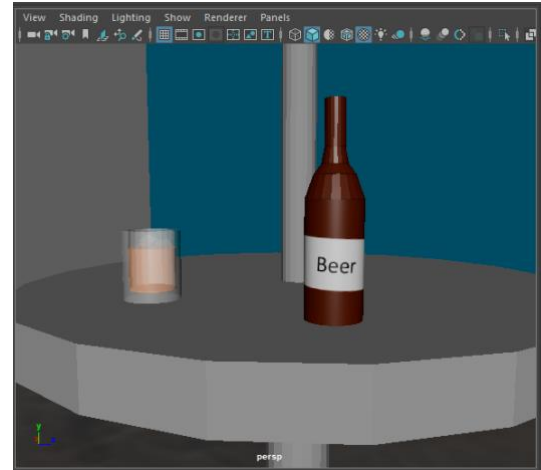
Office Scene:

- Objects made specifically for this animation: Computer, clock, paper, chair, filing cabinet, desk (modelling and UV rigging only)
- Sourced objects:
    - Office desk wood texture from: https://www.textures.com/download/PBR0961/140859

The background of this scene was effectively built from scratch once I started working on the project, unlike the aforementioned beach scene. The supposedly indoor area allowed me to do some lighting effects that wouldn't really be possible for an outdoors scene like the beach, i.e. the two-point lighting as seen on the image to the right. One spotlight-type light illuminates the whole area to make much of the office visible, and a second one – positioned at a different angle to the first – highlights the area of focus (in this case, the robot's immediate surroundings) to draw the viewer's eyes there and make shadows

appear more visually interesting, from how they come from two different directions. I quite like the "cartoony-looking" hard border to the edge of the wide light; I think it helps establish the silly tone of this world's universe to the viewer before anything within it even moves.

Because of the way my workflow is, I did lighting after modelling the scene, and wasn't sure how wide of a camera angle I'd have at the time I was building the space – so as a contingency plan, the office is actually quite a bit bigger than what the light reveals. I did at one point plan on using this extra space by having the robot simply walk out of the office and having the camera follow it, but that got scrapped by the final product; the robot would already be walking for the second scene. Having the robot fly away via a jet engine would be a lot more creative, in addition to being another action that is very typically robotic in nature.

Video Editing

For most of this project, working in a spontaneous fashion with little pre-planning was the method I found easiest, but I did have some things I had in mind to do once I got to the video editing phase. Initially, I only planned to use OpenShot for a fade-to-black transition between the two different locations and to add audio, but as I worked I noticed issues appearing that would necessitate being fixed in the video editor.

The most immediately noticeable error was that, when I finished editing the animations, I found that for some reason animations played twice as fast in the preview versus how fast they played when in the rendered playblast that Maya produced. The result of this was that the output video files that Maya made had animations that were slower than they should have been. Fixing this in OpenShot was simple enough; right click the video clip in the timeline, then adjust the playback speed until it looked suitable.

Another issue existed in how, for some reason, the robot's skeleton manipulators were moving between keyframes in ways that I did not intend; mostly small movements like slowly rotating body parts, but not too small to be unnoticeable. I attempted to fix this within Maya by adding more keyframes intended to keep the rotating body parts still and setting the motion to be linear, but this didn't work for reasons I'm not sure of, so I resolved to fix this in the editing phase instead, something that was only feasible because all the scenes where this error happened were supposed to be entirely static. To make those static scenes such, I used a function in OpenShot that saved a selected frame of the animation as a .png image file, cut out the clip of video where the movement error happened, then inserted the saved image file such that it took up the duration of the clip's length.
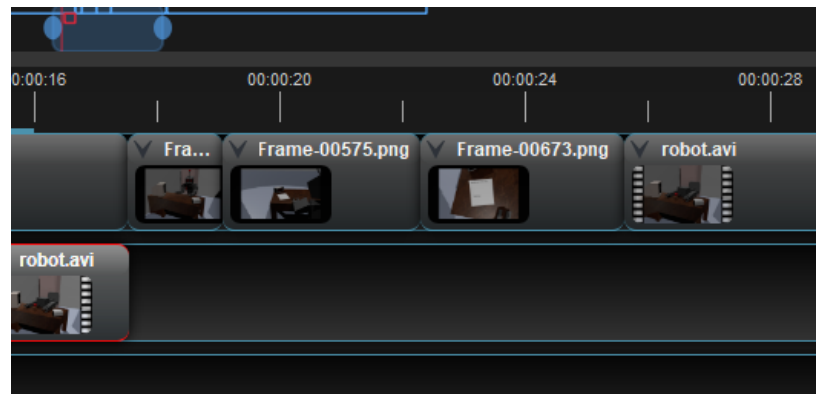
Audio Editing

- Sourced audio files:
  - *OFFICE NOISES* by "myNoise • Focus • Relax • Sleep"
  - *10 Hours of alarm clock* (2016) by "Sunville Sounds"
  - *Robot Arm SOUND EFFECT* (2015) by "BerlinAtmospheres"
  - *NASA Space Shuttle Rocket Launch Sound Effect* (2014) by "SoundEffectsFactory"
  - *Tropical Beach Ambience on a Island in Thailand* by "Relaxing Soundzzz"

Adding audio was one of the last things I did for this project, and one of the lower-priority items as this course was a computer graphics course rather than a computer audio course, but something I still took care in to considering. Some elements of this short video, such as the robot being woken up by the clock on its desk, could only be portrayed through audio.

One element I planned to use was having the robot speak, using automated text-to-speech programs in order to do so – robots are often imagined to sound robotic, after all. I was able to use Audacity to record the text-to-speech output of Google Translate in English, but something just did not sound right about how it pronounced words; perhaps it sounded too enthusiastic, where I was imagining the robot to sound very deadpan and unenthused for how it spends its life at work? In any case, I did not go through with giving the robot a voice and instead opted more for a "show, don't tell" approach and directed my efforts moreso towards the other audio design elements present.

I also planned to have the robot make robotic sounds whenever it moved its limbs, but I wasn't able to find the precise kind of sound effect I wanted. This was something I could overcome, though; to add sound effects for this, I used the *Robot Arm SOUND EFFECT* audio, but with some modifications done in Audacity. The sound effect used in the animation has some of the middle parts cut out to shorten the duration of the sound, as its full length is too long to be used for most of the robot's movements. It's also played mildly faster, increasing the pitch of the sound and making it more fitting for a smaller machine, rather than a large one that one might imagine with the original audio; though some of the robot's slower movements use a slowed version of the effect. I used a similar technique to adjust the rocket launch sound effect when the robot leaves the office; the original audio is far too long for the robot's launch, so I cut what wasn't necessary and used Audacity's "fade out" effect to indicate that the robot was getting far from the camera after it went offscreen.