Open Source Animation: DIY Motion Capture
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Wed. 09:30am–12:00pm in 406

Description: This class will use open-source software to solve interesting problems in animation, with a focus on integrating depth, motion-capture, and other kinds of live performance data into traditional film production workflows. We'll pay special attention to the Kinect, which (among other things) is the first motion capture system ever sold at Best Buy--but in order to fully realize its promise for our purposes, we'll have to get it talking to mature commercial animation software like After Effects and Maya. If the tools we need don't already exist, then we'll need to write our own. The end product of the class will be a complete animated short film and the software tools that help realize it--you can explore anything from pure visual music to narrative character puppetry. Our initial exercises will use After Effects, JavaScript, and Processing, but we can explore many other options depending on student interests. It'd be helpful to start the class with either some prior filmmaking or programming experience--but you don't necessarily need to know anything about 3D CG to do cool stuff with motion capture.

1. Review how a computer works with image and sound. Discuss the stages of production and workflow; software design and interface metaphors; advantages and disadvantages of procedural animation; montage and narrative structure. Review Processing, introduce After Effects and "Expressions," After Effects' JavaScript-based scripting language.

2. Discuss strategies for moving assets and control data between applications. Import assets into After Effects and demonstrate cutout character animation techniques. Introduce the Kinect and record mocap data for use in Processing and After Effects. Demonstrate how Expressions can be used to manipulate mocap data after it's imported into After Effects.

Assignment 1, Test Drive: Create an experiment using one or more techniques discussed in class.

3. Review the Kinect and further explore the mocap process, showing how Processing can be used to generate After Effects keyframe data. In After Effects, explore strategies for organizing layers, including precomps, proxies, and parenting. Demonstrate how Expressions, audio volume level, and the Time Remap feature can be used to control playback.

4. Introduce cameras in After Effects and Processing. Discuss the challenges in coordinating camera movements across programs. Demonstrate lights, shadows, parallax backgrounds, and After Effects' Mocha matchmove utility. Discuss export scenarios in various animation programs and common pitfalls. Experiment with realtime camera control.

Assignment 2, Visual Music: Create an abstract animation timed to sound. One approach is to begin by designing simple elements in Photoshop, then steadily build up a library of compositions. Experiment with rhythm, motion, repetition, and color choices that complement your music selection.

5. Explore techniques for drawing images with mocap and other controller data (for example, Wiimote, Wacom tablet, Razer, Android phones). Discuss OSC and its applications. Discuss motion capture's relation to rotoscoping; consider applications in classical animation and vfx. Introduce Flash as an alternative production tool, and demonstrate ActionScript examples.

6. Explore ways to build complex 2.5D or 3D environments and combine them with various camera techniques. Discuss the potential challenges of realizing a complete model of the environment, and find ways to fix this by planning out shots based on the camera's point of view. Review using external JavaScript scripts in After Effects (bypassing the Expressions GUI).

Assignment 3, Rotoscoping: Film or appropriate a clip with a live actor to use as a basis for rotoscoping or motion capture. Animate a character based on the actor's performance. If you're filming your own footage and are feeling ambitious, try getting a background plate and replacing your actor in the scene. You'll need to lock down the camera if you aren't ready to experiment with match-moving.

7. Overview of 3D CG animation. Discuss alternatives to traditional 3D modeling, such as scanning or using 2.5D cards in a full 3D environment. Demonstrate OpenGL shaders and how they can be modified to work with different apps or environments. Introduce Unity as an alternative production tool, and demonstrate JavaScript examples.

Assignment 4, Rube Goldberg Machine: Create an extremely complex machine to accomplish a simple task, and navigate through it with an unbroken tracking shot using a virtual camera. Any combination of animation and live-action elements can be used, as long as the primary camera movement is animated. (Try to cheat. When you're planning your shots, build in moments where you can cut without the audience noticing.)

8. Review the stages of production and discuss the challenges of pre-production. Briefly discuss screenplay formatting and approaches to creating storyboards. Discuss the uses of dedicated video editing programs (like Final Cut or Premiere); explain why they're still an important organizational tool even for non-traditional projects.

Assignment 5, Screenplay and Storyboards: Write a screenplay, if your film involves dialogue. Create a set of storyboards, scanned and ready to use in an animatic. Remember that storyboards are practical tools; they don't need to be works of art, but they have to unambiguously communicate what's going on in each shot. (Pay special attention to distinguishing your characters from each other.)

9. Review sound editing strategies, methods of moving data and assets between programs. Discuss the stages of audio production, and demonstrate some essential audio editing techniques. Introduce Max/MSP/Jitter as an alternative production tool.

Assignment 6, Voice Track and Animatic: Record your voice actors and any other sound elements that will be critical to sync, and cut your storyboards to the sound in Final Cut. Getting a clean, usable voice recording is easier than ever with current technology, but it's absolutely essential to get right. Be careful!

10. Discuss the technical challenges of distribution, including legacy anamorphic formats, changing broadcast standards, and festival exhibition. Class discussion of project workflows, identifying potential pitfalls.

Assignment 7, Rough Animation: Create a complete rough animation based on your animatic, concentrating on broad strokes and large character movements.

11. Review projects in progress; explore topics of interest suggested by students. Lab time, with individual assistance.

Assignment 8, Sound Mix: Rough animation with finished sync sound track. A little extra detail invested in your sound effects can have a disproportionately great payoff in the emotional impact of your film.

12. Review projects in progress; explore topics of interest suggested by students. Lab time, with individual assistance.

Assignment 9, Fine Animation: Do a detailed last pass over the project, looking to correct mistakes, tweak effects and colors, and improve character performances.

13. Review projects in progress; discuss any technical difficulties that remain. Lab time, with individual assistance.

14. Class critique of final projects.