Team Teaching Animation Art and Technology

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Abstract

In this paper we report on an interdisciplinary course, "Animation Art and Technology," which we have taught for the past two years at Carnegie Mellon University. Faculty and teaching assistants from computer science and art teach the class as a team and the students are an interdisciplinary mix. This class is a project-based course in which teams of students produce 4-5 animations. Most of the animations have a substantive technical component and the students are challenged to consider innovation with content to be equal with the technical. In this paper, we describe the structure of the class and assess the elements that have worked well and those that require improvement.

1 Introduction

A challenging gap in undergraduate curricula divides content development and visual realization of animation and the development of the technical components necessary to produce them. We report on our attempt to bridge this gap with an interdisciplinary course entitled "Animation Art and Technology." We have taught this class for the past two years at Carnegie Mellon University. The course is team taught by faculty and teaching assistants from both art and computer science. The class is cross-listed between the two departments and enrollment is approximately equally divided between the School of Computer Science and the College of Fine Arts. The class is project based and results in 4-5 animations created by interdisciplinary teams of 5-6 students each (Figure 1). Each animation should be artistically solid and contain a substantive technical component.

Our objective in creating this course is first to provide the students in each major with the opportunity to learn about and gain a greater appreciation for the skills of the students majoring in the other discipline. A number of the computer science students have also found the class to be an enjoyable outlet for artistic inclinations that they would not normally be able to exercise in computer science classes. Some of the art students took advantage of the technical tools included with Maya or created by their computer science classmates. Additionally, this class provided students with the opportunity to work in a team-oriented production environment, mirroring the project scheduling and completion constraints that they will encounter in commercial production.

Over the past two years, we have discovered a number of elements that are critical to the success of this class. First, neither of us could teach this class alone. Like the students, we depend on the expertise from the other side of the "cultural divide." We have also found it essential to have the students work together early in the semester so that they begin to understand the talents that their colleagues bring to the project. The technical components of the projects must be defined early, and introductory assignments in Maya are essential in creating a common base of expertise.

In the remainder of this paper, we describe the structure of the course, reflect on elements that worked well and discuss the elements that require improvement.

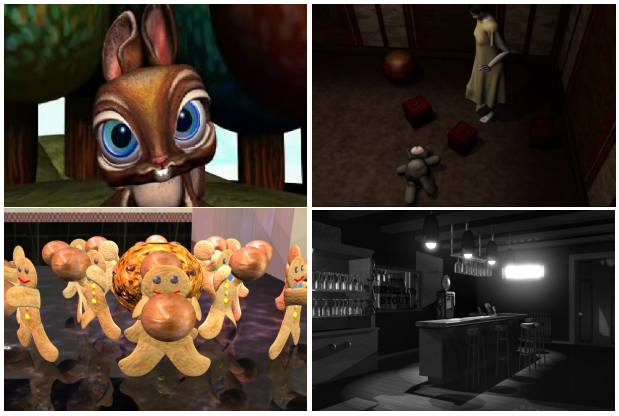

Figure 1: Frames from four of the nine animations produced in the class over the past two years. The upper left corner shows a frame from "Turtle Hill," a fable about a turtle who eliminates pesky rabbits from his meadow. The upper right image shows a frame from the animation "A012" about the inner life of a woman in a mental institution. The lower left corner pictures a scene from a campy musical where pastries come to life. The final image shows the bar scene from a robot detective story.

2 Structure of the Class

The class met six hours/week in a studio format. Although the class hours were an unexpected burden for the computer science students who were accustomed to three hours of class time/week for each class, the additional time in class had a number of benefits. It provided time for the teams to meet together without the scheduling conflicts that normally plague undergraduate teams. The longer class also allowed the instructors and the technical teaching assistant to assist students struggling with the difficulties of animating and modeling in Maya.

We began each class by showing one or two short animations. The nature of these animations changed throughout the semester. At the beginning of the semester, we selected animations such as TRANSIT by Piet Kroon, 1997, BALANCE by the Lauensteins, 1989, and THE STREET by Carolyn Leaf, 1976. We hoped these would encourage students to think more broadly about this art form. After students had selected their projects, we looked first for appropriate reference footage for each selection and then as the projects progressed, for animations that addressed similar problems to those that each team was facing. For example, for an animation that included an animated character of a small scale closely interacting physical objects in the real world (Figure 2), we showed clips from *Stuart Little* where the mouse interacted with objects in the real world. For an animation that was rendered in a film noir, black and white style (Figure 1), we viewed black and white animations that succeeded in lighting the scenes to distinguish characters from the background. Several students commented on the value of these animations in their evaluation reports.

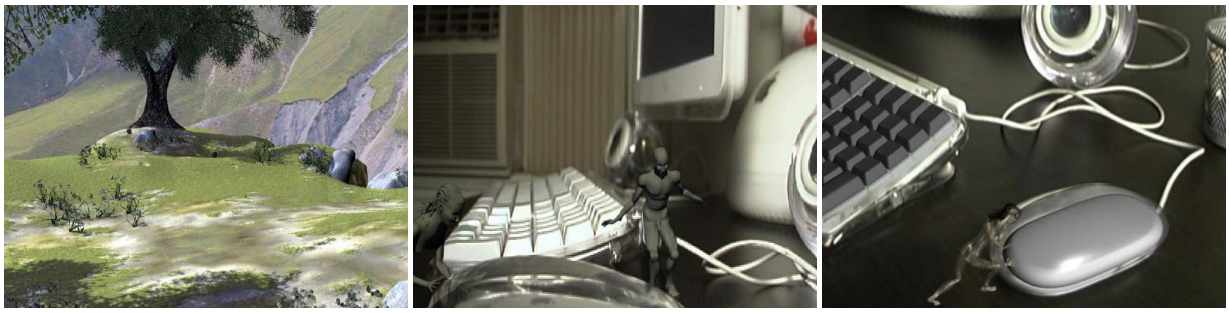

Figure 2: Several frames from an animation, "Id Vita Mortalis." It portrays an exit from Eden in which a male and female character interact extensively with physical objects filmed on videotape. The movement of the characters were motion captured and set up to interact with three-dimensional models of the mouse and keyboard. The models were used to create the transparency of the mouse cover and to bend the shadows of the virtual characters appropriately.

The first class assignment was to pitch a storyboard. Students worked independently to prepare drawings, photographs, and web art to visualize and explain their ideas. Each storyboard was required to propose a substantive technical contribution in addition to a unique idea for a projected two-minute animation. After the storyboard presentations, students voted (five votes/student) to move approximately half of the storyboards forward for further development. We then assigned teams of two students to refine each of the selected storyboards. These pairings were interdisciplinary and served to get the students from each major working together early in the semester. The refined storyboards were pitched to the class. The pitches this time could include not just storyboards but also experiments with the technical element and other evidence that supported both the technical and conceptual idea. The students voted again to select five final projects and ranked them in order of their willingness to work on a given project. The faculty then used these rankings to create teams. Although this assignment problem might seem difficult, we have been able to accommodate each student's first or second choice while maintaining a reasonable balance of skills on each team. The pitches and voting served to show students how their preliminary ideas could be refined and created a sense of commitment for the selected projects.

While the storyboard refinement and selection process was ongoing, students completed two short assignments: either to learn Maya (the computer science students) or to improve their skills (the art students). The first assignment was animating, mapping, and rendering with reflections and particles a simple sequence. The second was to model, animate, and render a sequence with a hierarchical character. These projects gave students a good idea of the pipeline for completing work. As the final teams were assembled, the students completed a third introductory assignment: either to use one of Maya's packages for fur, fluids, or cloth to create an animated sequence or to implement a plug-in to Maya that made a specific technical contribution to their animation. Allowing this third assignment to feed into the term projects was key and greatly strengthened the technical elements of the final pieces.

After selecting the teams to balance the skill sets of the members, we did not dictate the roles that team members should play. This decision had advantages. Students could gravitate toward the tasks that they wanted to try rather than being pigeon-holed as a "painter" or "coder." This decision, however, resulted in an environment that did not accurately mimic a commercial production environment. In a few cases, teams allowed a student to undertake a role that he or she was not adequately prepared for and that element was left incomplete or implemented poorly.

Music, of course, is an essential element of almost every animation. We brought in music composition students to become involved with the construction of music for the sound tracks. This involvement also provided the students with access to musicians and audio recording studios in the Music School. Although the composing of music for each piece created scheduling problems because the final timing was not set until near the end of the semester, the value of owning the rights to the music compensated for those problems.

Each animation was required to have a technical contribution. Some projects such as "Indelible" have managed this very successfully. In this animation, a non-photorealistic rendering style was developed by the computer science students to create a look that resembled many layers of small pieces of tissue paper (Figure 3). The animation was created in Adobe Illustrator, and the resulting lines were imported into Maya and processed to automatically place the tissue paper pieces. The animator in charge of rendering had control over the size and number of the pieces. Other successful technical elements included particle effects, grouping behaviors, clothing, fur, and substantial use of motion capture data.

We critiqued the projects each week. The critiques alternated between full-class participation and meetings between individual groups and the faculty. The class critiques were graded and the groups were provided with substantial written feedback. The concept of critiques was not familiar to the computer science students. We held a brief discussion and distributed articles so that students could familiarize themselves with the critique process; however, we need to do more to introduce this concept, gently, to the computer science students. We plan to do this early in the semester via a formal critique of a piece created by an animator outside the class as well as providing more reading material such as Whittington [2003].

3 Possible Improvements

Although each student pitched a project, only one project from a computer science student was selected each semester while three or four projects from art students were chosen. We suspect that this imbalance occurs because art students have more experience developing and presenting ideas and the skills to assemble a more refined presentation. The next time that we offer the class, we plan to provide additional support so the likelihood that a project from a computer science student is selected increases.

The selection process for the projects may tend to push the projects toward the lowest common denominator. A truly unusual piece is not likely to have sufficiently universal appeal to be selected while a plot rife with stereotypical elements or a piece with low-brow humor may play well in an initial pitch. Nonetheless, two of the pieces selected in Fall 2003 dealt with difficult topics: child abuse and the inner life of a patient in a mental institution.

Like all team projects implemented in academia and elsewhere,

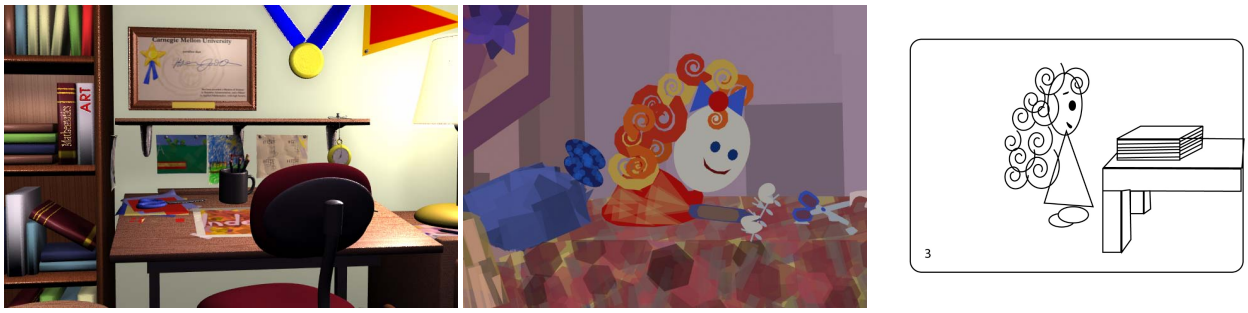

Figure 3: Two frames from an animation, “Indelible,” in which a young girl studies hard through grade school, high school, college, and graduate school only to discover that her inner artistic talents still need an outlet. The lead-in to the animation was created using three-dimensional models of the girl and her desk while the body of the animation was rendered using the non-photorealistic rendering shown in the middle image. The intention was to create a look that resembled layers of tissue paper torn to create the animated shapes. The final image shows a frame from the original storyboard. Although many elements of the story changed during production, the style of the girl and her hair remained.

production schedules tend to slip. We regard the need to produce a real product, on time, to be one of the most valuable lessons for the students in the class. However, regardless of how frequently we recommended and even insisted that students begin animating on schedule and test render early, they did not. We think a guest lecture from a person working in industry on work flow would help to drive this message home.

The team nature of the course allows students to accomplish projects of larger scope and has given them examples for their demo reel that they could not have created individually. Team projects, however, also create complications, as was discussed in an educator’s panel at SIGGRAPH 2003 [Perry et al. 2003]. Potential employers must now determine to what extent a student is actually responsible for an individual element.

Finally, we have discovered that it is often difficult to devise a technical contribution that can be completed early enough in the semester to allow time for it to be used in an animation. In part Maya is to blame because it now contains many of the most useful technical advances and they have become a standard part of the animator’s repertoire. We suspect that this problem will be ongoing, but we plan to add a lecture early in the semester that shows a variety of possible technical contributions and modifications. We hope that this will seed the students’ thinking as they develop their initial storyboard pitches.

In summary, we believe that this class provides a valuable opportunity for students from the engineering side and the art side of our campus to work together and to learn to respect the talents of their fellow students. We expect that this experience will help them in production environments and in life, where they must necessarily understand and support the talents and limitations of their colleagues with other skill sets.

4 Acknowledgments

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