Abstract:

Jean-Marc Gauthier is director of the new animation and digital arts Master of Fine Arts program for New York University Tisch School of the Arts Asia, located in Singapore. He will talk about the program curriculum, covering traditional animation, interactive animation, gaming, and motion studies applied to design. Animation and digital arts students are immersed in a unique and creative environment that teaches traditional forms of the art of animation and explores a sandbox of advanced and digital technologies. The presentation will cover “Life motion Analysis: ways to visualize motion from real life”, an example of collaborative work based on motion capture and designed for people from different disciplines. Jean-Marc will discuss interactive animation projects developed in class, figure 1, and how actors, dancers, storytellers, film makers, animators and others can bring invaluable depth to what can be produced.

Keywords: Asia, Singapore, animation program, motion capture, digital arts, collaborative work, storytelling

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1 Animation and Digital Arts MFA Program (ANDA), NYU Tisch School of the Arts Asia, Singapore

Tisch School of the Arts Asia offers a MFA program in Animation and Digital Arts in Singapore. Students, upon completion of the course, earn a Master of Fine Arts in animation and digital arts from NYU. For more than 40 years, NYU Tisch School of the Arts has been a leading center of study in the performing and cinematic arts. The tradition proudly continues at NYU Tisch School of the Arts, NYU's first branch campus abroad. Tisch Asia, Singapore's first graduate arts school-opened in Singapore in Fall 2007. MFA degrees in animation and digital arts, dramatic writing, and film production are offered. Professional workshops and non-credit courses are also available. The 40,000-square-foot educational center was renovated in 2007 to feature sound stages, animation studios, a writing center, two raked 50-seat theatres with 35 mm/video projection, computer workstations, foley rooms, editing labs, a motion capture lab and a script/film library.

1.1 Presentation of ANDA

Artists, designers and creators come to ANDA for learning and researching content, stories and the new audiences that will shape the future. The Asian market is becoming a leader in the areas of design, animation, gaming and digital media and has the capacity to bypass North America's dominance in terms of entertainment production, distribution, internet, telecom networks. The Animation and Digital Arts MFA program is designed for the Asian artistic scene. ANDA offers opportunities for artists, designers and professionals to immerse themselves into a multicultural environment in order to understand emerging ideas and professional opportunities from a fast developing world that we don’t know very well. The animation program, is based in great part on the study of motion. From capturing the motion of a dancer to animating facial expressions following a human voice, students explore ways to re-create motion.
and to create relationships through storytelling. ANDA also recognizes that the boundaries between traditional artistic disciplines (painting, sculpting, dance, architecture) and digital arts (interactive technology, animation, programming, design, storytelling, interactive media, gaming, advertising and on-line communities) are becoming more blurry.

1.2 Who are the students?
Students from the program come from many nationalities including China, Indonesia, India, Turkey, USA, South Korea, and South Africa. The animation program is also open to people with no animation background. We encourage candidates with diverse professional and educational experiences, coming from diverse cultural and professional backgrounds. For example, this includes and is not limited to film makers, video artists, installation artists, print makers, painters, sculptors, architects, journalists, engineers, storytellers, biologists, physicians, ethnologists, educators, researchers, entrepreneurs, musicians, actors, dancers, computer scientists, programmers, technologists, designers, or writers. The requirements for admission in the program are based on a portfolio of works and an essay answering the following questions.
Why do you want to come to the MFA Animation Program?
What will you bring to the other students in the Animation Program?
What do you plan to achieve in the Animation Program?
Can you describe your personal relationship with traditional arts and with digital arts and technology?

1.3 Collaborative work
ANDA’s students and faculty develop new ideas about collaborative work focusing virtual worlds and gaming environments using motion capture, creating linear and non-linear storytelling and interactive animations. New perspectives on animation are examined in close relationship with industry professionals and faculty from New York City.

1.4 Research
The study of motion and the observation of life including transformation, metamorphosis and adaptation of living creatures inside ecosystems helps to see the world as dynamic and forever evolving. Research on motion studies project a new light on various domains where information and data used to be only considered from a static point of view. In contrast, motion research by ANDA’s faculty include research projects that focus on more dynamic points of view; the reconstruction and growth of virtual molecules, visualization of a virus docking with proteins, genetic diversity of the world’s 10,000 Bird species organized by their motion attributes, the evolution of someone during a healing process. Other topics include interactive storytelling and gaming.

2 An example of collaborative work at ANDA “the magic glut”, Motion Capture

2.1 Choice of the system and of the equipment.
A motion capture session becomes a great environment for collaborative work.

<table>
<thead>
<tr>
<th>Motion capture system</th>
<th>Vicon</th>
<th>Organic Motion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suit</td>
<td>yes</td>
<td>no</td>
</tr>
<tr>
<td>Markers</td>
<td>yes</td>
<td>no</td>
</tr>
<tr>
<td>Construction for the stage setup</td>
<td>no</td>
<td>yes</td>
</tr>
<tr>
<td>Very large mocap space</td>
<td>yes</td>
<td>1 m²</td>
</tr>
<tr>
<td>Small mocap space</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Average number of cameras</td>
<td>8 and up</td>
<td>14</td>
</tr>
<tr>
<td>Speed of cameras</td>
<td>140 fps and up</td>
<td>120 fps</td>
</tr>
<tr>
<td>Floor</td>
<td>non reflective material</td>
<td>retro-reflective material</td>
</tr>
<tr>
<td>Walls</td>
<td>non reflective material</td>
<td>3M fabric</td>
</tr>
<tr>
<td>Possibility of collaborative work</td>
<td>specialized tasks</td>
<td>non-specialized tasks</td>
</tr>
<tr>
<td>Calibration</td>
<td>wand</td>
<td>video snapshots</td>
</tr>
<tr>
<td>Initialization</td>
<td>T pose</td>
<td>T pose</td>
</tr>
<tr>
<td>Number of actors</td>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td>character's rig and skeleton</td>
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<td>predefined</td>
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<tr>
<td>Number of joints</td>
<td>unlimited</td>
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<tr>
<td>Resolution</td>
<td>sub-millimeter</td>
<td>millimeter</td>
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<td>Real time mode data cleanup</td>
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<td>no</td>
</tr>
<tr>
<td>Recording mode data cleanup</td>
<td>yes</td>
<td>no</td>
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<tr>
<td>Software needed</td>
<td>Vicon IQ</td>
<td>Motion Builder plugin</td>
</tr>
<tr>
<td>Real time preview</td>
<td>Vicon IQ</td>
<td>Motion Builder</td>
</tr>
<tr>
<td>Additional programming</td>
<td>Maya and Python</td>
<td>SDK</td>
</tr>
</tbody>
</table>

Figure 2: Comparative chart Vicon and Organic Motion
During the classes that Chris Bregler and I taught at New York University, students from Tisch School of the Arts and Computer Science worked in groups using a marker based Vicon system. This experience of collaborative work between programmers and designers in New York City has been an important step towards getting the motion capture system made by Organic Motion at ANDA in Singapore. The chart in figure 2 shows pros and cons in a classroom environment for both systems.

2.2 Collaboration between dancers, animators, interactive designers and programmers

Collaboration is a key element of a motion capture project. A mocap session involves many factors that are perceived differently by all the actors. The language of gestures and postures is not always immediately understood by everyone in the group. For example, dancers warm up and others think that it’s a final move. Gestures and postures involve verbal and non-verbal communication. Students from many different backgrounds may need to learn a new vocabulary, and how to communicate about different types of motions. On another note, the ability to move becomes as important as the ability to use computer software or writing code.

The time factor is also perceived differently between members of the group. A dancer may be finished in 5 seconds, rigging a character can take several hours. For these reasons, we have been exploring solutions that enable non-specialized, less technical tasks to be done by any of the group participants. Figure 3 shows the ability for animators to move from the workstation to the stage in ANDA’s lab. A designated performer is wearing a suit in the Vicon system which does not allow the same flexibility the sessions. Dancers or actors can be involved in data cleaning and rigging while others are using the motion capture set up.

2.3 Preparation and planning of the session

Students work in groups to plan a storyboard and rehearse the sequences of motion that they plan to capture. The sequences are broken into segments of 10 seconds each. They document each segment with still images or drawings before the mocap session. Figure 4 shows a breakdown of the movement in motion clips in order to fit inside a tight space, for example a 10 cubic foot volume. When we start the motion capture session with the Vicon system, students need to choose a designated performer wearing a suit with markers. Each group of students need to explain the motion to the performer. In the case of the Organic Motion system used at ANDA, any animator can be the performer. He or she can walk from their workstation to the stage watch the animation being captured in real time and walk back to their workstation.

2.4 Planning for storytelling

Although students have the choice to create motion clips for sequential or non-sequential storytelling, we will focus here on the challenges of interactive animation which includes linear, non-linear and hybrids of recorded animation and real time animation.
Maya’s Trax editor. The interface is similar to a video editing software with tools that can trim, scale, overlap and blend different clips.

2.6 Non-linear storytelling

Figure 4: Breaking down a sequence into motion clips

In the case of a game production, the clips will be recorded in order to be assembled back to back in real time. There is no predefined order. The clips need to be as small in size as possible, and as much as is possible cycled with compatible entry and exit postures. A timeline does not exist because the viewer controls the game engine that creates the interactive animations. The motion clips are designed as autonomous elements that need to fit together. The clips can be recorded one by one or trimmed from longer clips. This work can be carried on in Motion Builder.

2.7 Hybrid animations

In some interactive installations using character animations, the player influences rather than controls the character, for example a 3D animated character can change the tempo of a dance with the Nintendo Wiimote. In this case, a character can be activated by both a recorded animation and a real time motion capture device. Some real time characters can combine up to four different animation techniques, including interactive animations for the main rig, morph deformations following a sound file for lip synch and facial expressions, real time animation for the eye gaze and interactive canned animations for secondary animations.

2.8 Designing a workflow

The diagram of the workflows for Vicon and Organic Motion, in figure 5, shows another decisive element which is how to clean and save the motion clip. A certain amount of time can be saved by having a system with less software involved and a fast workflow. This becomes more important when teaching in a collaborative environment with very diverse groups of people.

Figure 5: Workflows for motion capture data from Vicon System and from Organic Motion

2.9 Archiving the sessions

This activity is largely inspired by the pioneering work done at Carnegie-Mellon by the CMU Graphics Lab Motion Capture Database http://mocap.cs.cmu.edu/ A search engine that can recognize motion patterns is much needed. Text does a poor service at documenting variations between several walk cycles.

2.10 Creating an interactive animation

Exploring convergence and resonance between motion studies and storytelling

In this example, we look at a Kung Fu fight game with two different ways of creating an interactive story illustrated in figure 6. The first game follows the model of a tree
structure or a fork in the path where the viewer moves through the story by making binary choices and can repeat sequences. The second solution is based on an interactive interface organized as a “Merry Go Round” illustrated in figure 7. In this case, the viewer can access all the choices at any time. Although each game uses the same library of animations from motion capture, the two versions provide a very different user experience.

2.11 Interactive animations

Virtools and also Motion Builder are 3D gaming engines that allow animators to use an external input for example MIDI, in order to trigger motion clips for a character.

Figure 6: Top and bottom view, the viewer moves through the story one scene at a time

Figure 7: Viewer can access all the choices at any time

The “Keyboard Mapper Building Block” in Virtools and the “Trigger device” in Motion Builder are functionalities that lets you map the keyboard or the joystick to an input device of your choice.

3 Conclusion

The next collaboration projects will explore theater, dance, gestures and postures in Asian culture. We plan to use motion capture for creating interactive animations about Indian and Chinese storytelling traditions. We will also emphasize collaborations between motion capture classes in New York and Singapore. We plan to develop virtual worlds for collaboration and participatory learning. This will involve tele-presence and real time interaction with 3D digital puppets driven by people using motion capture set ups in both places.

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