Trance: Edutainment Project on Art and Cultural Subjects for Secondary Schools

LEE, Wai Keung Alpha
The Hong Kong Polytechnic University

Abstract: This paper reports on the development of "Trance", an online multi-user edutainment project on art and cultural subjects for secondary schools. This project aims to provide an immersive, interactive and inspirational virtual environment where participants can interact with each other, link up their ideas and create online 3D virtual worlds. Students can create story, dialogues, music, visual effects, 2D (texture) and 3D graphics (scene), arrange avatars and props in the scenes, and capture the design and development process. Participants can get inspired and broaden their viewpoint through this active-learning process which involves experimentation, reflection and teamwork.
Keywords: edutainment applications, art and cultural subjects, creativity education, design collaboration, virtual environment

Trance

Trance is a cross-disciplinary edutainment platform for art and cultural subjects in secondary schools funded by the Quality Education Fund (QEF), Education Commission, Hong Kong. The objectives are:

1). To develop a multi-user platform to empower teachers to actively participate in applications of new technologies in education;

2). To develop domain-specific edutainment modules to complement existing teaching materials of art and cultural subjects in the secondary school curriculum;

3). To develop generic modules to help teachers with the creation, integration, and delivery of edutainment content to educate students in art and cultural subjects; and

4). To develop multi-user modules to facilitate collaborative activities to educate students in art and cultural subjects.

To achieve the abovementioned objectives, Trance is developed based on a synergistic approach to enhance outcome of visual arts, music, and other cultural subjects. Using Trance, students and teachers can interact with each other, link up their ideas and create online 3D virtual worlds. Students can create story, dialogues, music, visual effects, 2D (texture) and 3D graphics (scene), arrange avatars and props in the scenes, and capture the design and development process. Participants can get inspired and broaden their viewpoint through this active-learning process which involves experimentation, reflection and teamwork. Trance includes:

1). A multi-user environment, which includes a Project Website with project introduction, video demos, client login, database, and backend systems, to empower teachers to actively

participate in the applications of new technologies in education (project website can be founded at http://neuron.sd.polyu.edu.hk/trance/);

2). Ten domain-specific modules, namely music, draw, terrain, scene, props, avatar, dialogue, particle, light, and camera, to complement existing teaching materials in the secondary school curriculum;

3). Five generic modules, namely music library (with 128 digital music instruments), avatar library (with human, animal, and monster characters), props library (with accessories, baby items, Chinese decoration, Chinese furniture, equipment, western decoration, western furniture, and ocean decoration), scene library (with classroom, office layout, and playgrounds), and texture library (for particle systems, canvas, and terrain generations) to help teachers with the creation, integration, and delivery of edutainment content; and

4). Three multi-user modules (by integration of domain-specific modules), namely "interactive storytelling" (by integration of avatar, camera, dialog, light, particle, props, scene, and terrain modules), "interactive particle" (by integration of particle with canvas modules), and "interactive sculpture" (by integration of canvas and terrain modules), are developed to facilitate collaborative activities.

Music Module

Music module (Fig. 1) is a domain-specific module designed to support improvisation and visualization of music through particle systems. Learners can first add and name a new music clip, and then select metronome, key signature, tempo, volume (3 levels), and music instrument (128 digital instruments in 16 categories are provided). Learners can record and improvise music by going up or down the scale, clicking the keys or by typing the respectives notes on the keyboard (88 keys are mapped on the computer keyboard). Learners can then save, playback created in any of the 128 digital instruments. Learners can also share the music created to group members by saving in public library. The particle visualization view can be maximized by hidding the piano guide accordingly.

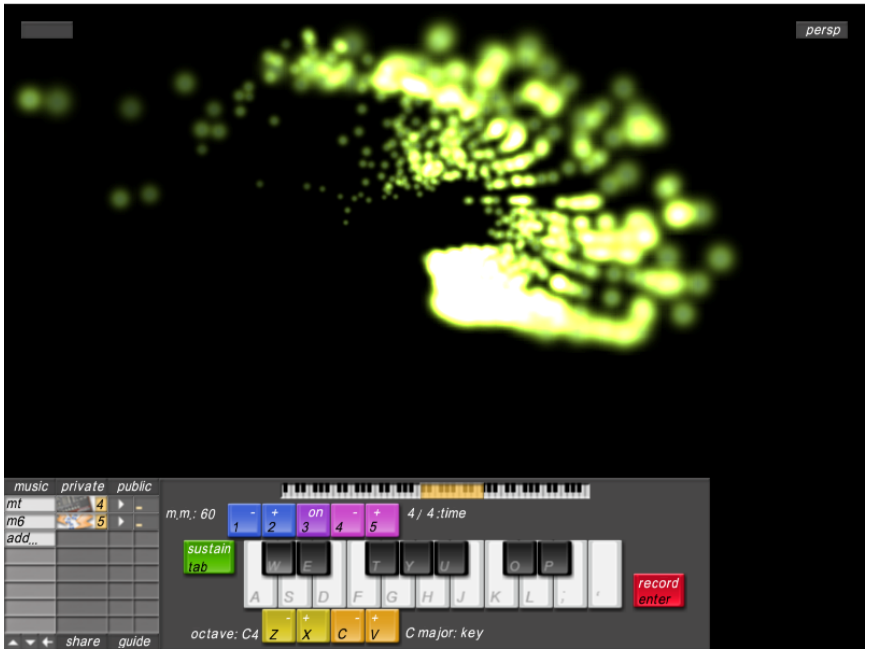

Figure 1: *Music Module*

Canvas Module

Canvas module (Fig. 2) is a domain-specific module designed to support 2D drawings. Learners can select pen size, colours, design the pen shape or pattern, move around the drawing panel, and draw directly on the canvas. Learners can also erase part of the drawings or reset the whole drawing. The finished work can be saved as a 2D image file by using the snap function.

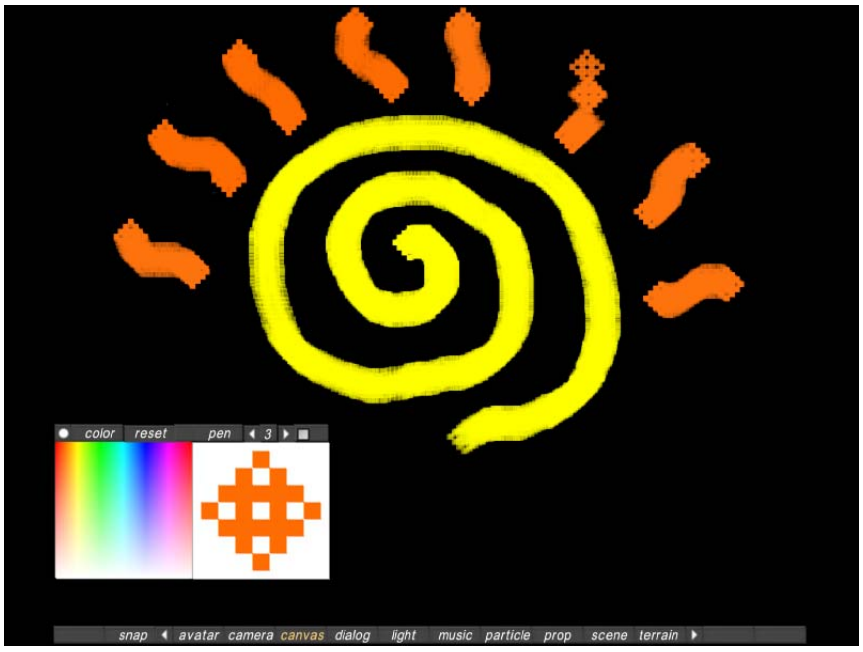

Figure 2: *Canvas Module*

Terrain Module

Terrain module (Fig. 3) is a domain-specific module designed to support creation of 3D terrain and landscape. Learners can first add and name a new terrain, and then enter height map view to draw the height map. Similar to canvas module, learners can select pen size, level of grayness, design the pen shape or pattern, move around the drawing panel, and draw directly on the height map. The level of grayness represents level of height. Once the height map is finished, learners can enter displace map view to check the 3D terrain generated using the orbit camera function. Learners can also add gaussian effect to smooth the edges of the 3D terrain. Canvas module is integrated with terrain module, learners can enter the canvas view to add texture and draw interactively colours on the 3D terrain.

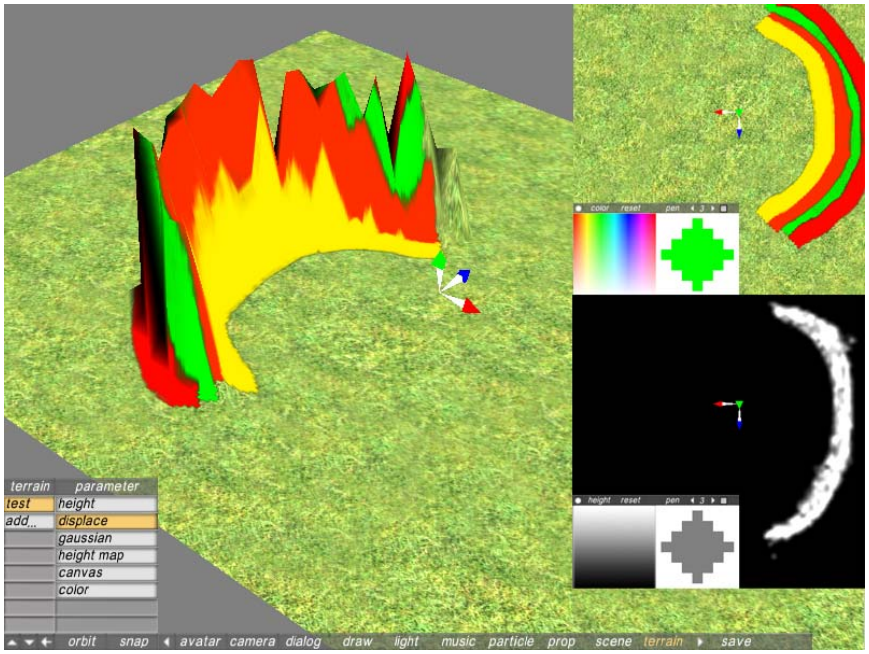

Figure 3: *Terrain Module*

Scene Module

Scene module (Fig. 4) is a domain-specific module designed to support creation of 3D virtual worlds. Learners can first add and name a new scene, select a scene from the scene library (e.g. classroom, office layout, and playgrounds), and check the scene generated using the orbit camera function. Learners can transform (scale, rotate, or move) the scene, and save it for further integration with other modules. To move from one scene to another, one can specify the portal by placing the portal box at the portal entrance in Props module.

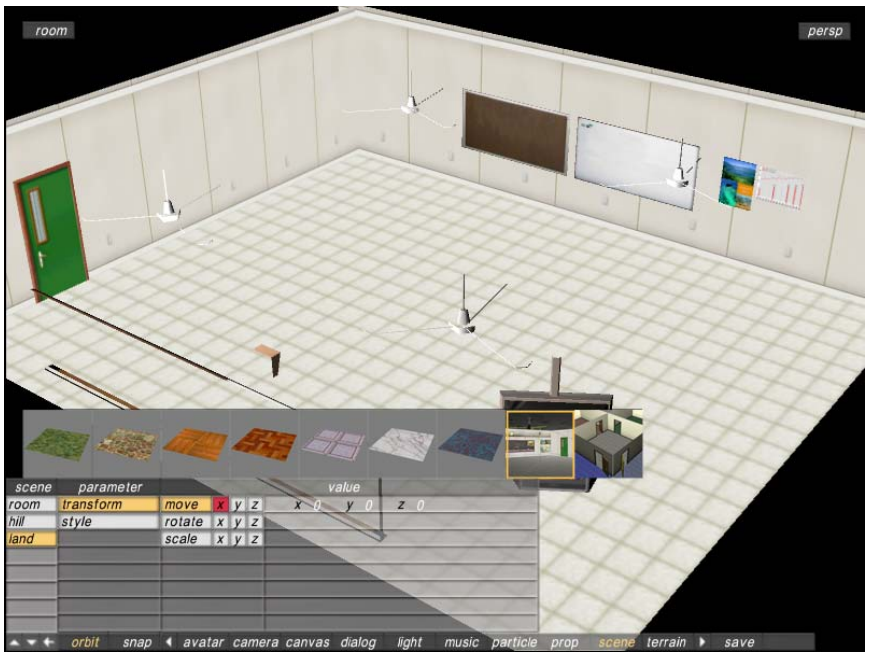

Figure 4: *Scene Module*

Props Module

Props module (Fig. 5) is a domain-specific module designed to support creation of 3D virtual worlds. Learners can first add and name a new props, select a props from the props library (e.g. accessories, baby items, Chinese decoration, Chinese furniture, equipment, western decoration, western furniture, and ocean decoration), and check the props generated using the orbit camera function. Learners can transform (scale, rotate, or move) the props, and save it for further integration with other modules.

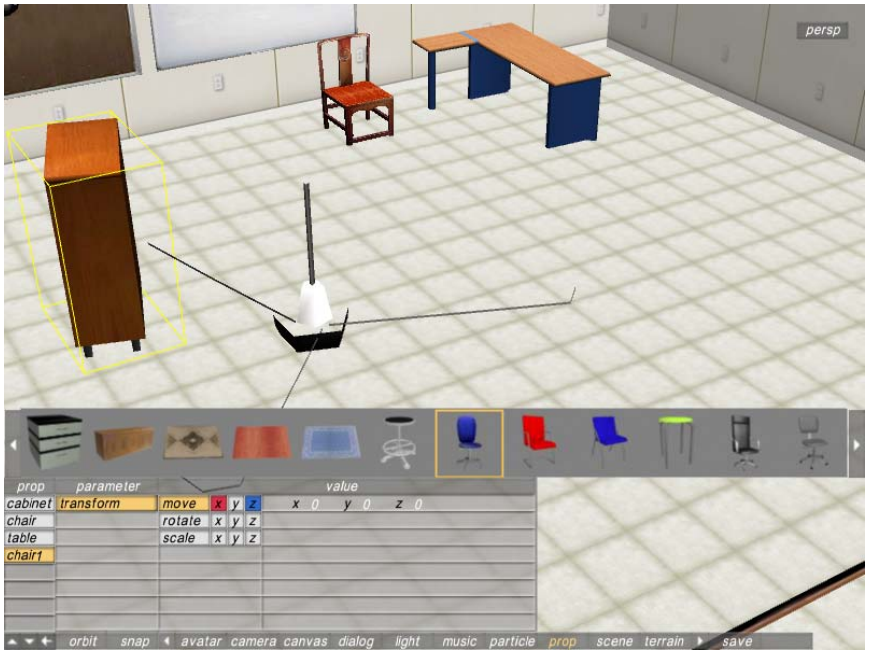

Figure 5: *Props Module*

Avatar Module

Avatar module (Fig. 6) is a domain-specific module designed to support creation of 3D characters. Learners can first add and name a new avatar, select a props from the avatar library (e.g. human, animal, monster), and check the avatar generated using the orbit camera function. For human avatars, learners can also specify the sex, select the body parts such as body, head, hair and cloth. Learners can then transform (scale, rotate, or move) the avatar, and save it for further integration with other modules.

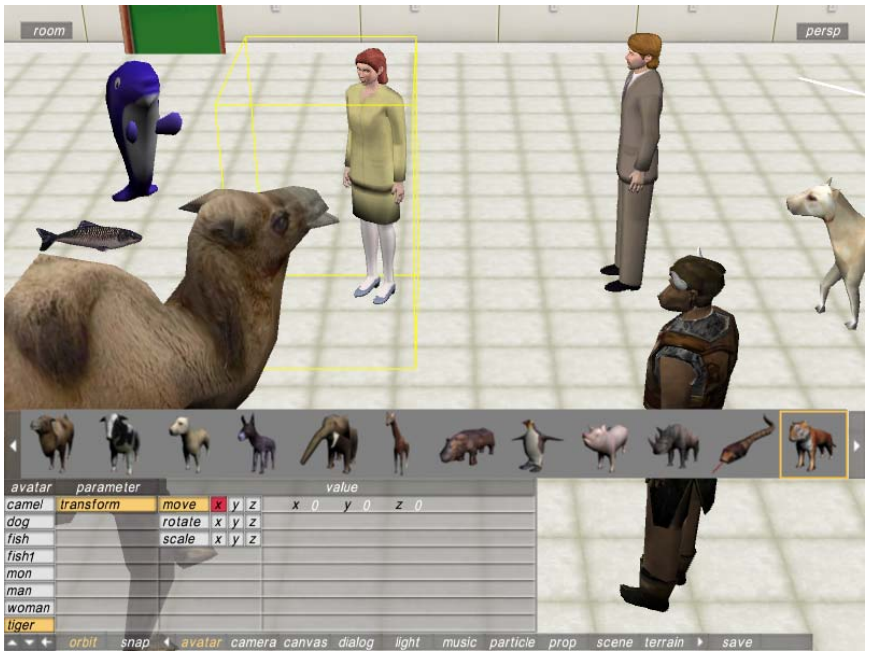

Figure 6: *Avatar Module*

Dialogue Module

Dialogue module (Fig. 7) is a domain-specific module designed to support interactive storytelling. Learners can first select avatar from a list of avatar created earlier in avatar module. Learner can then add avatar start dialogue, player reply dialogues (maximum four options), and continue to add avatar, and player dialogues sequentially and select the respective facial expressions (emotions) and gestures accordingly. Once the dialogues are saved, learner can preview and check if the interactive story created is as intended.

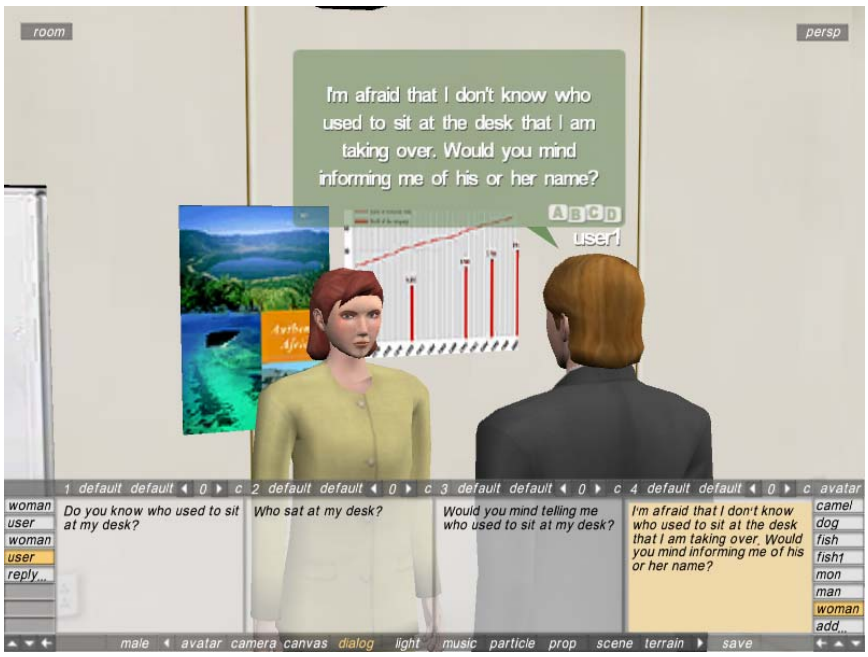

Figure 7: *Dialogue Module*

Particle Module

Particle module (Fig. 8) is a domain-specific module designed to support creation of natural and artificial visual effects such as snow, fire in a virtual environment. Learners can first add and name a new particle, select a texture from the texture library, and check the particle generated using the orbit camera function. Learners can then adjust various parameters (emission, lifespan, size, speed, colour, texture) for the intended result. Canvas module is integrated with particle module, learners can enter the canvas view to create texture by drawing interactively colours on the particle texture panel. Learners can then transform (scale, rotate, or move) the particle, and save it for further integration with other modules.

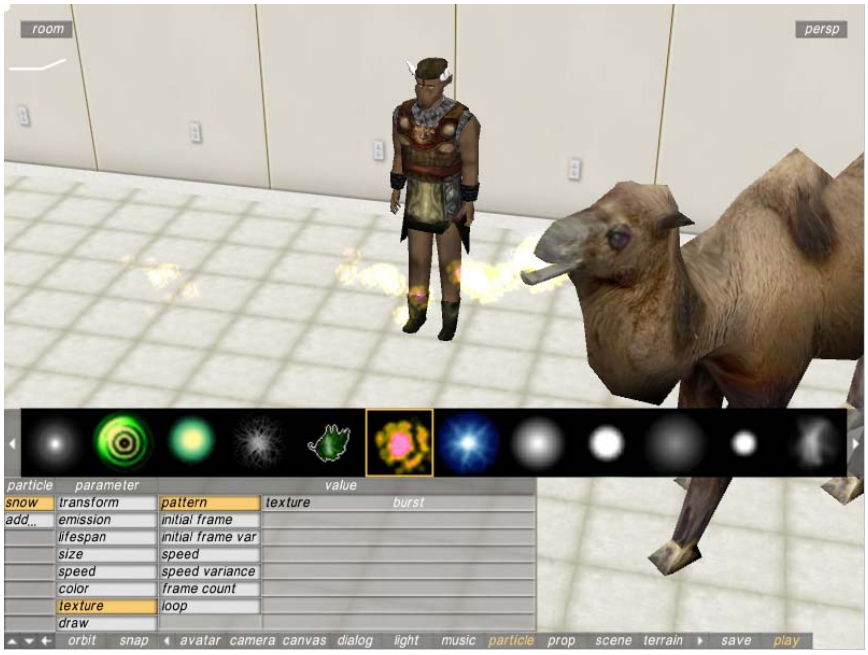

Figure 8: *Particle Module*

Light Module

Light module (Fig. 9) is a domain-specific module designed to support lighting effects in a virtual environment. Learners can first add and name a new light, select the light properties, and check the lighting effect (spotlight, directional, point light) generated using the orbit camera function. Learners can then adjust various parameters for the intended result.

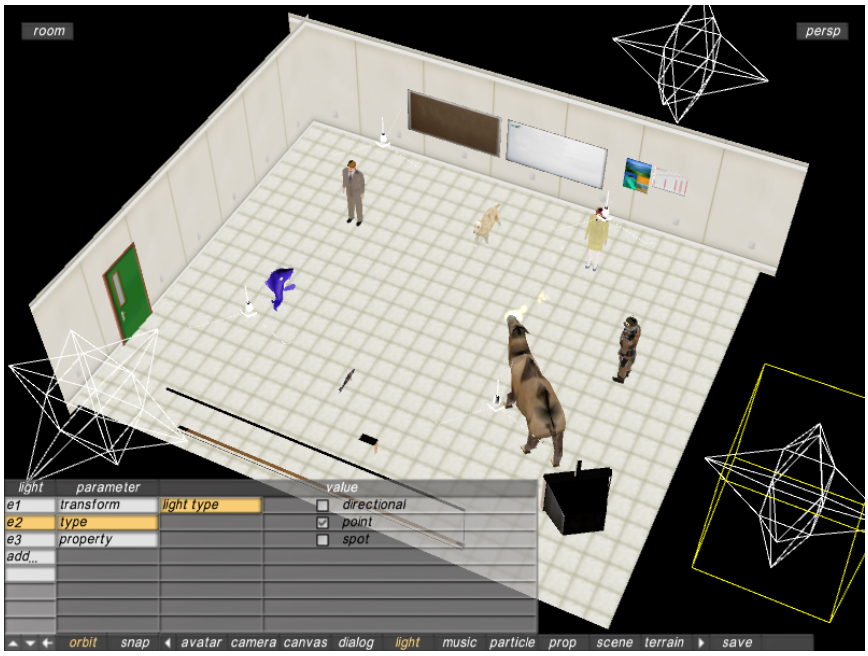

Figure 9: *Light Module*

Camera Module

Camera module (Fig. 10) is a domain-specific module designed for camera settings in a virtual environment. Learners can first add and name a new camera, select the camera

properties, and check the result generated using the orbit camera function. Learners can also add sensors so that camera can be activated when user come close to them.

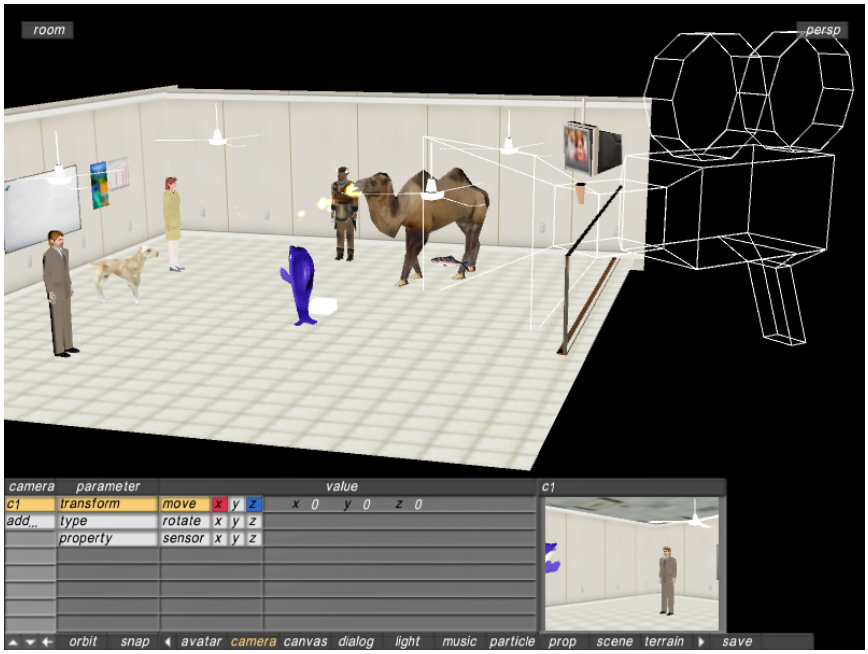

Figure 10: *Camera Module*

Usability Testing

In July and August 2006, Trance was introduced to 15 schools, a total of 37 participants (1 principal, 19 teachers, and 17 students) at four dissemination seminars and hands-on workshops. Usability testing is evaluated from the following four perspectives, namely instructional design, information design, interaction design and interface design. Participants commented that Trance is a practical, creative, impressive, motivational, and powerful real-time game-based environment suitable for extensive deployment not only in teaching and learning in art and cultural subjects but also in various other subjects. Further promotion and dissemination of the deliverables to a wider community is also recommended. The following is a summary of suggestions from the participants.

1). Instructional Design: Some teachers suggested mechanisms to allow instant feedback from teachers to students' individual virtual worlds. Some teachers suggested grid line and functions for subtle representations of 2D graphics in Canvas module.

2). Information Design: As teachers are usually loaded in other duties, customization of application may not be feasible. Participants suggested video or text-based manuals, guidelines on lesson plans, and sample versions of applications so that they can learn on their own. Some participants suggested a bigger library for models, textures, avatar gestures and facial expressions to simulate real world environment, and a standalone or CD-ROM version to avoid overloading of network connections when too many participants access the application at the same time.

3). Interaction Design: Most participants suggested mechanisms to allow students to create individual library of 3d models, avatars, 2D icons, and other visual elements. Some participants also suggested creation of communities by connection or integration of students' individual virtual worlds.

4). Interface Design: Most participants suggested a simplified, more colourful, icon-based, and bilingual version of the application. Some participants also suggested keyboard controls in addition to mouse controls.

Conclusion

The project impact of Trance is evaluated from the following three perspectives, namely learning effectiveness, professional development and school development.

1). Learning Effectiveness: Participants are impressed of the project deliverable, and suggested constructively that the project has the potential to broaden students' horizons, increase students' sense of achievement, foster students' development in their potential and specific abilities, equip students with a variety of learning approaches, and cultivate students' team spirit. Some participants suggested that further development of Trance can help teachers to understand students with special educational needs, e.g. by allowing autistic students to portray their feelings/thoughts in dialogues about what happens in school and daily life.

2). Professional Development: Trance has successfully broadened participant's scope of vision. Participants are looking for training opportunities to enhance their professional development in application of the project deliverables. Many participants requested further training opportunities on students, teachers and technical staffs in setting up lab facilities for the application of Trance.

3). School Development: Suggested by participants, this project has the potential in enhancing the overall image of the school, improving learning atmosphere, increasing opportunities for schools to organize activities, increasing inter-school collaboration and interflow, stimulating the motivation for collaborative learning in school, promoting a culture of action research in school, and fostering team spirit in school. One principal suggested leading a team of students in preparing a virtual play to reflect their school life as a project presentation for the school anniversary. He suggested that this could count into the interdisciplinary project work for four groups of S3 students in 2006/07.

Acknowledgement

Trance is a Quality Education Fund funded project started in December 2005 for a period of nine months ('Deployment of Networked Edutainment UniveRse ONline (NEURON) for Art and Cultural Subjects in Secondary Schools', EMB QEF 2004/0004). The system architecture of Trance is developed based on NEURON (Lee et al., 2004; Lee, 2005). The Music module is developed based on 'Seeds of Harmony' (Lee, A. & Leung, B. W., 2006), an edutainment project on music creativity. The Avatar and Dialogue modules are developed based on 'Manga' (Lee, A. & Morrall, A., 2006), an edutainment project on

profession-related language training. The author would like to thank the following fifteen Hong Kong secondary schools for participation in workshops and seminars: Arts & Technology Education Centre, CSBC Mrs Aw Boon Haw Secondary School, Holy Trinity College, Hong Kong Sea School, Immaculate Heart of Mary College, Jockey Club Government Secondary School, Liu Po Shan Memorial College, Po Leung Kuk Laws Foundation College, Po Leung Kuk Yao Ling Sun College, Shatin Public School, SKH All Saints' Middle School, St. Teresa Secondary School, Tuen Mun Catholic Secondary School, TWGHS Wong Fut Nam College, and YWCA Hioe Tjo Yoeung College.

References

Lee, A., Lai, K. W., Leung, C. C., Hung, F. T., Leung, W. L., & Lam, K. K. (2004). Synaesthesia: Multimodal Modular Edutainment Platform Development. *Proceedings of International Conference on Cyberworlds*, CW2004, Tokyo, pp. 335-342.

Lee, A. (2005). NEURON - Networked Edutainment UniveRse Online. *Proceedings of the 11th International Conference on Human-Computer Interaction*, HCII2005, USA. CD-ROM

Lee, A., & Leung, B. W. (2006). “Seeds of Harmony: Edutainment Project on Music Creativity”, in Proceedings of the Asia-Pacific Educational Research Association International Conference, APERA, Hong Kong. CD-ROM

Lee, A., & Morrall, A. (2006). “Manga: Edutainment Project on Profession-Related Language Training”, in Proceedings of the Asia-Pacific Educational Research Association International Conference, APERA, Hong Kong. CD-ROM