Performance transfer : animating virtual characters by playing and acting.

Advisor : Rémi Ronfard, IMAGINE team, INRIA

http://team.inria.fr/imagine/remi-ronfard/

remi.ronfard@inria.fr

Context

The exploratory research project "FIGURINES" is a collaboration between the IMAGINE team at LJK and the PRIMA team at LIG, supported by Labex Persyval. The goal of the project is to create short animated stories using augmented reality techniques. More precisely, storytellers can design and print 3D figurines, use them as puppets to show and tell a story, and transfer their performance into a 3D animated virtual world.

The internship will take place in the IMAGINE team at INRIA in Montbonnot.

Objectives

The goal of the internship will be to propose novel and original methods for transfering a performance created with real figurines into a 3-D animation.

Recent work on 3D puppeteering [1] has shown how to transfer the rigid body movements of 3D objects into an animated scene using a kinect interface. In this internship, we will extend this prior work by combining at least three motions:

- Rigid motion of the figurines, as captured with the kinect cameras in the real world.
- Hand gestures of the storyteller, as he manipulates the figurines.

- Facial expressions of the storyteller, as he mimics the figurine's characters.

This is a special case of "layered acting" [2] where the animation of a virtual character must be created from multiple sources. In our case, novel methods will need to be proposed, implemented and tested to successfully merge the different motions into a convincing and aesthetic virtual performance. For instance, locomotion of the virtual character will need to be recreated using a combination of the recorded motions of the figurine and the storyteller, with the physics of the imaginary virtual world. Head movements will also need to be recreated by combining those of the storyteller and the figurines. Facial expressions of the storyteller will also need to be transferred to the morphology of the virtual character. All cases will require novel methods significantly extending previous work [3,4,5].

A companion internship is proposed in the PRIMA team at LIG/INRIA, dealing with perception of the figurines, and the acting of the storyteller, from audio-visual streams recorded by one or more kinect cameras. Collaborations will be encouraged to propose "high level" descriptions of the performance that can be extracted from those streams and used to make the transferred performances more expressive (for instance, entrances and exits of characters, turn-taking in dialogue and interaction, contact between different characters, social attitudes mimicked by the storyteller, etc.).

We expect this research to lead to a PhD on story-driven interactive spaces [6] or a related topic in computer graphics and 3D animation.

References

1. Robert Held, Ankit Gupta, Brian Curless, and Maneesh Agrawala. 2012. 3D puppetry: a kinect-based interface for 3D animation. In *Proceedings of the 25th annual ACM symposium on User interface software and technology* (UIST '12).
2. Mira Dontcheva, Gary Yngve, and Zoran Popović. 2003. Layered acting for character animation. *ACM Trans. Graph.* 22, 3 (July 2003), 409-416.
3. R. Heck, L. Kovar, and M. Gleicher. Splicing Upper-Body Actions with Locomotion. Eurographics'06.
4. Jun-yong Noh and Ulrich Neumann. 2001. Expression cloning. In *Proceedings of the 28th annual conference on Computer graphics and interactive techniques* (SIGGRAPH '01).
5. Adela Barbulescu, Rémi Ronfard, Gérard Bailly, Georges Gagneré, and Huseyin Cakmak. 2014. Beyond basic emotions: expressive virtual actors with social attitudes. Motion in Games, Los Angeles, 2014.
6. C. Pinhanez. The SCD Architecture and its Use in the Design of Story-Driven Interactive Spaces. Managing Interactions in Smart Environments, 2000.