Real-time Cinematography for 3D Virtual Worlds

Goal: To explore the creative potential of real-time camera work and lighting in animated computational environments.

Overview: Traditional film cinematography has a certain set of conventions that enable it to serve as an important expressive channel in the film making process. Real-time camera systems for video games and other interactive worlds, though, lack much of this expressiveness, and have yet to develop a clear cinematic grammar unique to their medium. This course examines the theory and practice of both film cinematography and existing virtual world camera systems to find the strengths and weaknesses of each, and ultimately seeks to draw on both heritages to create a new breed of real-time cinematography systems that are both interactive and expressive.

Topics Covered:

- Film/video cinematography. We will begin with a brief look at the tools of the trade – cameras (aspect ratio, depth of field, camera movement, transitions, framing, etc.) and lights (placement, gels, diffusion, etc.) Readings will be drawn from Kris Malkiewicz’s book “Cinematography.” In addition, we will look at the canon of the traditional craft of cinematography, including clips from Chaplin, Hitchcock, Gilliam, MTV and others.

- Video game cinematography. Various computer games have taken strikingly different approaches to the problem of where to put the camera and lights. Examples may include Grim Fandango, Tomb Raider, Doom, The Sims, The Legend of Zelda and other games that are currently relevant. Readings will be drawn from Gamasutra and other game-related publications.

- Interactive cinematography research. Various researchers have looked at the problem of interactive cinematography in a rigorous fashion. Readings will include Drucker, He et al. and my own work.

- Editing. A real-time cinematography system subsumes the role that would be played by the editor in a traditional linear production. Therefore, we will examine the basics of film editing (e.g., pacing, montage, the Kuleshov effect).

- Interactivity. The demands of the user in an interactive experience are quite different from those of a viewer of a linear film or video. We will consider the core elements of this difference, and consider the effect that they have on cinematography. In particular, we will examine the effect of the interface and control paradigm on real-time cinematography. Readings will be drawn from CHI (Conference on Computer-Human Interaction) and other sources.

- Programmatic control. A brief introduction to the Java programming language and some necessary fundamentals of linear algebra, to give students the tools to approach real-time cinematography in practice.

- Final project. Using the simple cinematography programming system that I developed at the MIT Media Lab, students will create an interactive cinematography system in a clear expressive genre (e.g., film noire, romantic comedy, drama).