Improvisational Animation

Ken Perlin
Athomas Goldberg

Media Research Laboratory
New York University
719 Broadway 12th floor
New York, NY 10003
Tel: +1-212-998-3371
E-mail: media@mrl.nyu.edu

ABSTRACT

We are developing software tools for authoring real-time applications involving virtual actors. The actors have mood, presence and personality. They follow a script, using body language and gesture to convey an interactive story that has been scripted beforehand by an author. Scripts can contain random elements, so the same story is never told twice.

As the story unfolds, end-users participate and become part of the story by controlling an actor, by interacting with actors, or by giving instructions to the story telling system. For example, as two actors are embroiled in an argument, a user might instruct his actor to leave the room, or to end the argument by conceding. The virtual actors adapt as changes in the story occur, using guidelines from their scripts to decide how to respond and behave.

In this video, we present the history of our research in Improvisational Animation and discuss some of the principles involved in creating animated virtual actors who perform autonomously in real time and how this can be applied to the creation of compelling interactive experiences which allow for endless possibilities, yet always conform to the framework established by author and animator.

KEYWORDS

Agents, Entertainment, Networks, Programming Environments, Virtual Reality

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TECHNICAL OVERVIEW

Behavioral Scripting

The system uses a new behavioral scripting animation language. Animators and story authors use this to specify everything about an actor, from basic gestures and body movements to high level goals, moods and personality, to the overall structure for the story itself. The language is interpreted, so that changes to a script can be seen instantly.

Actors are described using a hierarchical structure of actions and scripts. Any number of actions and scripts may be running simultaneously.

Actions tell an actor how to do something, for example by describing angular motions of joints in the actor's body. Motions frequently contain a noise component so actors do not move in a wooden fashion.

Scripts tell an actor what they should be doing and when to do it - they contain sequences of actions, timing cues, and other commands. Operations for making weighted decisions and communicating between actors are used within scripts to create personality, body language and realism.

To develop a story, authors first write a top level script, then iteratively fill out details and tie events within the scripts to actions for the actor to perform.

Procedural Animation

Body movement actions are performed using a procedural animation. This performs transitions and layering, as well as a number of other low level animation tasks.

Transitions are used to move a body from one animated motion to another. For example, if you instruct an actor

to start walking while the actor is sitting, the animation system automatically performs a smooth transition from sitting to walking.

Layering allows an actor to be performing a number of things at once. For example, to make an actor look disoriented you could layer a nodding animation onto a walking animation.

Emphasis is on esthetics rather than physics. There is nothing to stop an actor from doing the physically impossible, though there are tools to help prevent this - for example, heads can't by default look backwards. Similarly, animators use intermediate positions for certain moves so that actors do not, for example, pass their hands through their body when placing them behind their back.

Distributed Architecture

In order to support large numbers of actors and props, a distributed architecture is used. A central rendering process acts as the server for a number of client processes - some of which manage the geometry and state for an actor; others manage props, lights and the camera. A shared blackboard is used to record global state, and each process can send messages to the renderer, blackboard, or to other processes - for example, an actor can instruct another to pay attention, or request that the camera follows a move.

Modeling and Rendering

The current implementation uses Silicon Graphic's OpenGL to perform rendering. Models are creating using a third party commercial modeling package and then imported into the animation tool using the DXF interchange format. Support for Pentium platforms and other interchange formats is planned.

APPLICATIONS

- Gaming environments - where users interact with arcade-style characters in a shared, networked virtual world.
- Interactive story experiences - solving a mystery or playing a character in a thriller.
- Intelligent agents - for example a professor who teaches young pupils a topic.
- Virtual conferencing - using a virtual actor as a remote proxy in a distributed conferencing tool.
- Interactive television - for example, interactive cartoon figures that provide running commentary on a television show.
- Animation production - in which virtual actors are used as part of an broadcast animation, e.g. to create a crowd scene, or to prototype an animation, or as an alternative to motion capture and keyframing.

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Contact Information

NYU Media Research Laboratory
715-719 Broadway, 12th floor
New York, NY 10003
Tel: (212) 998 - 3384
Fax: (212) 995-4122
Email: media@cs.nyu.edu
http://www.mrl.nyu.edu