Autonomous Virtual Humans

Tyler Streeter

April 15, 2004

Project Overview

- Goal: To create virtual humans in a 3D environment and give them complete motor control

Current Technology

FarCry, UbiSoft Entertainment

Current Technology

The Sims 2, Electronic Arts Inc.

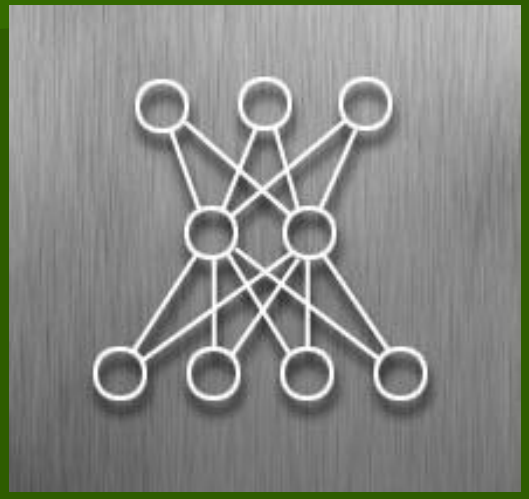
Current Technology

- Very limited intelligence
- No low-level motor control
- Typically, "finite state machines" are used
  - Example:
    - If in **Aggressive** State, attack
    - If in **Scared** State, run away
    - If in **Idle** State, stand still
  - Use a pre-scripted animation for each state

My Approach

- Create physically-simulated humans (demo)
- Give humans simulated brains (demo)
- Train/teach them to perform certain tasks

Artificial Neural Networks



- Use computer software or hardware to mimic biological nervous systems
- Useful for things like speech & handwriting recognition
- Can also be used to control robots or simulated creatures…

Training a Neural Network…

- Use a Genetic Algorithm
  - Start with a "population" of random neural networks
  - Evaluate each one on some task (e.g. standing or jumping)
  - Throw away the bad neural networks
  - "Mate" the good networks to produce offspring
  - Randomly mutate the new offspring

Demo Videos

- Standing Video
- Jumping Video

Future Work

- New sensory inputs
  - Better sense of touch
  - Sense of sight
  - Sense of hearing
- Robotics Applications

Future Work

- Try more complex behaviors
  - Staying balanced when pushed
  - Walking across uneven terrain
  - Carrying objects
  - Jumping over obstacles
  - Operating virtual machinery
  - Competitions between virtual humans

Questions?

- Please come to my demo booth upstairs to see more demonstrations and ask questions.