



My Players are Monkeys

Building Games for Animal Research

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Studio Lead, Blanket Fort Games



Blanket Fort Games

- Small Independent Developer
- Upstate NY
- Broad Platform Experience
 - Arcade
 - PC
 - Web
 - Zune





The Scientists



- University of Rochester
 - Department of Brain and Cognitive Sciences
 - Hayden Lab
- Motivated by knowledge-seeking





The Monkeys

- Rhesus Monkeys
 - *Macaca mulatta*
- Motivated by cherry juice





The Game

- 3D Maze
- First-person
- Joystick driven
- Display stretched over three monitors in landscape
 - Nearly 180 degree field-of-view
- Collect fruit
 - Detect when a patch of fruit is exhausted
 - Decide to move to another area of the maze
 - Navigate to new patch





The Experiment

- Scientists monitoring in real time
 - In the next room
- 3 Displays
 - Repeater of Monkey's display
 - Top-down view of maze
 - Configuration window
- Configures maze in advance
 - Builds walls
 - Sets up triggers
 - Wall creation/deletion
 - Fruit spawning
- Adjusts maze in real time
 - Adds/removes walls
 - Adds fruit





The Tools

- Analog USB I/O Board
 - Actuates juice dispenser
- Digital USB I/O Board
 - Synchronizes game logs with neurological data
- Custom Joystick
 - Reinforced to withstand harsh treatment
- Neurological Data Recorder





The Logs

- Monkey position, facing, speed
- Position of each fruit
- Visibility of each fruit
 - Which of 3 monkey monitors
 - Occlusion
- Fruit collected
- Visibility of each landmark
 - Which of 3 monkey monitors
- Monkey collision status
 - Collided with wall
 - Scraping along wall
 - Free
- Logs saved twice
 - Machine readable, for replays
 - CSV, for data analysis





The Challenges





Teach The Monkeys

- Already knew how to play a 2D game with a joystick
- First iteration was easier
 - Open field – no maze
 - Fruit ran away
- Monkeys would watch replays with rewards enabled
 - Monkey see, Monkey do
- Understanding joystick control in 3D was easy
- Understanding maze navigation is hard





Teach The Scientists

- Scientists are not gamers
 - “Virtual Environment” meant 3D
- Throw out 10 years of game design convention
 - Build a new set of jargon from scratch
 - Words like trigger, spawn, event were unfamiliar
- Build a level editor out of a text editor
 - Scientists are accustomed to tedious processes
 - Much less comfortable with ‘standard’ level editing tools
 - Access to cheap labor
- Understanding what is possible





Interface with the Hardware

- Two different USB I/O boards
 - From different manufacturers
 - With different libraries
- Custom Joystick
 - Just a normal joystick, reinforced
- Single lab computer
 - 'Works on my machine' really is good enough
 - Once driver versions matched between lab and office





Two Games in One

- Monkeys and Scientists playing simultaneously
 - Different games with different goals
 - Monkey wants fruit
 - Scientists want data
 - Neither goal is entertainment





Development is Ongoing

- Changes for new experiments
- More advanced triggers
- Custom head rotation tracker
- Eye tracking camera





Questions?

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