BODY PAINT
Real-time Digital Painting with Motion Capture
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Dance, Mo-Cap, & Graphics

- Interactively create a virtual painting in real time from dance using the Vicon motion capture system
  - Improvised performance art
  - Generating backdrops to use in later performances
  - Planning atmosphere for performance
Related Work

- 1985: San Francisco Ballet’s “Pixellage” using an Aurora 100 videographics workstation, Darryl Sapien created animated backdrops relating to pieces choreographed by Betsy Erikson. Some complimented pieces, while others provided props and interacted with the live dancers.

- DigitalBeing: an ambient intelligent environment using pressure and physiological sensors to control lighting and projected light imagery to project the dancer’s arousal state
  - Magy Seif El-Nasr and Thanos Vasilakos, *DigitalBeing: an Ambient Intelligent Dance Space*. 
OVERVIEW

[Diagram showing a person in a motion capture suit, cameras capturing data, and a data table with coordinates, leading to a 3D reconstruction of the body.]

[Table data]

| 5  | -584.4243 | -20.6503 |
| 6  | -596.244  | 49.57842 |
| 7  | -430.8454 | -20.91483 |
| 8  | -374.684  | -60.96157 |
| 9  | -628.6105 | -39.1553  |
| 10 | -446.8915 | 154.9754  |
| 11 | -442.9143 | 271.4127  |
| 12 | -451.0745 | 311.3223  |
| 13 | -462.3891 | 317.7682  |
| 14 | -409.9991 | 204.2796  |
| 15 | -461.8405 | 342.2488  |
| 16 | -486.0468 | 267.6412  |
| 17 | -555.4429 | -138.7922 |
| 18 | -627.4448 | -210.8626 |
| 19 | -687.7206 | -238.7719 |
| 20 | -709.5269 | -250.2236 |
| 21 | -620.7932 | -220.8743 |
Vicon Blade
Real Time Engine

- Blade has a built-in RTE which outputs marker positions and joint angles in real time
  - Configure a skeleton to a captured ROM
  - Turn on RTE and change to solve data
  - Connect to RTE on port 801* using altered ExampleClient
  - Request data from RTE
  - MoCap data is stored in markerPositions and bodyPositions vectors
  - Use data in your application!
Range of Motion
Processing ROM

Constraint RIHAND_R_Wrist has no parameters. Its offset will not be altered by calibration.
Character Callibration

- The character calibration operation determines the following information based on the .vst file:
  - the length of the bones of the actor
  - the constraint offsets of the markers (determines where the markers are actually placed on the actor)
  - the preferred pose of the bones
  - the joint range of the bones
  - the marker covariance

from “Calibrate a VSK File for an Actor” in Vicon Blade Help 1.5.195
Vicon Issues

- Flickering or lost markers even with increased strobe intensity
- Bad automatic labeling and solving
- Errors loading skeletons - only loads BladeDefault
- Errors calibrating characters
- Errors receiving packet and packet type when requesting Info from RT Server
Basic Brushes

- Pencil
- Calligraphy
- Chalk
Advanced Brushes

- Ink
- Airbrush
- Pointillism
Color Variance
Randomly selects next color
Increments or decrements RGB values until reaches next color
Ink

Dynamically adjust brush radius as a function of velocity
Ink

Dynamically resize brush with velocity

Detail from *Bambus* by Hsü Wei
Airbrush
Draws a triangle fan with alpha channel .3 in center and 0 at edges
Airbrush

Fading to transparent using alpha channels
Pointillism

Draws random-value square at a random location within the radius
Draws complementary color as well for 1/5 of the squares
Pointillism

Detail from *La Parade* by Georges Seurat

Randomized hue and location within radius and occasional complementary colors
CURRENT STATUS
Contributions

- Troubleshooting Vicon/Blade problems
- Captured Range of Motion
- Progress on connecting to Vicon in Real-Time
- Painting program with various brushstrokes
- Color variance and interpolation
Future Work

- **Vicon Blade**
  - Get a skeleton to map and calibrate to subject correctly
  - Create a new, simpler end-effector skeleton; load and calibrate correctly

- **Real Time Engine**
  - Continue troubleshooting bad type and packet from received data

- **Painting**
  - Restructure to take in (x,y) from real-time marker data
  - Intelligently adjust color based on input velocity: cool colors for slower motion; warm colors for faster motion
Tools & Languages

- Vicon Motion Capture Systems
- Blade and Real Time Engine
- C++, OpenGL, GLUT
Live Demo of Painting
Questions?

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