Rapid Authoring for VR-Based Simulations of Pervasive Computing Applications

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Overview

- A framework for the construction of VR-Based pervasive computing simulation environments
  - Content creation design flow
  - Generic inter-program connections
  - Distributable runtime environment
  - Accessories for the runtime environment
Tools

- **Capture tools**
  - Tape measure, camera, microphone

- **General Purpose 3D application**
  - Modelling, Texturing, lighting, rendering, animation and basic VRML authoring

- **Image and Video Processing**
  - Texture layout, processing, formats, frame rates and codecs

- **Audio processing**
  - Formats, sample rates, channels

- **VRML/X3D specific tools**
  - Advanced editing and interaction authoring
Media Creation Design Flow

Environment Capture

Measurement Capture → Mesh Construction

Texture Capture → Texture Layout

Audio Capture → Audio Process

Texture Baking

Texture Processing

VRML Authoring

XML-encoded X3D

Asset Assembly

Design Flow

Collation and Deployment

Scripting
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The Graphical Environment
Runtime Environment

- Multi-user VR Environment
- Low Cost Haptics/Head-Tracking/Stereoscopy
- Language Independent System/Hardware Simulations
- Example Interface Simulations
- VRAPTIC Clients e.g. PDAs
Runtime Environment /continued

- Multi-user interactive 3D
  - multiple viewing options, Collaboration or group activities, Versatile use of multiple browser technologies, Flexible media representations

- Language/Platform neutral system/hardware simulations
  - Java, Web pages, System C, Executable UML models

- Interface simulations
  - Java, C++, Web pages, shockwave files

- Low cost I/O
  - Motion capture, Haptics, Stereo viewing

- The VRAPTIC (Virtual Reality Annexed Pervasive Technology Interface Client)
  - Tangible display of virtual interfaces
A VRAPTIC Implementation

- PDA
- Thin Client
  - VNC
- Flexible server
  - X-VNC
    - (display size)
- PDA Connections
  - Blue tooth (via active sync)
  - W-LAN (direct to server)

PocketPC VNCViewer  http://www.cs.utah.edu/~midgley/wince/vnc.html
Inter-program communication

- Socket connections
- Generic Data Types (Strings)
- Standards based VRML/X3D access interfaces (EAI/SAI)
- ECMA Script processing
- Applications
- Web Pages
Conclusion

- Available tools successfully provide the media assets in Standard compliant formats.
- The distributed runtime environment successfully provides the levels of interaction, media playback and simulation processing required.
- The sum of these developments provides a system that is already capable of providing simulation services for many pervasive computing applications, and contributes towards the flexibility of our framework for the construction of VR-Based pervasive computing simulation environments.
Future Work

- DIS/ ViPERS 3D messages
- Load sensing facilities for communication connections
- Distribution of audio rendering task
- XML/SOAP-based framework for underlying pervasive computing simulations
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