A Generic UPnP Architecture for AmI Meeting Rooms and a Control Point Allowing for Integrated 2D and 3D Interaction

Ali A. Nazari Shirehjini

Presenter: Michael Hellenschmidt
Fraunhofer Institute for Computer Graphics
Fraunhoferstr. 5, 64283 Darmstadt
ali.nazari@igd.fraunhofer.de
+49 6151 155208

Ambient Intelligence

The vision:
Ambient Intelligence is the vision of a world where the user is surrounded by a huge amount of smart everyday appliances.
Reality: How to interact with devices?

Existing Solutions, Examples

- CMU's Personal Universal Controller
- Philips iPronto
- Sony InfoPoint
- Nevo, KAMELEON, etc.
3D-Based Environment Manipulation

- Intuitive Orientation within the room
  - Device access
  - Document access
  - Drag&Drop, selection, clicking

Requirements for Automatic UI Creation

- Dynamic creation of 3D-model when entering the room or environment changes (e.g., extension with new devices)
  - Need for Device Discovery
  - Need for Positioning System
  - Need for 3D Objects Database

- Device selection and access
  - Standard devices access interface
  - Addressing devices

- Device transparent media access
  - Finding Content directory
  - Browsing/searching content
  - Transfer of media objects

Dynamic 3D based assistance

Dynamic Device Discovery and Standardized access

Media Management

Environment Control

LOCATION-AWARE UPnP
PRESENTATION ARCHITECTURE
**Universal Plug&Play**

- Widely accepted standard
- Device Discovery
- SOAP-based Control
- Ontologies for some devices available:
  - Light
  - Security Cam
  - AV Architecture: Media Renderer, Media Server
- Many SDKs available
  - Microsoft, Intel, Siemens

**Examples:**

- E.g., UPnP enabled Light
  1. SSDP Device discovery
  2. Provides XML Device Profile
  3. Provides XML Service Profile
  4. Provides Web Service Control Interface

---

**Indoor Positioning**

- Ubisense Smart Space Platform
  - C++ and COM-based Interface
  - Provides events (call-backs) on object movement, e.g. entering a room, leaving an area
- RFID-based positioning
  - User defined regions (Rooms)
  - Position (x,y,z), Orientation
Several devices have been realized yet:
- Lights, Shutters
- VCR, Visualizer, Camera, Video Phone, Audio Mixer
- Projector

Supported document types
- PowerPoint slides (.ppt)
- MP3 files, MPEG movies
- Analog input source as proprietary content type
General Approach for UI Generation

Composition of the UI Model

- Environment Model
  - Room ID
  - Room description
  - 3D Object

- Device
  - Device ID
  - Device description
  - Position
  - Orientation
  - 3D Object (URL)
  - Device Control Services (URL)
Results and Future Directions

- **Location Aware Device Discovery system**
  - Providing UPnP Stub for Devices of diverse Meeting Rooms of our Institute
  - A UPnP Meeting Room Architecture, allowing to model, e.g.:
    - Projectors with embedded media sources
    - External media sources
    - PECo 3D control interface as a usual UPnP Control Point
    - Analog sources and the “A / V cross bar”
    - Media control components (e.g. PowerPoint control, MP3 control)
  - Providing a UPnP based model for other devices (like Shutters)

- **Automatic UI generation and update**

- **First Qualitative Evaluations conducted**

Personal Environment Control (PECo)

© 2005, Fraunhofer IGD
Results and Future Directions

Future work focuses on

- Visual Feedback on PECo (e.g., animating shutter movement on PDA)
- Quantitative User Evaluation (usability Testing)
- Supporting more standards (e.g., EasyLON)
- UPnP implementation tools (for fast integration of PECo within other environments)
- Identifying and supporting other devices (e.g. smart phones)

"THE END"

Thank you for your attention.

Questions?