Digital Interior Spaces (DigiSpaces)

Project proposal to Tekes TILA programme (Dead-line 23.3.2011)

Prof. Charles Woodward
VTT Technical Research Centre of Finland

Background

Mobile Augmented Reality moving to mainstream
- E.g. Layar, Wikitude -> phone manufacturers
- Display hidden information of the surroundings to the user
- Mixed Reality (MR) enabling also user created content and social media: Facebook, Twitter etc.

Big players creating 3D reconstructions of the world
- Google (StreetView), Nokia (CityScene), Microsoft (BingMaps)

Interior spaces still a major challenge
- User locationing accuracy & camera tracking initialization
- Currently only "easy" applications e.g. museums, tracking of paintings

Building Information Models (BIMs)
- Providing databases of information related to our living environments
- Used mainly during construction, but could serve also for building life cycle
Project Goals

Advance the use of building information data
- Brought to user’s immediate access by AR/MR and other means
- 3D models to be utilized in AR/MR localization & tracking
- To serve building’s life cycle management applications

.. Including
- X-ray vision, see behind walls
- Visualizing the building as-built vs. plans
- Renovation work both by tenants and building owner
- Personalized content, cumulating the history of the interior space

... Covering
- Construction related information (BIM, Building Information Models)
- Architectural insight (AIM, Architectural Information Models)
- Feedback method for user created content, social media
- Generalizations to various other application domains

Use Scenario

Manufacturer: XYZ Oy; Cost €€

Partition wall installed dd.mm.yy

Architect’s note: day light from all directions

Geotag, see note under the lamp!

Room’s previous occupant: Mr. X tel 040 444 444

Show elements behind roof panel

Mounting differs from original: see photo

Add new provider to database

Maintenance required dd.mm.yy

Provide affordances to digital information
Applications

Building's life cycle services
- Properties e.g. manufacturer of building elements, windows, doors, lamps etc.
- Visualizing building elements as-built vs. plans
- Hidden elements, constructions behind walls and panels
- Architect's notes, for residence and renovation
- Apartment owner's notes, for future owners
- Plans and scenarios for renovation work
- Maintenance information, time scope for renewal etc.
- Register changes, as required by real estate legislation

Other applications
- Building façade & infrastructure
- Industrial, asset management in factory halls
- Social media, geotagging houses and public spaces
- Artistic applications, digital graffiti
- Others ...

Implementation

Indoors locationing and tracking
- Enabling the users to access hidden digital information by pointing in physical space
- Also enabling user feedback, to annotate and add information by browsing / pointing

Tracking technology
- Based on the underlying 3D representation of the interior space
- Coupled with sensors (e.g. Kinect, compass) & imagery of the interiors

Information display
- Textual, web page style content where applicable
- Augmented reality to display 3D intensive information
- Affordances, indicating what and where information is available

Pilots / platforms
- Skanska new offices at Ruskeasu, using Tekla Structures as 3D platform
- Others, to be agreed, e.g. using Nokia CityScene / Mixed Reality Service Platform
Related Work by VTT

Project AR4BC
- AR visualization of architectural and BIM models, before and during construction
- Incl. 4DStudio system for BIM export & interaction, and as general development platform

Project MMR
- AR on mobile phones, general purpose tracking research
- Client/server tracking solution using mobile phone (tied winner at ISMAR 2010 tracking competition)

Project MWI
- Mixed Reality interaction between Real and Second Life

Project ARSisustus
- Commercial AR solution for interior design (VividWorks)

ALVAR subroutine library
- AR tracking and rendering solutions for various platforms

Project Scope

Duration
- June 2011 – May 2013

Resources
- 32 person months

Budget
- Total 460 k€ / 2 years

Funding
- Tekes 60%, VTT 25%, companies 15%

Research partners
- VTT (coordinator), Aalto University

International co-operation
- DFKI (Germany), as part of EIT ICT Smart Spaces Action Line
Contact

Prof. Charles Woodward
VTT Technical Research Centre of Finland
Vuorimiehentie 3, Espoo, Finland
Tel: +358 40 500 1514

charles.woodward@vtt.fi

http://www.vtt.fi/multimedia

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