Augmented Reality

Talk at Cocoaheads

Aachen, 14.12.2011
Augmented Reality

About Augmented Reality

Impressions from ISMAR

Showcase
Augmenting Reality...

... is not necessarily related to computational AR-applications

Display at a bus stop.

Old-style AR-applications:

Old-style black & white TV-set

Public transportation is a big playground for AR-applications.

Old phone at `Landesbunker NRW’, Urft/Eifel
Augmented Reality

Augmented Reality (AR) is commonly understood only as visual augmentation.

3 steps-procedure:

A registered camera provides images from the real world. A virtual image is rendered accordingly. Both images are composed into one composite image.

Also:

- Haptic augmentation.
- Olfactional augmentation.
Augmented Reality

Terminology

The term was invented by Boeing in the late 80s, early 90s, at the time, and maybe inspired by the movie Top Gun, with Tom Cruise. Other terms: Mixed-, Composed-, Hybrid Reality; or - Virtuality; Hybrids; Hybrid Space, Cybrids etc.

10+ years of silent development, only for insiders. First booth after 2000. Since 2007 common on smart phones.

Explanation:
To become real, it has to be in real time.

Real time, in terms of computational power, was the limiting factor.

See also: History of Mobile Augmented Reality
Milgram Continuum

Paul Milgram and Fumio Kishino: Virtuality Continuum

REAL ENVIRONMENT — MIXED REALITY (MR) — AUGMENTED VIRTUALITY (AV) — VIRTUAL ENVIRONMENT

Source: Giovanni Vincenti
Tracking based AR

as on smart-phones

Pro:

• Affordable with in-built GPS etc.
• Everywhere accessible, deployable etc.

Con:

• Delayed processing
• Images are not really synchronized.
• Appearance is jagged.
Marker based AR

How Marker Tracking Works

Image courtesy Daniel Wagner, T U Graz

Source
Marker and tracking based

Marker based Augmented Reality is usually used indoors, while tracking based AR is used in outdoor environments.

Marker based outdoor solutions are very rare and exotic, especially those large scale markers:

Source: Werner Lonsing
Marker and Tracking based AR

Source: Werner Lonsing

Camera with viewing volume, model and fiduciary feature
Augmented Reality

Impressions from ISMAR 2011
Non-visual AR

Work of Adrian David Cheok (Video):

Kissenger: Kissing machine (Video)

Huggy pajama: Remote hugging (Video, Video)

Liquid interfaces, Lovotics

... and more
lifeClipper3 by Jan Torpus

Setup:
HMD, earphones and backpack
Tracking based.
Outdoor, but needs guidance.
Single user experience

Result:
Unique spatial impressions
in space and time.
Toe Input with Depth Camera and Wearable Projector

by:
Daiki Matsuda, Keiji Uemura, Nobuchika Sakata, Shogo Nishida

see also: wearable projection (CMU)
Architectural Models in Urban Landscapes
Synthesis of Marker and Landscape

Synthesis of real world and virtual model
Technical principles and schematic view of the system.

Requested features:
• The marker provides only one single feature, its size.
• It is both physically and optically tracked.
• The position of a camera must be tracked.

Some physical Representations
Large scale inflatable marker First prototype

Poster presentation at the ISMAR 2011 conference
Basel 2011

Source: Werner Lonsing
Instead of markers the QCAR SDK provides image targets. Images are uploaded, examined and processed. As result a special file is produced, which has to become part of the project.
Showcase

*Dominoes* application with the *Qualcomm SDK*

Source: Qualcomm SDK