

# 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.



Public transportation is a big playground for AR-applications.

Old-style AR - applications:



Old-style black & white TV-set



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:

- Haptical 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 - Virtualiy; 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



Source: Giovanni Vincenti



# Tracking based AR

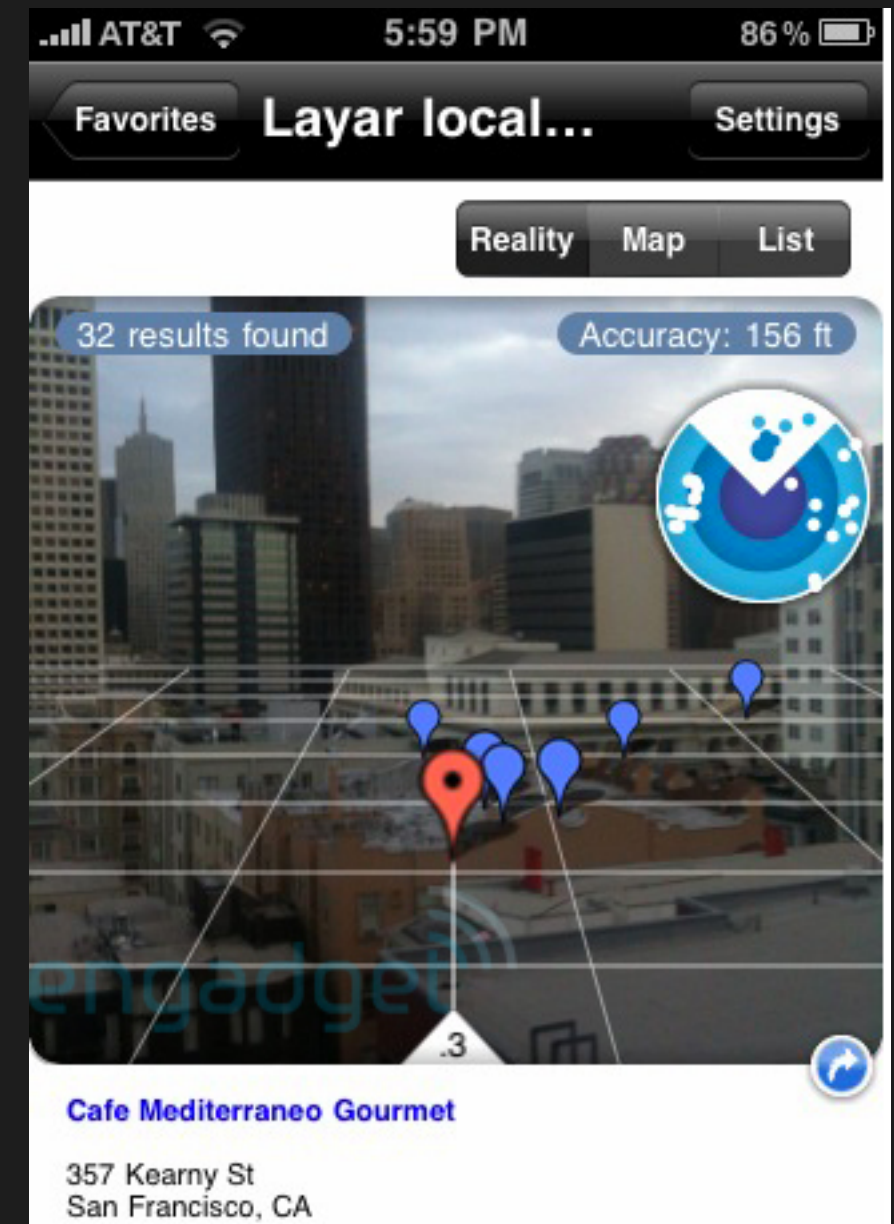
as on smart-phones

Pro:

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

Con:

- Delayed processing
- Images are not really synchronized.
- Appearance is jagged.



Source

# Marker based AR

## How Marker Tracking Works

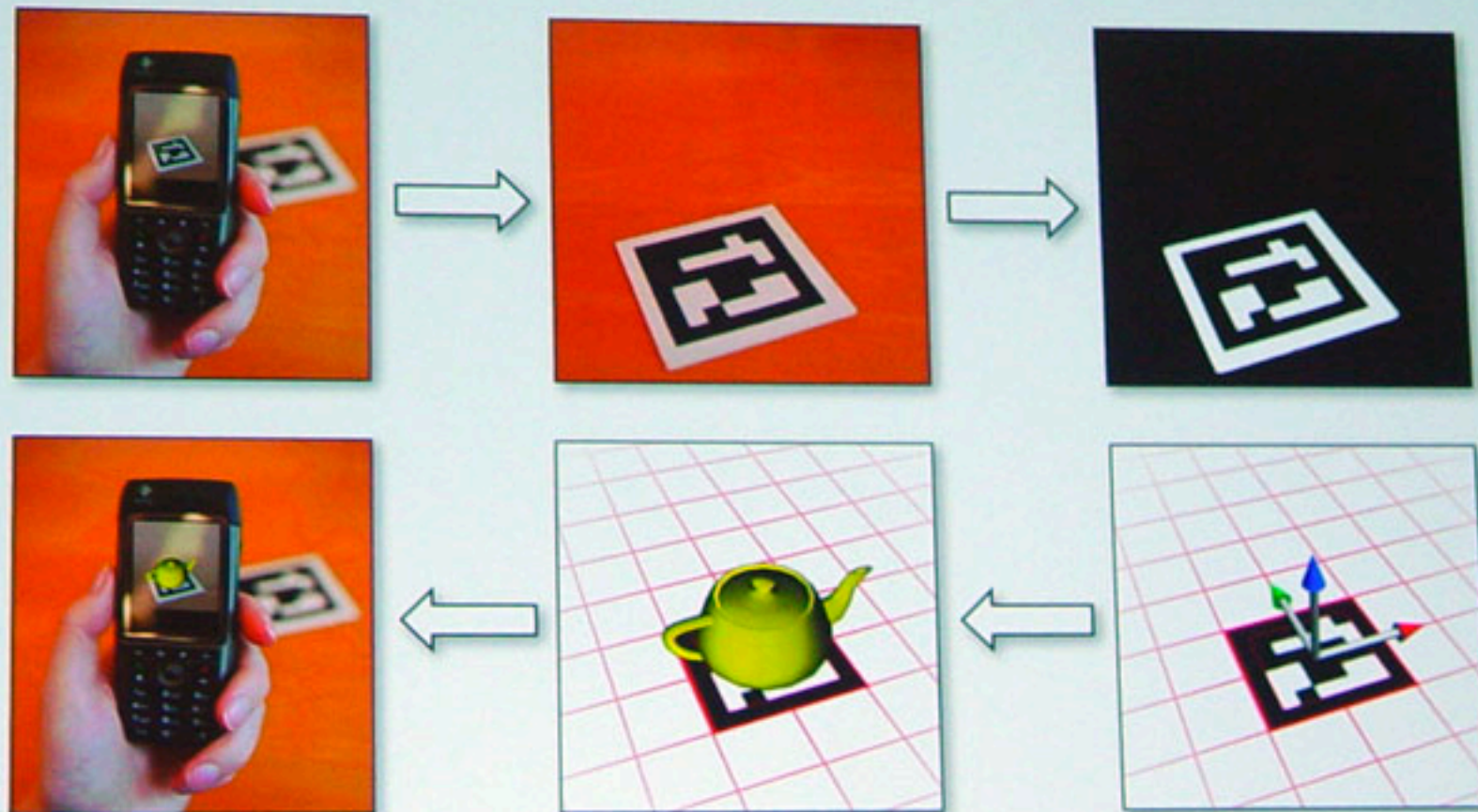


Image courtesy Daniel Wagner, T U Graz

Source



# Marker and tracking based

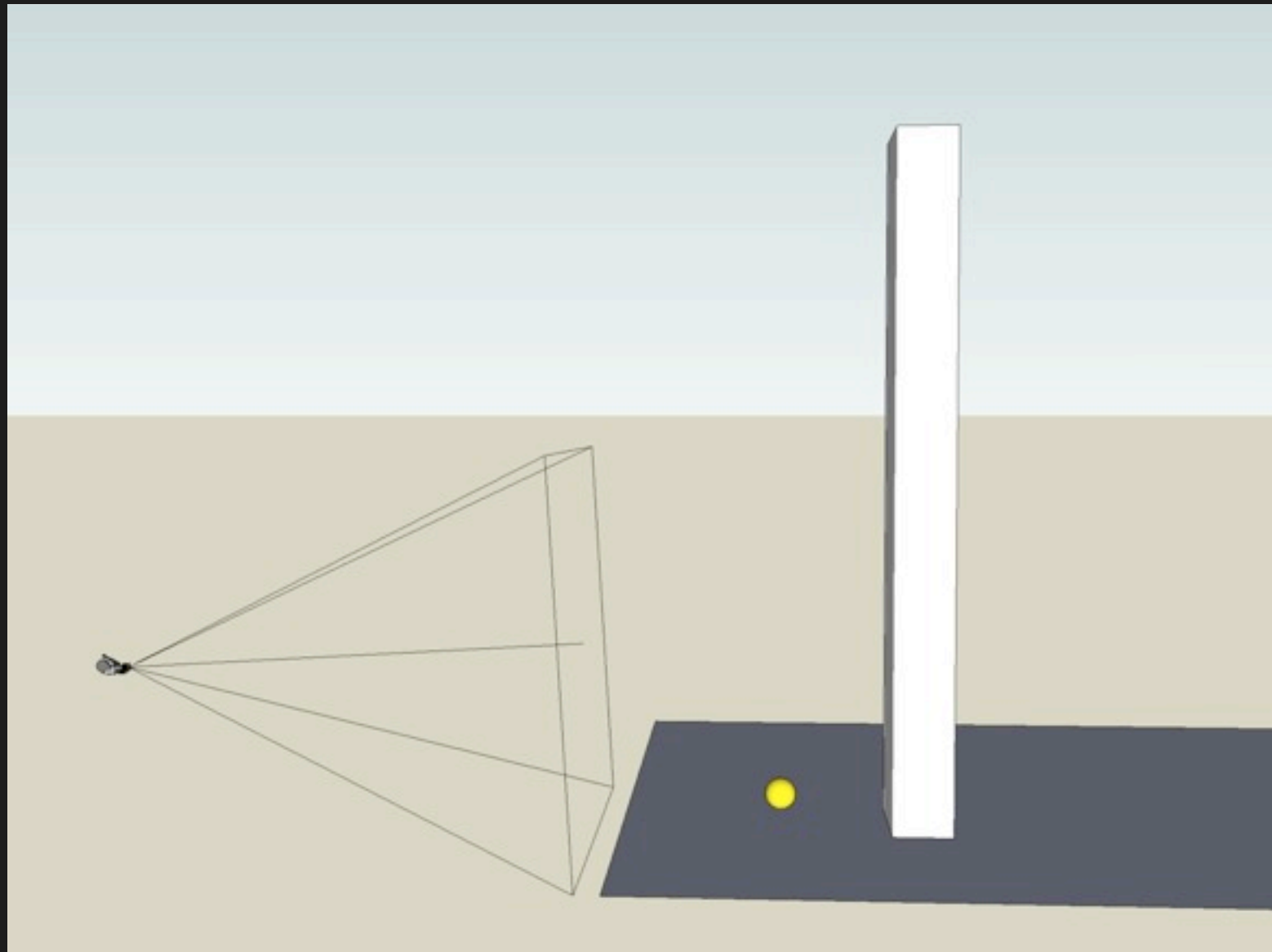
Marker based Augmented Reality is usual used indoor, while tracking based AR is used in outdoor environments.

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



Source: Werner Lonsing

# Marker and Tracking based AR



## Principle Setup

Source: Werner Lonsing

Camera with viewing volume, model and fiduciary feature

USP No. 7,391,424

AR © W. Lonsing 2011

# 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



Source: Jan Torpus

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

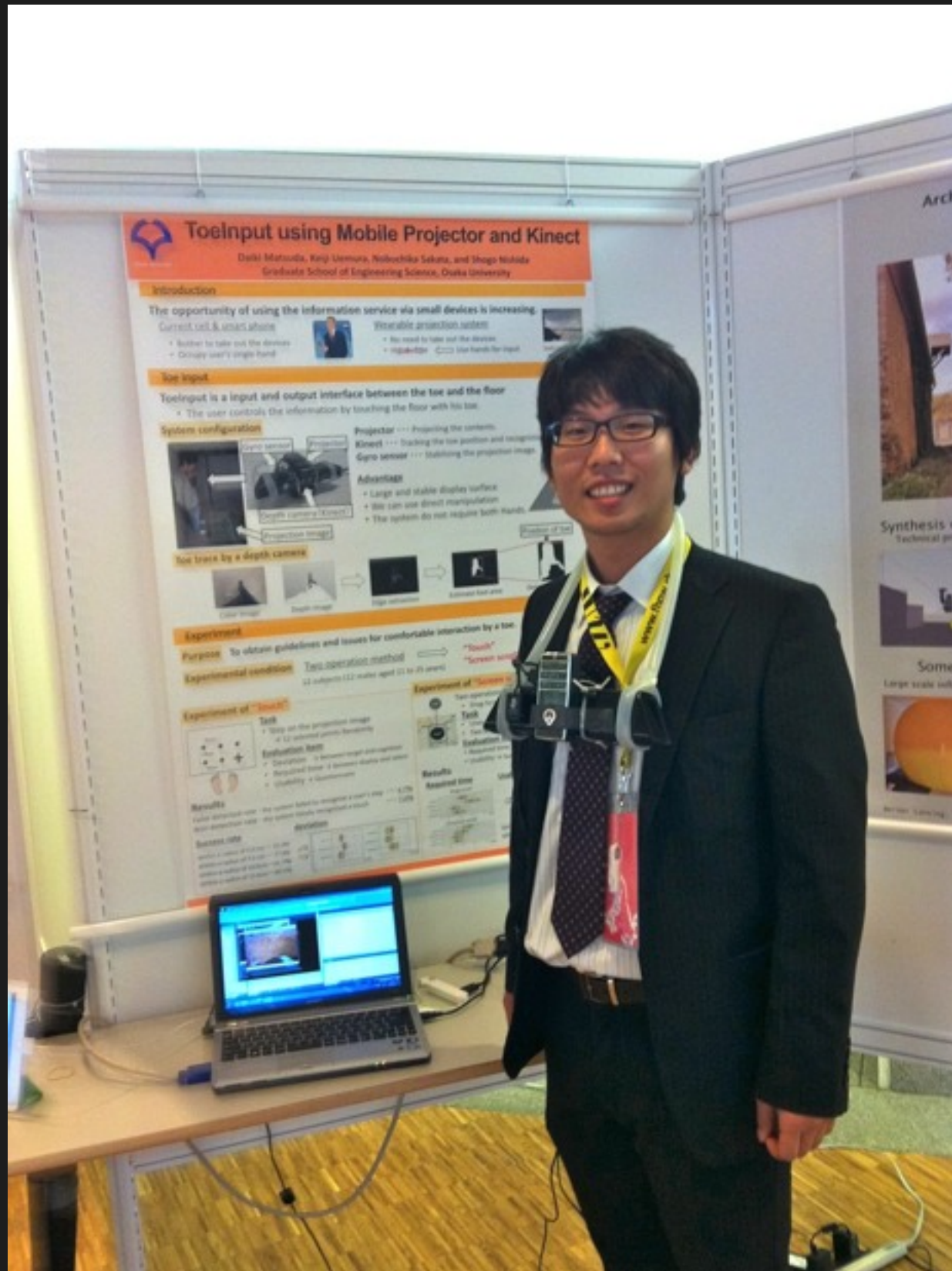


Source: Jan Torpus

**Result:**  
Unique spatial impressions  
in space and time.



# ToeInput



## Toe Input with Depth Camera and Wearable Projector

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

see also: wearable projection (CMU)

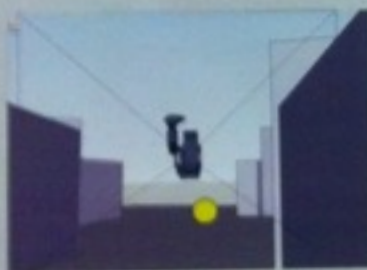


## Architectural Models in Urban Landscapes Synthesis of Marker and Landscape



The spherical marker or simply the ball  
 • marks a POI in a landscape.  
 • is a fiducial feature.  
 • presents lighting references.

### 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.

#### Benefits (as ball or balloon)

- The diameter from all sides is always the same.
- The size of the marker has (almost) no constraints.
- The Marker is flexible and deployable.
- Cameras may have a flexible focal length (zoom cameras).

### Some physical Representations

#### Large scale inflatable marker



#### First prototype



#### References

1. Adams, P. and Lonsing, W.: *Architectural Models in Urban Landscapes*. In: *Proceedings of the 10th International Conference on Computer Graphics and Computer-Aided Design*, pp. 1-10, 2009.
2. Klein, P.: *3D Tracking in Real Time*. In: *Proceedings of the 10th International Conference on Computer Graphics and Computer-Aided Design*, pp. 1-10, 2009.
3. Lonsing, W.: *Augmented Reality in Urban Landscapes*. In: *Proceedings of the 10th International Conference on Computer Graphics and Computer-Aided Design*, pp. 1-10, 2009.
4. Lonsing, W.: *Augmented Reality in Urban Landscapes*. In: *Proceedings of the 10th International Conference on Computer Graphics and Computer-Aided Design*, pp. 1-10, 2009.
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6. Lonsing, W.: *Augmented Reality in Urban Landscapes*. In: *Proceedings of the 10th International Conference on Computer Graphics and Computer-Aided Design*, pp. 1-10, 2009.

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# Poster @ ISMAR



## Poster presentation at the ISMAR 2011 conference

Basel 2011

# Qualcomm SDK

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.



**Weimar: Ansicht von Südosten**  
Aus Merians Topographia Germaniae, Bd.12:  
"Topographia Superioris Saxoniae" (Obersachsen),  
Frankfurt am Main 1650.



**Processing results.**

Source: Werner Lonsing



# Showcase

Dominoes application with the Qualcomm SDK



Source: Qualcomm SDK