



Magic Touch

A Simple

Object Location Tracking System

Enabling the Development of

Physical-Virtual Artefacts

in Office Environments


Thomas Pederson

Department of Computing Science

Umeå University

Sweden

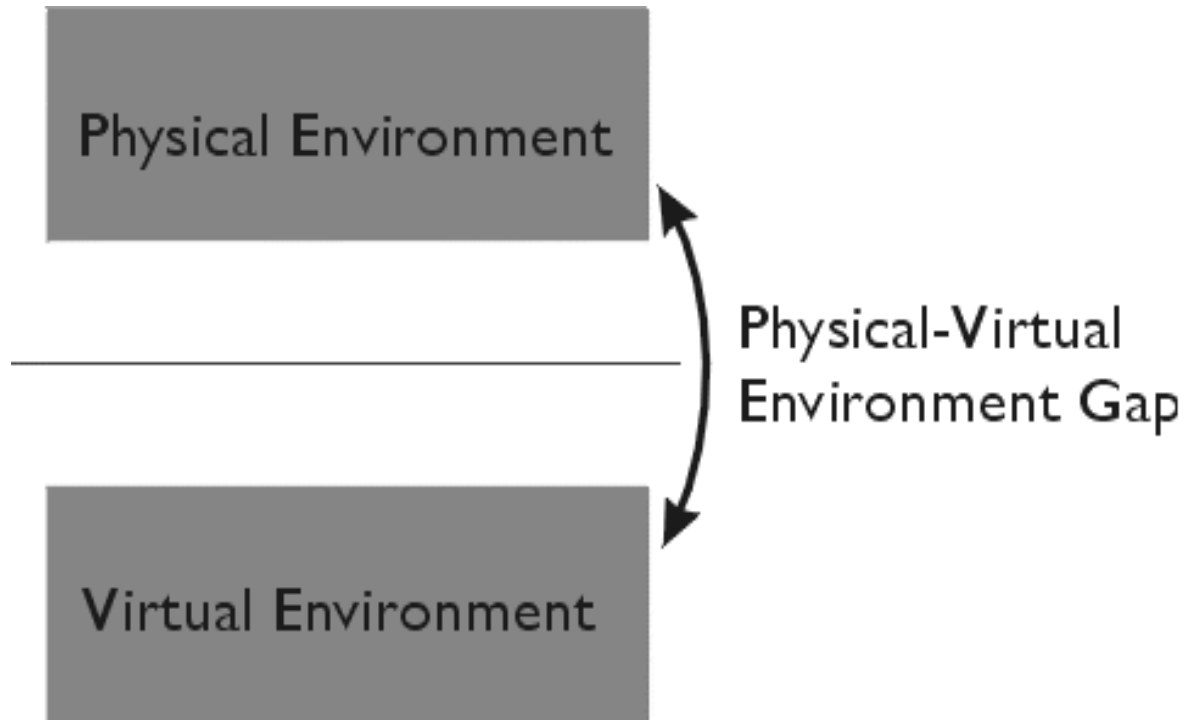
<http://www.cs.umu.se/~top>



Magic Touch: A Simple Object Location Tracking System
Enabling the Development of Physical-Virtual Artefacts
in Office Environments

Background

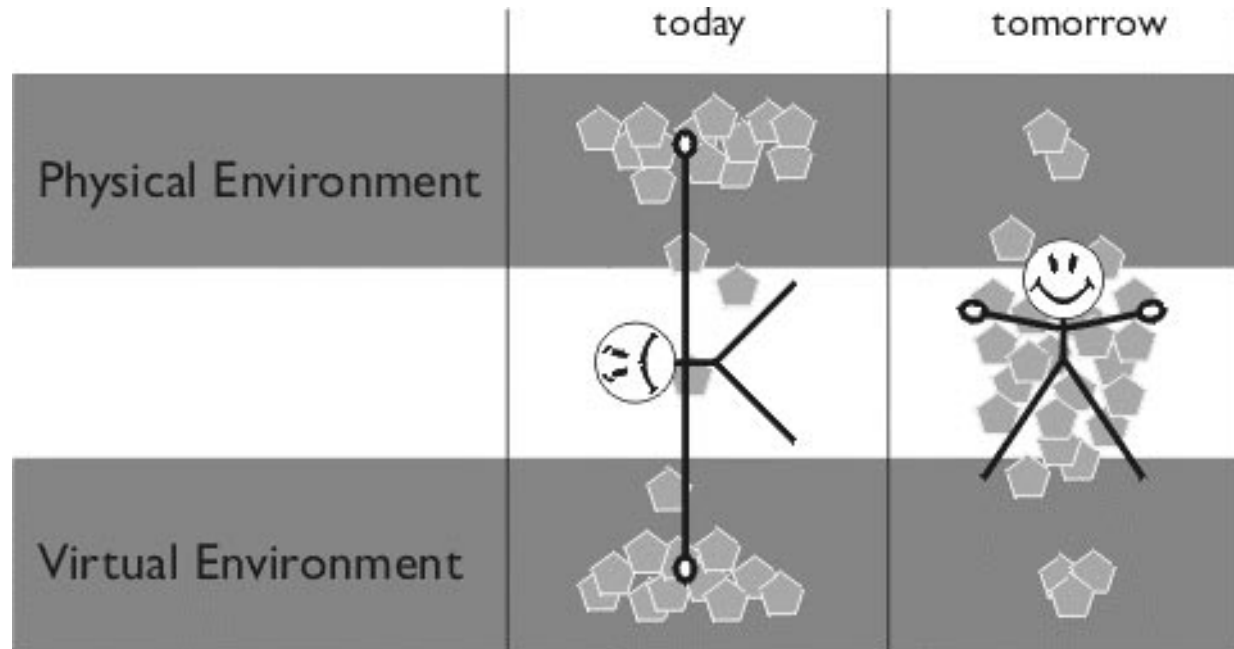
The physical-virtual environment gap



Background

Physical-Virtual Artefacts — bridging the gap (?)

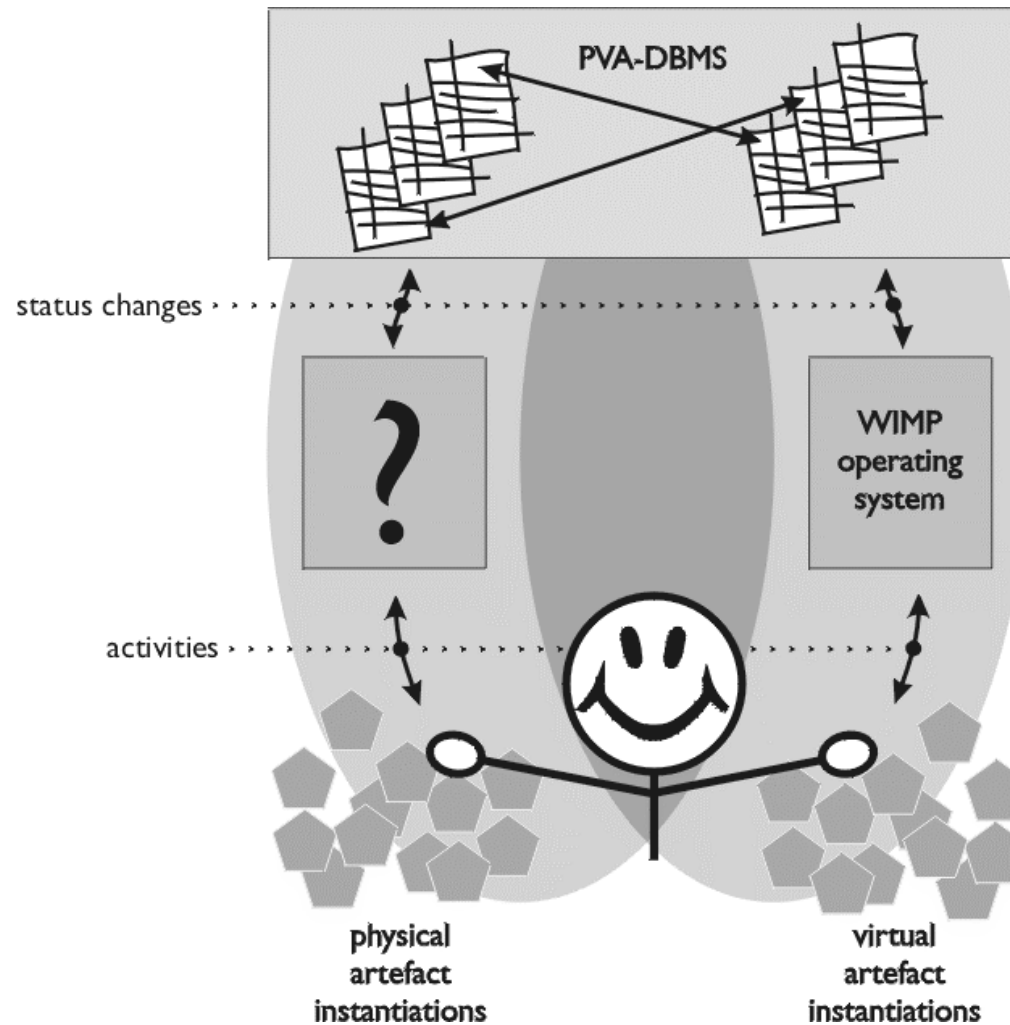
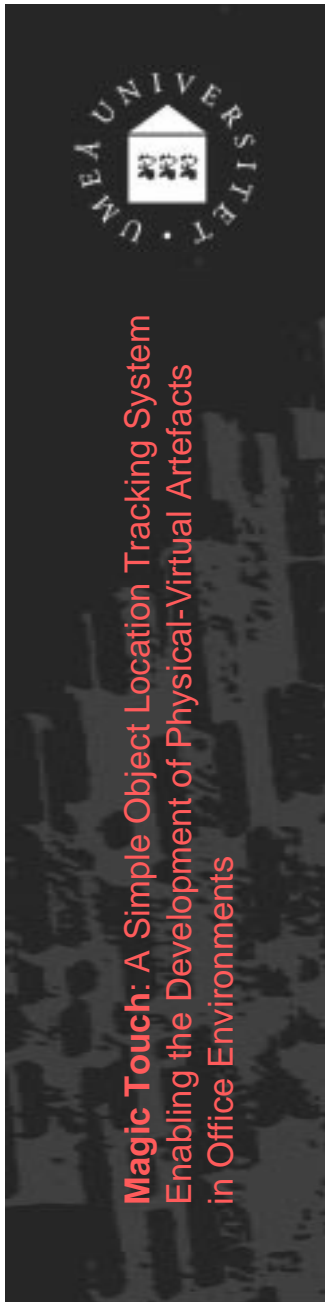
Magic Touch: A Simple Object Location Tracking System
Enabling the Development of Physical-Virtual Artefacts
in Office Environments




(Pederson 1999)

- ◆ A physical-virtual artefact is an abstract artefact that
 - (1) is instantiated in both the physical and virtual environment, where
 - (2) these instantiations to a large extent utilize the unique affordances and constraints that the two different environments facilitate, and finally
 - (3) where one instantiation of a specific physical-virtual artefact is easily identified if an equivalent instantiation in the other environment is known

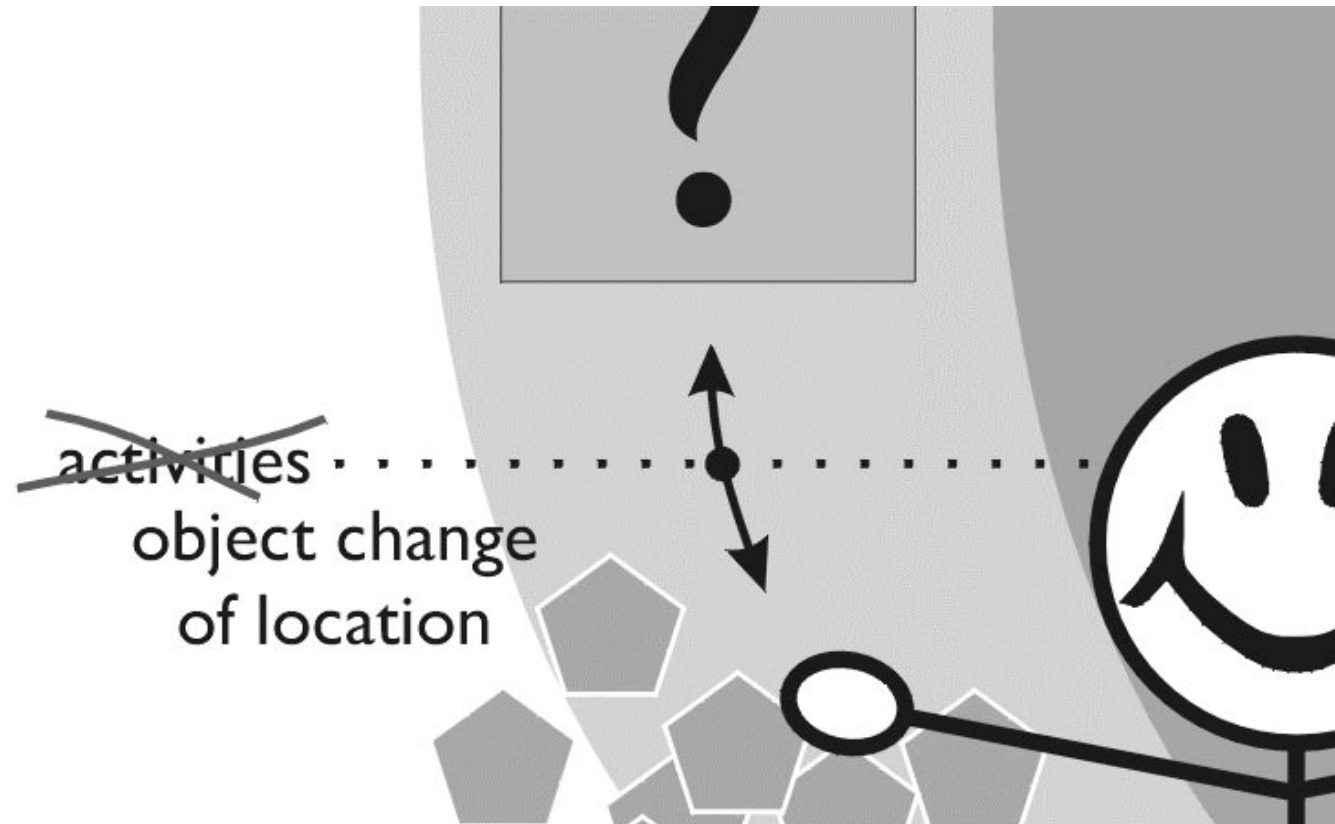
A general system architecture for Physical-Virtual Artefacts



Reducing the problem of tracking user behaviour



Magic Touch: A Simple Object Location Tracking System
Enabling the Development of Physical-Virtual Artefacts
in Office Environments





Magic Touch: A Simple Object Location Tracking System
Enabling the Development of Physical-Virtual Artefacts
in Office Environments

Some possible applications

- ◆ implicit acquisition of user's organisation preferences
- ◆ a physical-virtual search engine
- ◆ a physical-virtual paper basket
- ◆ a physical-virtual mail handler
- ◆ “active volumes”

Some solutions for tracking object location changes

Magic Touch: A Simple Object Location Tracking System
Enabling the Development of Physical-Virtual Artefacts
in Office Environments

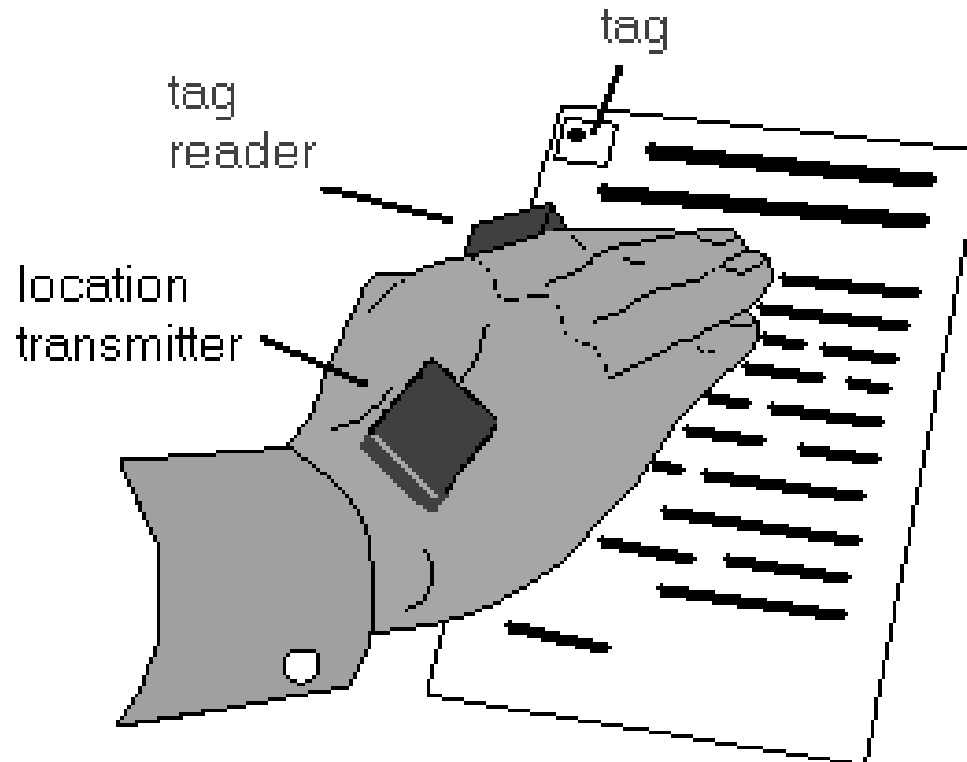
- ◆ let all objects carry position transmitters:
expensive and unwieldy
- ◆ camera in the ceiling, visual tags
(Rekimoto, 1996): free line of sight
necessary, limited tracking area

Major discovery: things don't move by themselves!



- ◆ An object (at least in office environments)
 - (1) stays where it is until the user grabs it in one or two hands,
 - (2) moves the hand(s) to a new location and
 - (3) drops the object.

Magic Touch: human hands as the link between physical and virtual





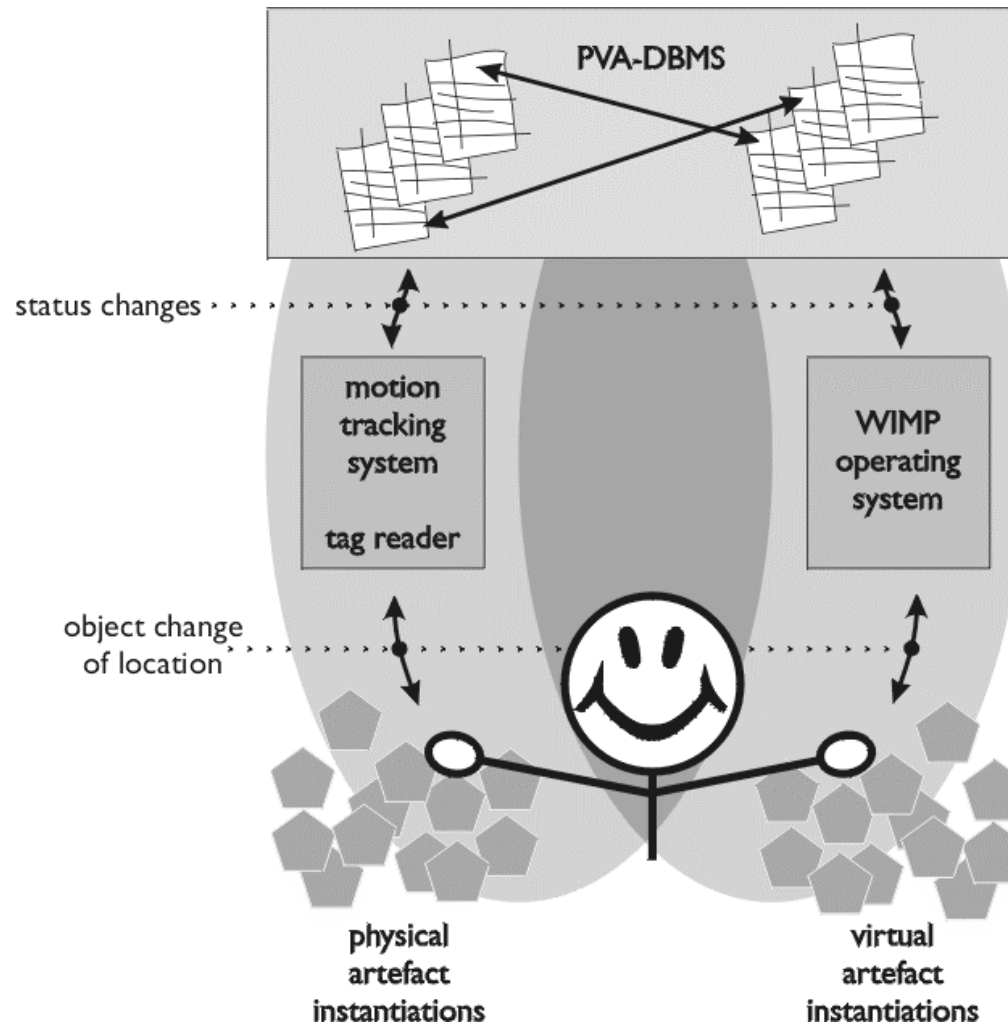
Some assumptions & limitations

- ◆ all objects that are to be tracked have to be tagged
- ◆ no object is allowed to move by itself
- ◆ the user doesn't drop objects "in the air"
- ◆ the user moves only one artefact at a time
- ◆ the position of an object is based on the tag position, one point in space

General system architecture for PVAs with Magic Touch



Magic Touch: A Simple Object Location Tracking System
Enabling the Development of Physical-Virtual Artefacts
in Office Environments





Near future

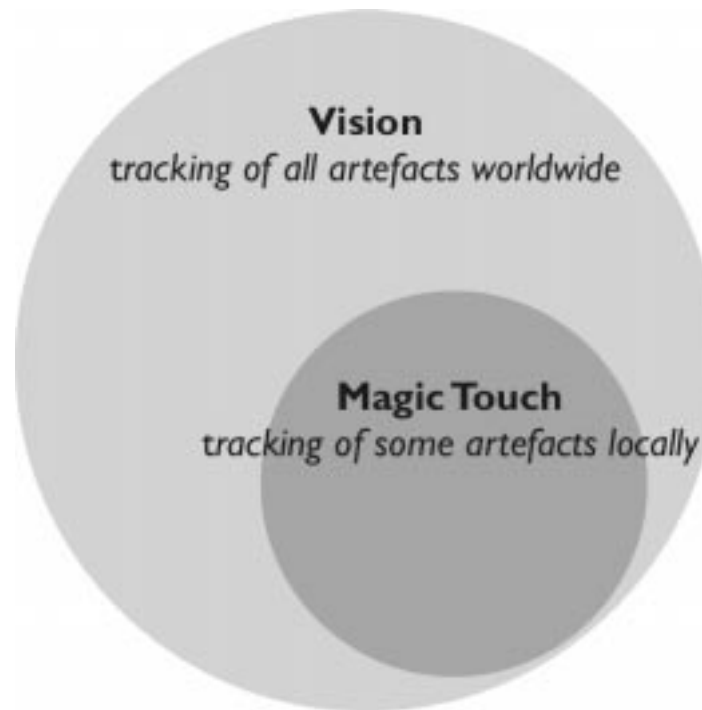
- ◆ prototype system up in June
- ◆ evaluation



Magic Touch: A Simple Object Location Tracking System
Enabling the Development of Physical-Virtual Artefacts
in Office Environments

A bit further ahead

- ◆ expanding the tracking area
- ◆ PVA-DBMS on the Internet - networked physical-virtual environments





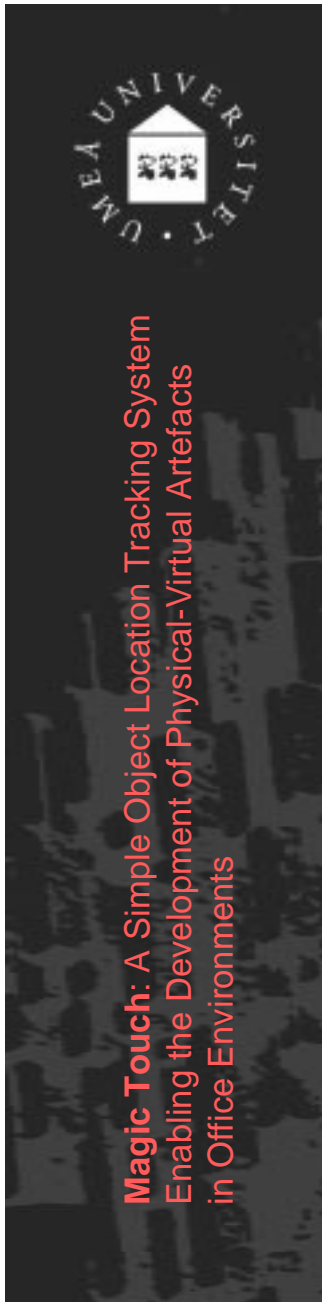
Magic Touch: A Simple Object Location Tracking System
Enabling the Development of Physical-Virtual Artefacts
in Office Environments

Related Work

- ◆ DigitalDesk (Wellner 1993)
- ◆ “Integrating Physical and Computational Media” (Arias, Eden and Fischer 1997)
- ◆ Mackay, et al. 1998, “Augmented Reality Air Traffic Control”
- ◆ Graspable (Fitzmaurice et al. 1995)
Tangible (Ishii and Ullmer 1997) and
Manipulative (Harrison et al. 1998)
User Interfaces
- ◆ RF/ID-tagged objects (Want et al. 1999)

Open questions related to situated interaction (1)

- ◆ Wearable virtual environment: How should the virtual environment be presented to and altered by the user when the user is moving around all the time.
- ◆ User modeling based on physical actions: How do we best make use of the information we acquire?



Open questions related to situated interaction (2)



- ◆ Which office activities involve bridging the physical-virtual environment gap today?
- ◆ Which of these activities could be facilitated by the introduction of sufficient Physical-Virtual Artefacts?



Magic Touch

A Simple

Object Location Tracking System

Enabling the Development of

Physical-Virtual Artefacts

in Office Environments

Thomas Pederson

Department of Computing Science

Umeå University

Sweden

<http://www.cs.umu.se/~top>