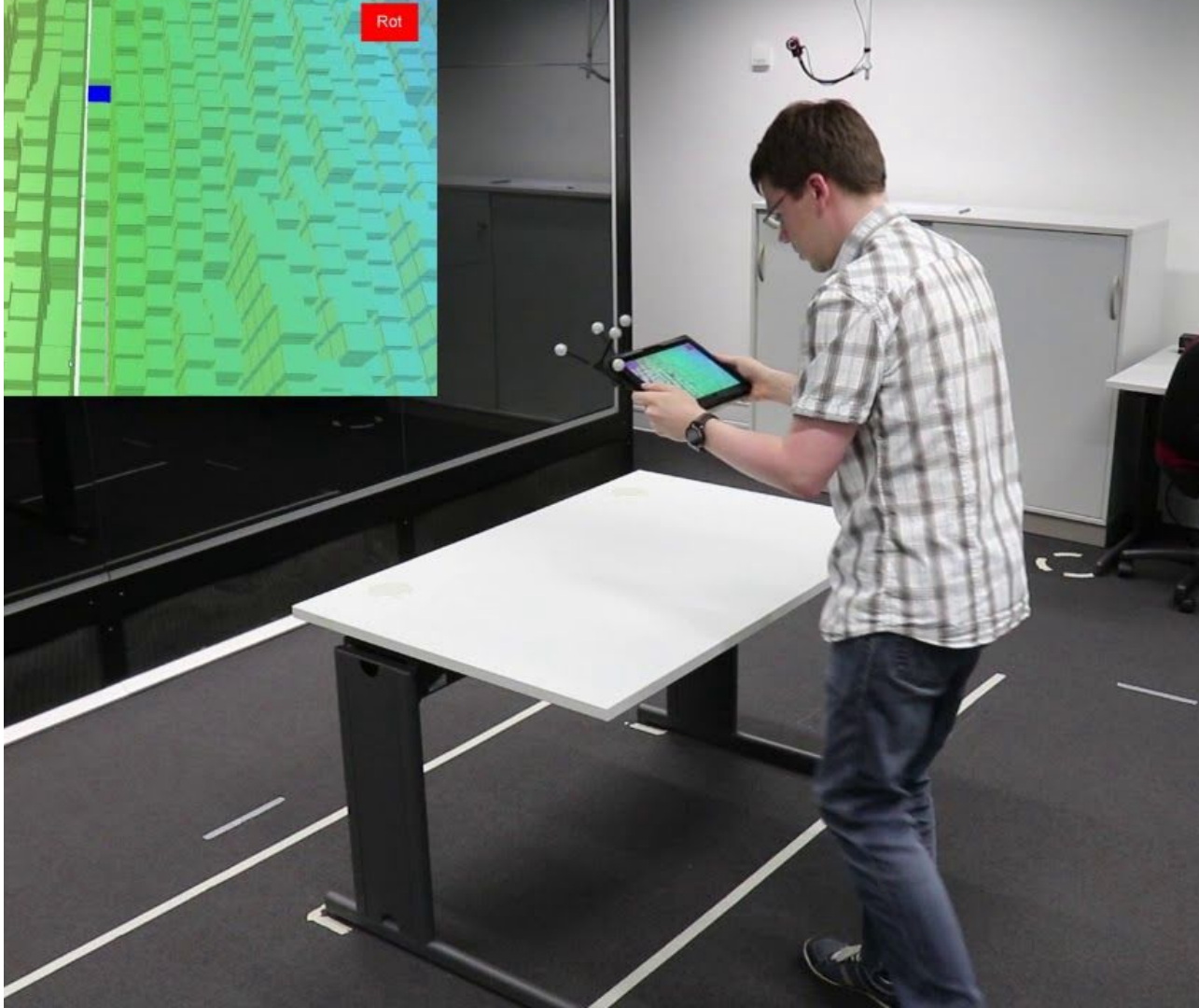
Investigating the Use of Spatial Interaction for 3D Data Visualization on Mobile Devices



3D visualisation challenges:

1. Misleading Perspective
2. Occlusion
3. Interaction

Mixed reality

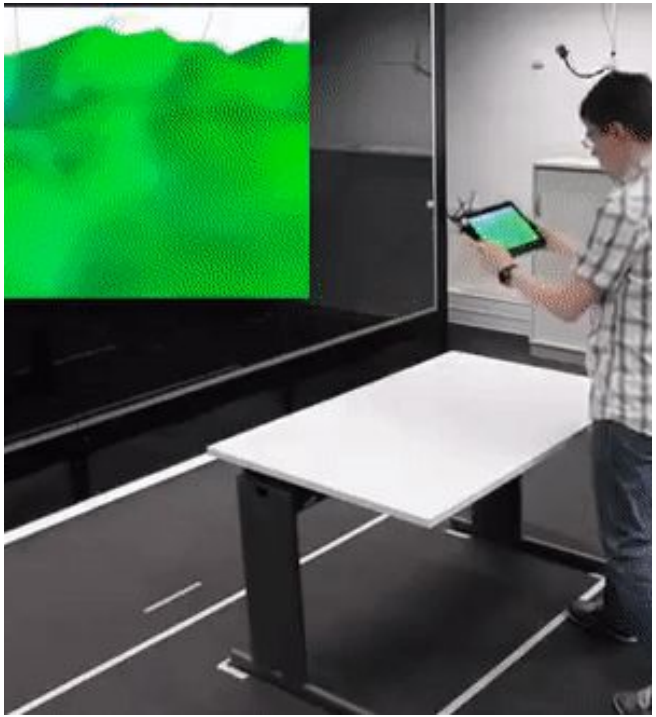
- 3D content
- Situated data semantic concentration to a physical location
  Non-traditional devices with new interaction paradigms and special interaction

How does it its contribution as related to immersive analytics?

Spatial Interaction is one of the key advantages of **mixed reality** solutions compared to more traditional inputs.

Devices and locations mapped with the virtual camera.

User moves and explores the visualization



It cited Immersive Analytics

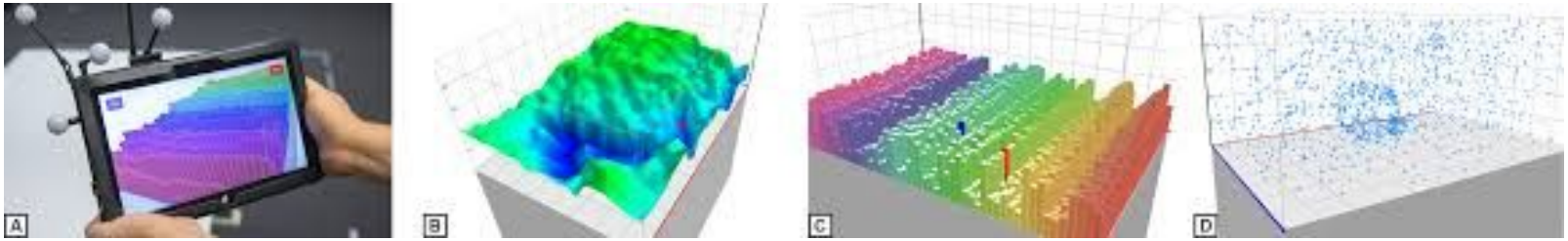
Recent trend in visualization community, revival of 3d visualization.

New style of data visualization using new technology with phone or tablet.

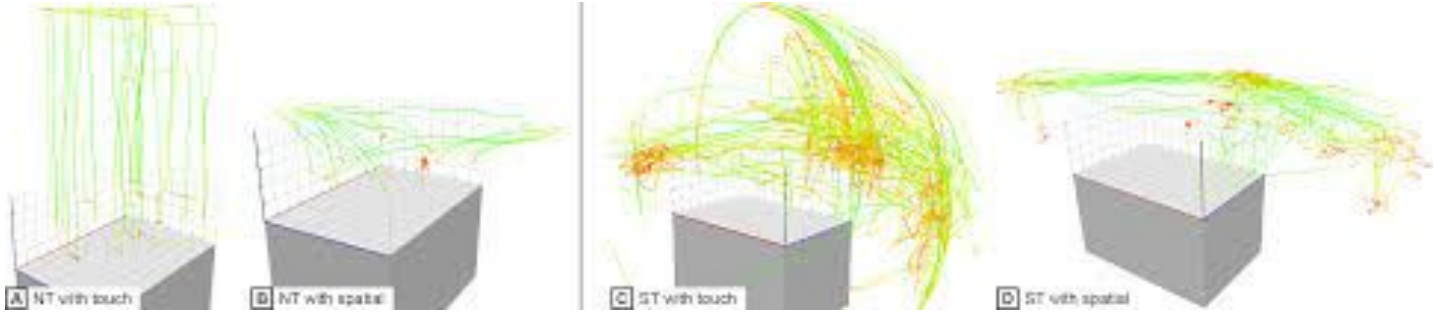
Research questions:

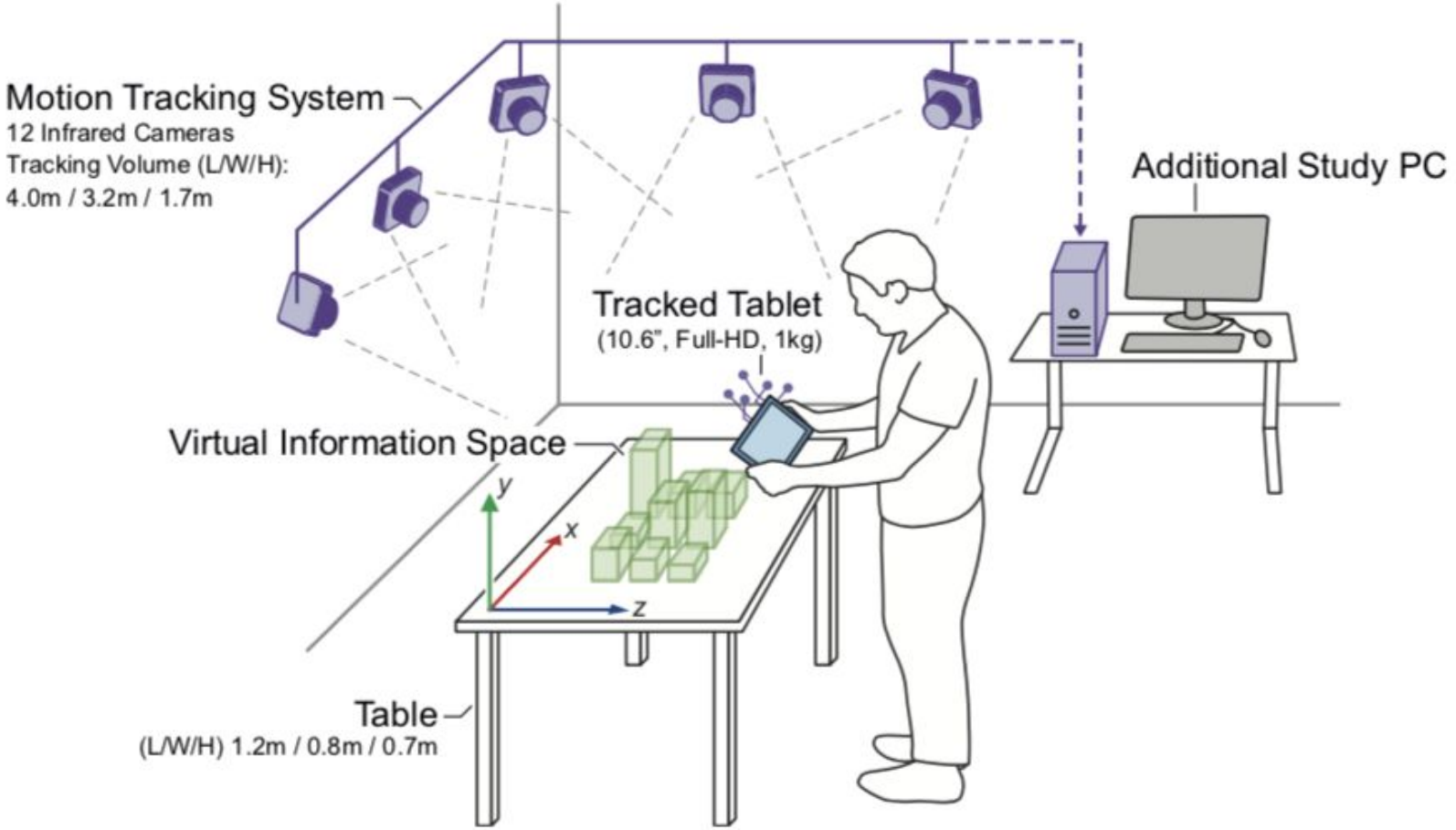
What are the beneficials of the spatial interaction?

3 Vis in different tasks : **Navigation** / **comparison**/ **Structural understanding**



They compared the **spatial interaction** & **touch input** for 3D data visualization




Motion Tracking System
12 Infrared Cameras
Tracking Volume (L/W/H):
4.0m / 3.2m / 1.7m
Additional Study PC
Tracked Tablet
(10.6", Full-HD, 1kg)
Virtual Information Space
y
x
z
Table
(L/W/H) 1.2m / 0.8m / 0.7m

Result of using the Spatial Interaction for Data Visualization

- Physical demand higher for spatial interaction
- Better feeling of controlling camera
- Spatial interaction preferred by most users
- Lower mental demand and stress level for navigation task
- More memorable and more engaging (Spatial than touch)
- Weight of devices and tracking was criticise
- Spatial was faster,
  Limitations:
- Mixed reality might benefit the 3D visualization
- Spatial interaction is a promising paradigm

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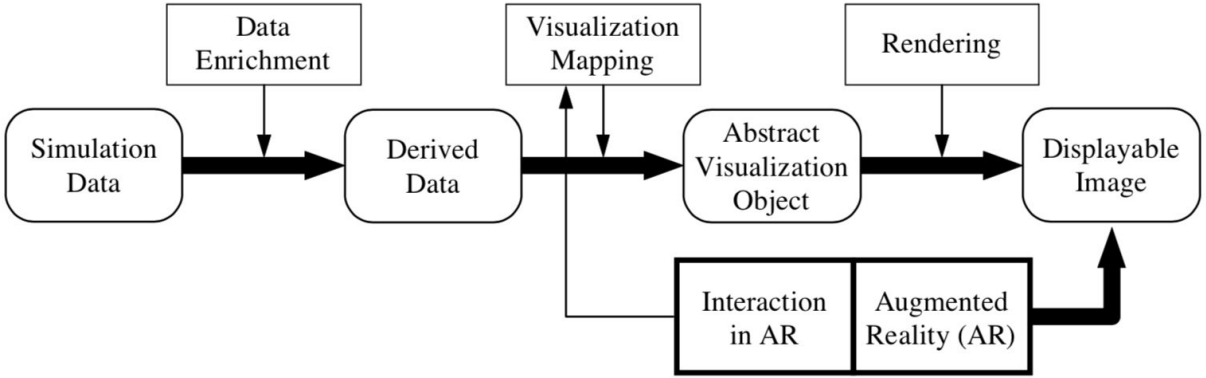
“Studierstube”: An environment for collaboration in augmented reality

This paper combined

AR : which has potential broad range for scientific vis, medicine and surgical planning, education, training and etc.

And to provide insight into a complicated problem by the enrichment of simulation data, that is mapped and rendered to a displayable image.



Scientific visualisation needs different backgrounds

Efficient collaboration requires that each researcher has a customized view of the data set.

AR can cover requirements.
Combination of the real and virtual world.

Compared to **immersive VR**, **AR** allows the use of detailed physical models, The properties of which cannot be met by their virtual counterparts.

Approaches

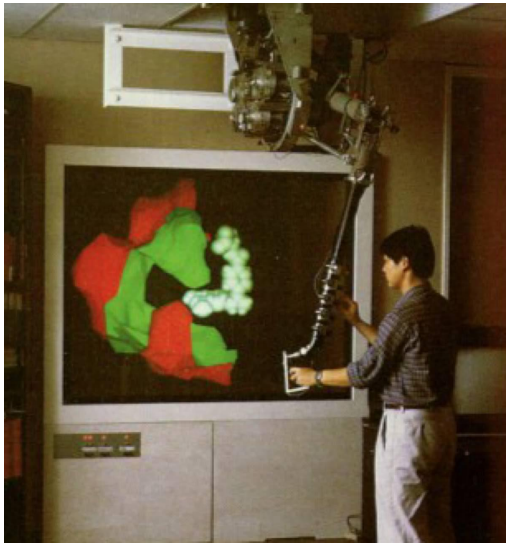
Combination of a **physical world workspace** and an **augmented environment**

for **multiple users** in **three dimensions**

With augmented user interface that supports **natural handling of complex data at interactive rates**

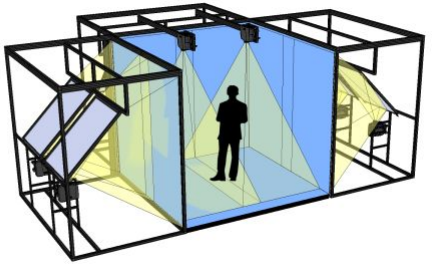
Similar

Ivan Sutherland



GROPE project
haptic arm-like device and a large stereo display for The visualization and manipulation of the chemical data.

BOOM device and data glove as interaction tool.



Cave and interactions observe the augmented environment from different viewpoints.

Properties of our system

Virtuality

Augmentation

Multi-user support

Properties of our system

Independence

Sharing vs. Individuality

Interaction and Interactivity

- **This collaborative augmented environment setup supporting interactive scientific visualization** for multiple users.

- This system provides **3D display of synthetic data and augmentation of physical objects** with geometrically aligned information.

- Co- workers wear position and orientation tracked see-through head mounted displays, allowing independent choice of viewpoint.

- Interaction is performed using the Personal Interaction Panel, a two-handed interface for augmented reality.

- Direct exploration and modification in visualization provides improved insight in complex problems.


magnetic tracker
view HMD#1
view HMD#2
3D-mouse
virtual object

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Virtual Reality Journal

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