

# Spatiality and Semantics – Towards Understanding Content Placement in Mixed Reality

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## Motivation & Basic Idea

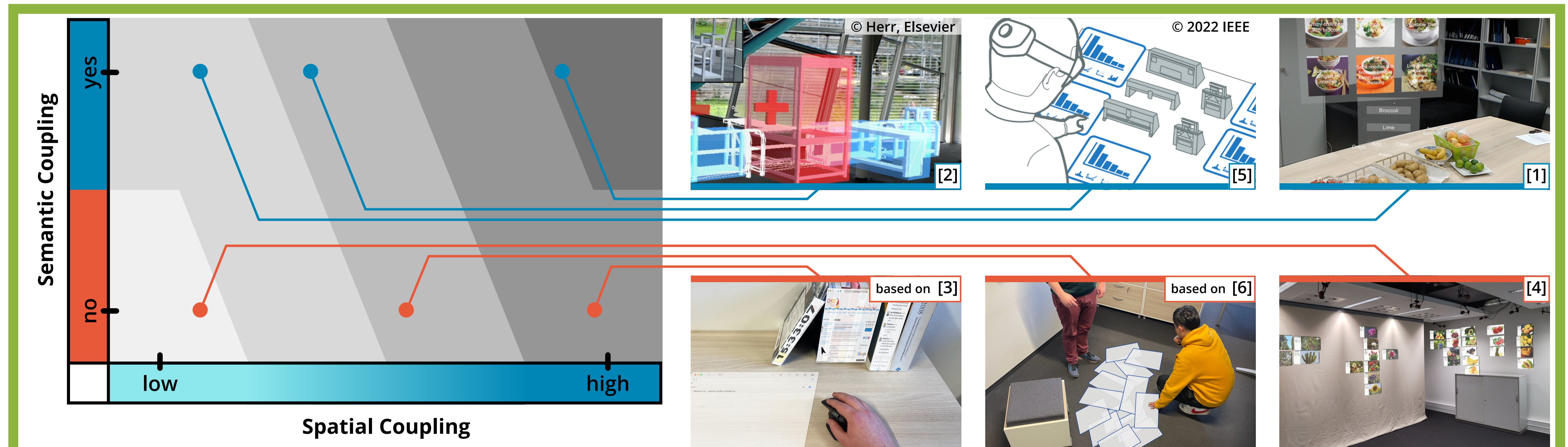
Mixed Reality (MR) popularizes numerous applications and enables virtual content spatially integrating into physical environments. We investigate:

- ▶ How do environmental properties affect content placement and perception?
- ▶ What are the relations between virtuality and reality for content placement?

We present a **two-dimensional design space** (see Fig. 1) which establishes the relation between the characteristics of spatial and semantic coupling of Mixed Reality (MR) content organization. This design space is based on:

- ▶ A preliminary study (N = 8) on how physical surfaces affect organizing virtual content
- ▶ Small scale literature research

## Design Space for MR Coupling



**Fig. 1:** Schematic of the two-dimensional design space, highlighting important points (left side) and categorizing exemplary literature (right side), like [1-6]. The gray gradient within the design space illustrates the perceived unity, with a darker color corresponding to a higher value of “unity”.

### Spatial Coupling

The **geometric alignment** of virtual content to physical objects in the situated environment, embodied by their spatial attributes. While the position is likely the first step for intensifying *Perceived Unity*, other attributes should also be considered.



### Semantic Coupling

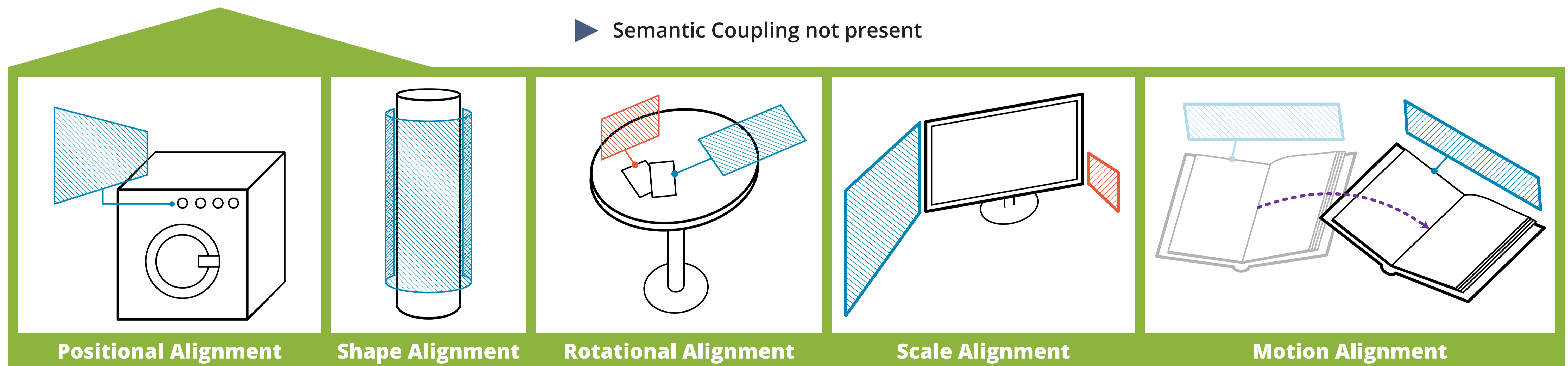
The **presence of informational meaning** (e.g., data source, related concepts) between virtual objects and the objects in the immediate environment. In the current state, we define the *Semantic Coupling* as binary:



### Perceived Unity

The state of **forming a complete and harmonious whole** from one or several (i.e., a group of) virtual contents and physical objects in the content's environment, similar to being perceived as “belonging” to each other or being embedded into those objects.

- ▶ Semantic Coupling present
- ▶ Semantic Coupling not present



## Future Work & Outlook

We wish to inspire design guidelines and suggest promising research directions:

- ▶ The effect of contextual real-world objects or content on surfaces on placement decisions within our design space
- ▶ Balancing the *Perceived Unity* (esp. *Spatial Coupling*) with other important factors, like user-friendliness or readability

- ▶ Other forms of the *Semantic Coupling*, e.g, tertiary or continuous
- ▶ Investigating to what extent a change in *Spatial* or *Semantic Coupling* affects the *Perceived Unity* in detail

### References

- [1] Büschel et al., 2018. “Here and Now: Reality-Based Information Retrieval”.
- [2] Herr et al., 2018. “Immersive Modular Factory Layout Planning using Augmented Reality”.
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- [4] Luo et al., 2022. “Where Should We Put It? Layout and Placement Strategies of Documents in Augmented Reality for Collaborative Sensemaking”.
- [5] Satriadi et al., 2022. “Augmented Scale Models: Presenting Multivariate Data Around Physical Scale Models”.
- [6] Schmidt et al., 2015. “Ergonomic Interaction for Touch Floors in Augmented Reality”.



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