Dimensions as Structural Phenomena: An Informational Ontology

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Abstract:
This paper argues that dimensions are not merely abstract spatial or temporal coordinates but emerge as structural features organizing informational flow. Without internal structure, dimensions cannot be distinguished or meaningfully identified. Dimensions are thus modes of structural differentiation, realized through boundaries and resolutions within information networks. This perspective reframes dimensionality as an emergent, relational property dependent on the organization of information, rather than a fixed backdrop for phenomena.

1. Introduction: Rethinking Dimensions

Conventional views treat dimensions as fundamental, independent axes or measures—length, width, height, and sometimes time. These dimensions are often considered absolute containers within which events unfold or objects exist. However, this view struggles to explain how dimensions acquire meaning or identity in the absence of relational or structural features.

This paper proposes a structural perspective: dimensions are emergent properties arising from how information is organized, bounded, and resolved within systems. Without structure, different dimensions collapse into an indistinguishable undifferentiated expanse.

2. The Role of Structure in Defining Dimensions

Structure refers to the organization and patterning of information within a system. It includes boundaries, hierarchies, differentiation, and relationships. Dimensions gain identity only when structure imposes constraints or distinctions that separate one mode of information flow from another.

For example, consider a perfectly uniform, unbounded space with no variation or pattern. Within this space, no “directions” or dimensional axes have meaning because nothing distinguishes one direction from another. Structure provides the “handles” through which dimensions become perceptible and definable.

3. Dimensions as Modes of Differentiation

Dimensions can be understood as different modes or layers of structural differentiation within information. Each dimension corresponds to a distinct way in which information is organized and resolved.

The first dimension may represent simple linear distinctions.

The second dimension introduces planar relations and orthogonal differentiation.

Higher dimensions encode more complex structural patterns, such as temporal ordering or multi-directional dependencies.

These modes are not fixed coordinates but emergent organizational states within an informational network.

4. Informational Resolution and Dimensional Boundaries

Drawing from theories of observation and resolution, a dimension’s identity is tied to the event of resolution: the collapse of uncertainty within a structured observer or system.

Each resolution marks a boundary, a distinct “surface” where information flow is differentiated. Dimensions arise at these boundaries, as distinct informational modalities become identifiable and stable.

Thus, dimensions are not pre-existing axes but outcomes of structural collapse events within information flow.

5. Implications for Understanding Space and Time

This structural view implies that space and time are not containers but emergent from networks of informational flow and resolution. The “directions” of space correspond to different structural modes, and time is the shape of sequencing resolutions.

This explains why different observers or systems might experience dimensionality differently, as each has unique structural configurations defining their dimensional frames.

6. Conclusion: Dimensions as Emergent Structural Realities

Dimensions are best understood as structural phenomena arising from how information is organized, bounded, and resolved within systems. They are relational and emergent, dependent on the presence of structure to differentiate and define them.

Without structure, dimensions lose meaning and collapse into indistinguishable unity. Recognizing dimensions as structural deepens our understanding of reality as an informational network shaped by flows and resolutions.