Fundamental Interaction Language

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Chapter 1

Foundations and Semantic Constants

1.1 The Information–Observation–Language (I–O–L) Triad

Modern knowledge systems reveal a recurring motif: comprehension requires only the *differences* between two bodies of knowledge, not their entirety. We formalise this with the **Information–Observation–Language triad**

$$(\mathcal{I}, \mathcal{O}, \mathcal{L}) = (\mathcal{I},\ \mathcal{O},\ \mathcal{L}), \tag{1.1}$$

where $\mathcal{I}$ denotes possible information states, $\mathcal{O}$ the set of admissible observations, and $\mathcal{L}$ the symbolic language capable of encoding both. Minimal "bridges" between domains are implemented by Local Language Constructors (LLCs), treated in Chapter **??**.

1.2 Foundational Postulates

Postulate F1 (Semantic locality). Any act of communication factors through a finite sub-language $B \subseteq \mathcal{L}$ such that $E \otimes B \cong \mathcal{L}$, with E the receiver's existing language fragment.

Postulate F2 (Minimal bridges). Among all such B, natural communication selects one that minimises $|B|$.

Postulate F3 (Hierarchical union). Languages compose by hierarchical union and the semantic density ρ is non-decreasing under this union.

1.3 Semantic Constants

We introduce two universal constants:

c_s the *semantic light-speed*, bounding information propagation in a knowledge graph:

$$d_G(v_1, v_2) \;\leq\; c_s\,\Delta t. \tag{1.2}$$

$\hbar_s$ the *semantic Planck constant*, appearing in an uncertainty relation between discovery and invention operators:

$$\Delta D\,\Delta I \;\geq\; 12\hbar_s. \tag{1.3}$$

Convenient units set $c_s = \hbar_s = 1$; deviations measure complexity.

1.4 Road-map

This chapter establishes notation for the remainder of the book. Chapter **??** develops the geometric view (c_s as cone slope), Chapter **??** derives global limits from Eq. eq:sem-uncertainty, Chapter **??** treats drift and masks, and Chapter **??** links the constants to physical information bounds.

Take-away. The triad $(\mathcal{I}, \mathcal{O}, \mathcal{L})$ and constants $(c_s, \hbar_s)$ provide an irreducible substrate on which all higher FIL structures are built.