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Definition

Entelopy

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Entelopy is the informational quantity that measures a system's capacity to perform directed state-change through the closure of its internal-model-driven feedback loop. It is the rate at which an entelenomic system can convert symvironmental information into coherent adaptive state-change, given its current internal models and the closure of its symvironmental loop.

Provisional formal definition:

$$\mathbf{Ent}_i(t) = \boldsymbol{\kappa}_i(t) \cdot \mathbf{I}_i(t) \cdot \mathbf{C}_i(t)$$

where, for system i at time t:

- $\boldsymbol{\kappa}_i(t)$ is predictive coherence (the alignment between the system's internal models and symvironmental dynamics; $0 \leq \kappa \leq 1$)
- $\mathbf{I}_i(t)$ is the mutual information between the system's internal state and the next-step symvironmental state (Shannon, in bits)
- $\mathbf{C}_i(t)$ is a closure index (the fraction of the system's state changes that feed back into its own next-step inputs; $0 \leq C \leq 1$)

Entelopy is positive when prediction is accurate, internal state carries information about the symvironment, and the loop is closed. It collapses to zero when any of the three factors vanishes: no prediction ($\kappa = 0$), no informational coupling ($I = 0$), or no loop closure ($C = 0$).

Units: bits per unit time, weighted by dimensionless coherence and closure. In the long run, entelopy has the same dimensions as Shannon information flow.

Direction: Entelopy increases when the system improves its predictive grip on the symvironment within a closed loop; it decreases when the loop opens, when prediction degrades, or when the symvironment becomes unpredictable. Unlike entropy, entelopy is not monotonic in isolated systems; it is a measure of ongoing informational work, not of disorder or order alone.

doi.org/10.32388/HBR6B1

Pseudo-energy interpretation: Entelopy plays a role in entelenomic systems analogous to free energy in thermodynamic systems: it is what gets "spent" when a system performs directed state-change. A system with high entelopy has informational work available to it; a system with low entelopy is informationally exhausted, regardless of its thermodynamic state.

Declarations

Potential competing interests: No potential competing interests to declare.