Discussion on Nibbler Algorithm and Fractal Knowledge Graphs

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1 Introduction

This document compiles discussions between Paolo Pignatelli and Grok 3 on the Nibbler Algorithm, fractal knowledge graphs, and their unification with physical laws, based on *main9.pdf*, *.tex* file, *Nibbler1.pdf*, and *Nibbler_Discussion1.md* (May 15–19, 2025). New sections address the primordial Nibbler and Learning-to-Learn (L2L).

2 Primordial Nibbler Algorithm

The primordial Nibbler (*Nibbler1.pdf*) transforms $P_0 = \{T_1, T_0\}$ into P_1, operating on an FL Field via observation operator O. Constants include $\hbar_{\text{lang}} = \hbar \cdot \log_2 2$, $\tau_0 = t_P$, $c_{\text{obs}} = c$.

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Algorithm: Primordial Nibbler
Input: FL Field I, O, P_0 = {T_1, T_0},  _lang ,  _0 , c_obs, G = (V, E
   , F),   ,  _M0 ,   , F_max
Output: P_1, G, K_meta
1. Initialize O_0 =    , P_s = P_{0,rules}, V = {T_1, T_0}, E =
2. Observation: O(I)     K_observed = {o_k = <t_1, ..., t_L> | t_j
   P_0, L = 2}
   a. O_0     O_0     {o_k | E(o_k)       _lang }
3. Verification: V_0(o_k) = TRUE if stable for  _0  and E(o_k) > 0
4. Recognition: k_P = exp(-H(o_k)/H_max), k_D = E(o_k)/<E(context)>
   a. O_{0,recognized} = {o_k | V_0(o_k) = TRUE and k_N(o_k)       }
5. Extraction: Cluster O_{0,recognized}, assign S_A to p_A if count(p_A
   )       _M0
   a. P_1     P_1     {S_A}, G: V     V     {S_A}, E     E     {(v_i,
      S_A)}
6. L2L: O_internal(I_internal)     K_meta, update Ops_1
7. If  H (K_meta) <  _lang  / (k_B T), solidify P_1
8. Return P_1, G, K_meta
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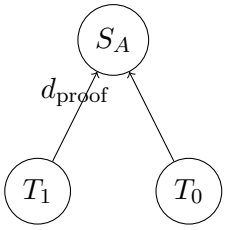
3 Fractal Knowledge Graphs

Fractal graph $G = (V, E, \mathcal{F})$:

- Nodes: T_1, T_0 ($F(v) = 0$), S_A ($F(v) = 1$).
- Edges: Operator transitions, $w(e) = \hbar_{\text{lang}}$.
- $D_f = \lim_{\epsilon \to 0} \frac{\log N(\epsilon)}{\log(1/\epsilon)}$.



4 Learning-to-Learn

L2L uses O_{internal}:

$$O_{\text{internal}} : I_{\text{internal}} \to K_{\text{meta}}, \quad k_{\text{meta}}(m, K_{\text{meta}}) = \frac{\Delta H(\text{patterns}|m)}{\hbar_{\text{lang}}}.$$

Halting: $\Delta H(K_{\text{meta}}) < \frac{\hbar_{\text{lang}}}{k_B T}$.

5 Simulations

Computed D_f for graphs ($|V| = 50, 100, 200$), $P(v^*) \propto \exp\left(-\frac{d_\pi(v^*,V)^2}{D_f}\right)$ for $S_A \in P_1$.

6 Speculative Connections

Holographic principle: $I_{\text{FIL}}(S_A) \leq \frac{A_{\text{entity}} E(S_A)}{4\hbar_{\text{lang}}^2} \ln 2$. Cognitive parallels: FIL vs. neural networks.

Acknowledgments

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A Quantum Information Linguistics Syllabus

- Week 1–2: FIL and LLC (*main9.pdf*, Sections 3–4).
- Week 3–4: Fractal Graphs and Primordial Nibbler.
- Week 5–6: L2L and Operator Evolution.
- Week 7–12: Quantum Correspondences, Applications.