Noetic Morphisms

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Abstract

In March of 1845 Gauss described the conception of an action at a distance, propagated with a finite velocity, the natural generalization to electrodynamics view of Newtonian force. Unsuccessfully, Wheeler and Feynman attempted a new theory for Absorber in 1945 [9]. In their paper there is a detailed reference provided by Prof. Einstein about a relatively unknown physicist named Hugo Tetrode[10,11] and quoted: "*The sun would not radiate if it were alone in space and no other bodies could absorb its radiation... If for example I observed through my telescope yesterday evening that star which let us say is 100 lights years away, then not only did **I know** **that the light which it allowed to reach my eyes was emitted 100 years ago, but also the star or individual atoms of it knew already 100 years ago that 'I', who then did not even exit, would view it yesterday evening at such and such time***..."[11]. The process by which the verb "knew"occurs is modelled by the **Noetic** morphisms of the **arr**(**Decay**) Arrow Category. However this treatise is not about energy emission absorption in nature, rather about their mechanism of information knowledge exchange to make the emission possible. This treatise and its categorical constructions, Universal Properties and symbols pave the way for grammars and functions and operators and Formal Systems (algebras, calculi) of de novo programming languages to describe the nature of specific Emitter Absorber coupling.

Keywords: Wheeler Feynman 1945 paper, Emitter Absorber, Hugo Tetrode, Simplex category, Decay category, Arrow category,

1.1 Background

- Construct a **Simplex Category** with **Label operator** for each morphism and call it the **Serial** category
- **String Term Rewriting** for all morphisms of **Serial** [2, 3]
- Assume the successive/nested compositions of the **morphisms reduces the Komplexity** [Appendix A] of each morphism
- Call this the **Decay** category
- Finally define the Arrow of **Decay** category denoted by **Arr**(**Decay**) and its natural dual the **Arr**($\mathbf{Decay}^{\mathbf{op}}$)
- an object a of **Arr**(**Decay**) is a morphism $E : \hat{x} \longrightarrow x$ of **Decay**
- a morphism $(\boldsymbol{E} : \hat{x} \longrightarrow x) \longrightarrow (\boldsymbol{A} : \hat{y} \longrightarrow y)$ of **Arr**(**Decay**) is a commutative square in **Decay**
- composition in **Arr**(**Decay**) is given simply by placing commutative squares side by side to get a

commutative oblong

- E, A, ν and τ (Fig 1.1.1) are fixed morphism symbols used with certain assumptions as will be detailed later
- $\hat{\blacksquare}$ symbols with hats ^ are to be in the same configuration as below, this convention is necessary for ease

(Fig. 1.1.1)

$$\begin{tikzcd}
\hat{x} \arrow[r, "\nu"] \arrow[d, "E"'] & \hat{y} \arrow[d, "A"] \\
x \arrow[r, "\tau"] & y
\end{tikzcd}$$

1.1.2: Imagine the **Decay** category as a **graph** with **edges stand for the loss of information** per one transmission/edge. Moreover, imagine that an edge requires construction with a cost (integer quantity) that is precisely the amount of loss. The Categorification is to generalize the concept of finite length ordered sequences of integers. The said order is generalized by the Category of **Simplex**. The information quantities are computed as **Kolmogorov Complexity** (Komplexity) of finite integer sequence(s) with the **algebra of Big-*O*** notation [7,8].

1.2 Lexicon

E: **Emitter**, Sender, Server, Master (sample words to give an impression about usage of symbol E)

A: **Absorber**, Receiver, Client, Slave (words for A matching E's meaning)

ν : **Noesis** , morphism that contains information/**knowledge about the morphism E**. This knowledge is in the String format subject to grammar of a Formal System or Formal Language and part of the morphism's String Term Rewriting systems.

Definition 1.2.1: We say a morphism is **Noetic** if it contains **Explicit** and **Serialized** information or knowledge about Category's objects, morphisms, functors, Formal Systems, Formal languages, String Term Rewriting, diagrams and algebraic components. This information is either contained in its source object or target object or within the String Term Rewriting system.

Definition 1.2.2: **Explicit** and **Serialized** information or knowledge refers to actual words formed by tokens of the Labeling operator of the Category Serial and used by the String Term Rewriting systems.

τ: **Transmission**, raw word transmission which is to serve as Komplexity [Appendix A] made available to the morphism A, as fuel, for morphism A to spend to construct all the other/nascent morphisms in commuting square.

τ^{op}: **Noesis**, morphism that its Image contains information/**knowledge about the morphism A**

The functor **cod** : **Arr**(**Decay**) $\mapsto$ **Decay** is given on objects by the codomain (= target) map, and on morphisms it gives the lower arrow of the commutative square.

(Fig. 1.2.3)

$$\mathbf{cod}: \quad \begin{tikzcd} \hat{x} \arrow[r, "\nu"] \arrow[d, "\mathbf{E}"'] & \hat{y} \arrow[d, "\mathbf{A}"] \\ \mathbf{x} \arrow[r, "\tau"] & \mathbf{y} \end{tikzcd} \quad \mapsto \quad (x \xrightarrow{\tau} y)$$

2.1 Etymology: noesis, noetic, noema

noesis
Learned borrowing from Ancient Greek *νόησις* (nóēsis, “concept”, “idea”, “intelligence”, “understanding”), from *νοεῖν* (noeîn, “to intend”, “to perceive”, “to see”, “to understand”) (from *νοῦς* (noûs, “mind”, “thought”), from *νόος* (nóos)) + -*σις* (-sis), suffix forming nouns of action.

In computing, **noesis** means **to Serialize information or knowledge**.

Information: examples data arrays/matrices, functionals and so on but specific to a morphism.

Knowledge: valid words in a Formal Language or valid expressions in a Formal System as analytical expressions about a morphism, discrete **finitely serialized words** and expressions (See also 2.1.2).

noetic
Being of the type of noesis, being of knowledge form or behaving like one.

noema
Information and knowledge exclusively for one morphism, **noemata** for multiple morphisms.

Remark 2.1.1: The reader might wonder why all such fuss about the nomenclature? The words "knowledge" and "information" are highly overloaded with unnumbered many general or vague definitions yet this treatise requires a narrowly focused definition of finitely serialized data attachments to certain components of a category.

2.1.2 finitely serialized data: note that the word "finite" was placed between serialized instead of before data! We can have data that is infinite in nature and only its finitely serialized form can take part in computations. Example: Real function Sin()'s output is infinite on its description since the Real number Sin(x) expressed in say a Taylor series requires infinite terms to compute/describe. Yet the Sin(x)'s **finitely serialized** description computation is available given the addition of a **finite number of Taylor series terms**. This simple concept is the core essence of all Formal Deformation theories.

2.2 Quanta: Kolmogorov Complexity

The noesis' quantity is of positive integer type.

The noesis' unit is length (L) as in the length of the shortest program [Appendix A] that outputs a particular information (Label attached to a morphism).

The noesis' algebra is of **Big-*O* notation** type [7,8]. See also Appendix A , A3-A11.

Quantal: from Latin Quant meaning "having quantity" (1580s), the suffix -al meant "of the kind of" and in this treatise "of the kind of positive integers".

Remark 2.2.1: Quantal in this treatise is not aimed for any relations to Quantum Mechanics! If any, would be of latent and unintended nature.

2.3 Noetic Properties

- noesis is not acquired and generally not computable; it is a given; it appears in a String Term Rewriting as a natural part of its components e.g. initial tokens on the Tape. This incommutability is due to the fact that Komplexity [Appendix A] is not a computable function:

Properties 2.3.1: General noesis of a morphisms Label is uncomputable.
Proof: Directly follows from the Kolmogorov Complexity being uncomputable. □

However it is possible for certain subsets of noetic words to compute their noesis for given size. For example the noesis of size $O(1)$.

● noesis of size $O(1)$ indicates a simple program of constant size which practically copies/reads and pastes/writes the tokens from one location to another on the same Tape, or between two Tapes.

3.1 ν : noesis

In category of **Arr**(**Decay**) for every object $E \in$ **ob**(**Arr**(**Decay**)) and morphism $\tau \in$ ***hom***(**Decay**) .

Tetrode[10,11] and quoted: “The sun would not radiate if it were alone in space and no other bodies could absorb its radiation... If for example I observed through my telescope yesterday evening that star which let us say is 100 lights years away, then not only did **I know that the light which it allowed to reach my eyes was emitted 100 years ago**, but also the star or individual atoms of it knew already 100 years ago that ‘I’, who then did not even exit, would view it yesterday evening at such and such time…”

The verb “know” is ν morphism:

(Fig 3.1.1)

$$\begin{tikzcd} \hat{x} \arrow[r, "\nu"] & \hat{y} \arrow[d, "A"] \\ & y \end{tikzcd}$$

ν morphism’s noesis is the knowledge transmitted from the past to the future in **Arr**(**Decay**) .

transmitted from the past to the future: this English language phrase is nonsensical, unless we attach to it the semantics of (Fig 3.1.1) categorical diagram. Then the verb **transmitted** alongside the nouns **past** and **future** have meanings. The article “the” is used for specificity of “past” referring to E and “future” to A.

3.2 τ^{op} : noesis

In category of **Arr**(**Decay**) for every object $E \in$ **ob**(**Arr**(**Decay**)) and morphism $\tau \in$ ***hom***(**Decay**) .

Tetrode[10,11] and quoted: “The sun would not radiate if it were alone in space and no other bodies could absorb its radiation... If for example I observed through my telescope yesterday evening that star which let us say is 100 lights years away, then not only did I know that the light which it allowed to reach my eyes was emitted 100 years ago, but also **the star or individual atoms of it knew already 100 years ago that 'I', who then did not even exit, would view it yesterday evening at such and such time**…"

The verb "knew" is $\tau^{\mathbf{op}}$ morphism:

(Fig 3.2.1)

$$\begin{tikzcd} \hat{x} & \\ x \arrow[u, "E^{op}"] & y \arrow[l, "\tau^{op}"'] \end{tikzcd}$$

$\tau^{\mathbf{op}}$ morphism's noesis is the knowledge transmitted from the future to the past in **Arr**(**Decay**$^{\mathbf{op}}$) .

transmitted from the future to the past: this English language phrase is nonsensical, unless we attach to it the semantics of (Fig 3.2.1) categorical diagram. Then the verb **transmitted** along side the nouns **future** and **past** have meanings. The article "the" is used for specificity of "future" referring to A and "past" to E.

Appendix A: Kolmogorov Complexity

Definition A.1: The Kolmogorov Complexity $C_{\mathcal{U}}(x)$ of a string x with respect to a universal computer (Turing Machine) $\mathcal{U}$ is defined as

$$C_{\mathcal{U}}(x) = \min_{p:\mathcal{U}(p) = x} \ell(p)$$

the minimum **length** program p in $\mathcal{U}$ which outputs x.

Therefore we assign the dimension L of length to the said Complexity integer (A.1.1).

Komplexity is shorthand for the Kolmogorov Complexity.

Theorem A.2 (Universality of the Kolmogorov Complexity): *If $\mathcal{U}$ is a universal computer, then for any other computer $\mathcal{A}$ and all strings x,*

$$C_{\mathcal{U}}(x) \leq C_{\mathcal{A}}(x) + c_{\mathcal{A}}$$

where the constant $c_{\mathcal{A}}$ does not depend on x.

Corollary A.3 : $\lim_{\ell(x)\to\infty} \frac{C_{\mathcal{U}}(x) - C_{\mathcal{A}}(x)}{\ell(x)} = 0$ *for any two universal computers.*

Remark A.4: *Therefore we drop the universal computer subscript and simply write C(x).*

Theorem A.5: $C(x) \leqslant \ell(x) + c$.

A string x is called incompressible if $C(x) \geqslant \ell(x)$.

Definition A.6: Self-delimiting string (or program) is a string or program which has its own length encoded as a part of itself i.e. a Turing machine reading Self-delimiting string while knowing when exactly when to stop reading the tape.

Definition A.7: The Conditional or Prefix Kolmogorov Complexity of self-delimiting string x given string y is

$$K(x \mid y) = \min_{p:\mathcal{U}(p,\, y) = x} \ell(p)$$

The length of the shortest program that can compute both x and y and a way to tell them apart is

$$K(x,\, y) = \min_{p:\mathcal{U}(p) = x,y} \ell(p)$$

Remark A.8: *x, y can be thought of as concatenation of the strings with additional separation information.*

Assume Prefix K:

Theorem A.9: $K(x) \leq \ell(x) + 2 \log \ell(x) + O(1), \quad K(x \mid \ell(x)) \leq \ell(x) + O(1)$.

Theorem A.10: $K(x,\, y) \leq K(x) + K(y)$.

Theorem A.11: $K(f(x)) \leq K(x) + K(f)$, f is computble function

Let's assume the Prefix Kolmogorov Complexity from now on and further assume K(x) = l(x) while assuming l(x) being astronomically large!

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