

Mathematical Entanglement Theory of Parallel Realities

Seppo Ilari Tirri

*Information & Communication Technology
Asia e University (AeU), Malaysia
Jalan Sultan Sulaiman, 50000 Kuala Lumpur, Malaysia*

seppo.tirri@aeu.edu.my

Keywords: Artificial Generic Intelligence, Rewriting Systems, Homomorphism, Universal algebra, Quotient Relation, Abstraction, Perception, Entanglement, Parallel Realities, Multiverse.

ABSTRACT

The current study with proceedings totally of mathematical nature regards our reality as embodied by problem solving paradigm on quotient algebras over crusts of different gravity. Because each entity perception can be presented by realizations of a net in the appropriate algebra, concept and processes thereof on those entities are dealt with subject to iteratively derived multiple order and dimension abstract algebra quotient operations. Crust elements are multiple order and dimension partially quotient algebra nets classified by possessed gravity, Cartesian element the saturating sets constituted by multidimensional abstraction relations classes. Entangled crust operations share common causality with respect to the quotient transducers they generate. Conceptual realities are set as abstract partial algebra comprising crust elements and of the next order quotient transducers over them. Perceptual multiverse manifested as realizations of conceptual realities over set of algebras will be shown to be generated by realizations of ITG-type entangled parallel realities and by satisfying commutative property establishes a closure system.

INTRODUCTION

Multiverse with ingredients of parallel universes e.g. Tegmark M (2007) is understandably regarded as vaguely defined due to lack of complete empirical evidences and presumed to reach only level of implicit nature at most; the same kind of lack of empirical tests was concerning “spooky entanglement action” derived from Schrödinger’s wave-functions nearly a century ago, although recently has been verified and utilized by means of great variety and regarded as one of the most far-reaching theoretical insights in centuries. Multi-realities are seen to explain probability phenomena comprising also its “annihilated” negative compound Feynman RP (1987), that notion expanded to cover a variety of perceptions. Information itself and its fluctuations are increasingly equated with continuous processes of tangible matters and regarded as entropy in cosmology studies e.g. about black hole horizon Hawking SW (2014). Every entity and processes thereof are mathematically describable and can be presented by appropriate realization of free abstract algebras. Therefore the target of this study is to create a solid mathematical ground for syntax of processes in parallel realities as seen possessing a nature of problem solving paradigm.

PRELIMINARIES

Due to mathematical complexity readers are advised to turn to the author’s works Tirri SI (May 2013) and Tirri SI (Aug 2013), where the initial definitions, notations and results are presented.

RENETTING SYSTEM (RNS) APPLICATION. For given RNS \mathcal{R} , jungle S is \mathcal{R} -rewritten to jungle T (*rewrite result*), denoted $S \rightarrow_{\mathcal{R}} T$ (called \mathcal{R} -*application*), and is *reduced under* \mathcal{R} or by rule φ in \mathcal{R} , and is said to be a *rewrite object* for \mathcal{R} or φ respectively, denoting $T = S\varphi$ (the postfix notation is prerequisite), if the following “rewrite” is fulfilled:

$$T = \bigcup (S \text{ } \leftarrow \text{ (right}(r))g) : \text{left}(r) \text{ matches } s \text{ in } p \text{ by some } f_{sp}, r \in \varphi, g \in G_{sp}, p \in p(s), s \in S, \mathcal{C}(\mathcal{R}),$$

where G_{sp} 's are sets of net substitution relations and net substitution mapping f_{sp} is called *left side substitution relation* and each g in G_{sp} is *right side substitution relation*. RNS is *S-instance sensitive* (S-INRNS), if for a rule $\varphi \in \text{RNS}$ and for each $s \in S$, $p \in p(s)$, $G_{sp} \neq f_{sp}$. Set $\mathcal{C}(\mathcal{R})$ is for extra demands and may contain some orders liable to substituting manoeuvre letters in the rewrite process (*substitution order*), especially if rewrite objects have outside loops with the apexes of left sides of pairs in rules or \mathcal{R} is manoeuvre increasing and instance sensitive. Instructions concerning binding right side substitution relations to specific rules in RNS might also have been included in $\mathcal{C}(\mathcal{R})$.

We say that \mathcal{R} *matches a rewrite object*, if the left side of a rule preform matches it. Observe that $T = S$, if \mathcal{R} does not match S ; of course \mathcal{C} may contain demands for necessary matching. The enclosures at which rewrites can take places (the sets of the apexes of the left sides in the pairs of the rules in RNS's) satisfying all requirements set on the RNS are called the *redexes* of the concerning rules or RNS's in the rewrite objects. For RNS \mathcal{R} and jungle S we denote

$$S\mathcal{R} = \bigcup \{S\varphi : \varphi \in \mathcal{R}\}.$$

TRANSDUCER. For each $\omega \in \Omega$, $i \in \mathcal{S}_\omega$ and $j \in \mathcal{J}_\omega$, let r be a bijection, *RNS-attaching mapping*, joining a set of RNS's to each triple (ω, i, j) . Let $\mathcal{A} = (F_\Sigma(X, \Xi), \Omega, Y_{\mathcal{A}}, \Xi_{\mathcal{A}})$ be a $\Omega, Y_{\mathcal{A}}, \Xi_{\mathcal{A}}$ -algebra, where for each $\omega \in \Omega$

$$\omega^{\mathcal{A}} : F_\Sigma(X, \Xi)^\alpha \otimes \tilde{F}_{\text{out}\Sigma}(X, \Xi)^\beta \mapsto F_\Sigma(X, \Xi), \text{ where } \alpha = \text{in-rank}(\omega) \text{ and } \beta = \text{out-rank}(\omega),$$

is such an operation relation that

$$\omega^{\mathcal{A}}(s_{iL}; \lambda_j \mid i \in \mathcal{S}_\omega, j \in \mathcal{J}_\omega) \subseteq \bigcup \{s_{iL}r(\omega, i, j) : i \in \mathcal{S}_\omega, j \in \mathcal{J}_\omega\}.$$

\mathcal{A} is called a *renetting algebra*. For any net $t \in F_\Omega(X, \Xi)$ realization $t^{\mathcal{A}}$ is called *R-transducer* (R-TD) over *RNS-attached family* $R = \{r(\omega, i, j) : \omega \in \Omega \cap L(t), i \in \mathcal{S}_\omega, j \in \mathcal{J}_\omega\}$ of sets of RNS's. We say that a TD *matches a rewrite object*, if any of its RNS does it.

NET BLOCK HOMOMORPHISM. Let $t = s(\mu_i; \lambda_j \mid i \in \mathcal{S}, j \in \mathcal{J}, C)$, where $\mathcal{S} \subseteq \mathcal{S}_s$, $\mathcal{J} \subseteq \mathcal{J}_s$, be a net in $F_\Sigma(X, \Xi_\Sigma)$ and $D \subseteq F_\Sigma(X, \Xi_\Sigma)$. We define *net D-block homomorphism relation* (D-NBH) h as net homomorphism with the exception that ranked letter rewriting relation h_Σ is replaced by *net block rewriting relation* $h_D : D \mapsto h_\Sigma(\Sigma)$ and

$$h(t) = h_D(s)(h(\mu_i); h(\lambda_j) \mid i \in \mathcal{E}_{\text{inh}_D(s)}^{\text{UN}}, j \in \mathcal{E}_{\text{outh}_D(s)}^{\text{UN}}).$$

Jungle D is indicated via corresponding NBH h by notation block(h). Relation h we entitle *right hand side alphabetical*, if $h(X \cup \Xi_\Sigma) \subseteq Y \cup \Xi_\Omega$, and for each $\sigma \in \Sigma$ $h_\Sigma(\sigma) = \omega(\varepsilon_i; \varepsilon_j \mid i \in \mathcal{E}_{\text{in}}, j \in \mathcal{E}_{\text{out}})$, where $\omega \in \Omega$ and $\{\varepsilon_i; \varepsilon_j \mid i \in \mathcal{E}_{\text{in}}, j \in \mathcal{E}_{\text{out}}\}$ is an arity alphabet. Net block homomorphism is (*overlapping*) *environment saving*, if it does not delete the contexts (e.g. s in our example) of (overlapping) subnets (e.g. $\in \{\mu_i, \lambda_j : i \in \mathcal{I}, j \in \mathcal{J}\}$) and preserves at least one linkage between the preimage contexts and each of their (overlapping) subnets. Right hand side alphabetical and environment saving net block homomorphism is called *alphabetically abstracting*, abbreviated (D)-AlpANBH.

REMARK. The operational efficiency of the set of all *net block homomorphism* NBH's and on the other hand of all RNS's equates. Because NBH generates RNS-normal forms and on the other way round, obtaining TD-solutions over a sample of abstraction classes for one representative per class results solutions for all routes derived through these classes.

FIXED PARALLEL RNS's

First we recall definitions of micro and macro of rules liable to intervening RNS types and centers of corresponding abstraction relation. Parallel TD's derived from those micro and macro form classes of parallel TD equivalence relation $\simeq^{\mathcal{C}_T}$ for T-types of ITG ($=\{\text{PRNS}, \text{GPRNS}, \text{CLRNS}, \text{UPRNS}\}$) in the set of all TD's. Two jungles are in *NBH-abstraction relation* with each other, if they are NBH-images of NUO-presentations of the same jungle.

Let θ be *alphabetically abstracting net block homomorphism* AlpANBH-abstraction relation. Let (A,B) be an AlpANBH-abstract pair of nets, \mathcal{W}_1 and \mathcal{W}_2 being of AlpANBH-type intervening NBH's in concern, A \mathcal{W}_1 -image of net s and B \mathcal{W}_2 -image of net t while s and t being *net NUO-representations* of the same net, say K, with block of s $D_s \subseteq \text{block}(\mathcal{W}_1)$ and block of t $D_t \subseteq \text{block}(\mathcal{W}_2)$. Without a loss of generality we make an assertion:

$$s = p(\mu_i; \lambda_j \mid i \in \mathcal{I}_p, j \in \mathcal{J}_p, C) \text{ and}$$

$$t = q(\mu_i; \lambda_j \mid i \in \mathcal{I}_q, j \in \mathcal{J}_q, (\exists k \in \mathcal{I}_q^{\text{oc}} \cup \mathcal{J}_q^{\text{oc}}) p \in \{\mu_k, \lambda_k\}, C).$$

Let r be in A a redex possessing rule preform as a part of a known memory solution RNS for A . Next we construct the following rule preforms:

- $\text{micro}(r)$:

left side: $\text{apex}(\text{left}(\text{micro}(r)))\tilde{\omega}_1 = \text{apex}(\text{left}(r))$ and $\text{micro}(r)$ matches K

right side : First we define notion net induced AlpANBH: Let t be a net. N -AlpANBH is entitled t -induced, denoted N -AlpANBH¹(t), if $N = \alpha(\text{rank}(t))$ is a cover of a net homomorphism image of t , where α is a bijection from the rank alphabet to a set of jungles. Because for each [NUO(t)]-class representative AlpANBH-images are equal for the same AlpANBH, we can now choose $\text{right}(\text{micro}(r))$ to be a net in the preimage domain of an $\text{apex}(\text{right}(r))$ -induced AlpANBH. From the same reasons for the case “ r is an instance sensitive INRNS-rule”, we can choose for each manoeuvre letter x in the domain of right side substitution g of r the x -image of right side substitution of $\text{micro}(r)$ to be a net in the preimage domain of an AlpANBH¹($g(x)$).

Therefore there is such an AlpANBH, say $\tilde{\omega}_{o1}$, that $s\tilde{\omega}_1 r = K(\text{micro}(r))\tilde{\omega}_{o1}$.

- $\text{macro}(\text{micro}(r)) (= \{r_1, r_2\})$:

First we construct such a new AlpANBH, say $\tilde{\omega}_3 : K \rightarrow B$ that $\text{block}(\tilde{\omega}_3)$ is a partition induced by union $\text{block}(\tilde{\omega}_1) \cup \text{block}(\tilde{\omega}_2)$:

$$\{\bigcap D' \cup \{\bigcap D'' : D' \subset D'', D'' \in P(D)\} : D' \in P(D)\}, \text{ where } D = \text{block}(\tilde{\omega}_1) \cup \text{block}(\tilde{\omega}_2).$$

1. first executed rule preform (*ferp*) $r_1 : t\tilde{\omega}_2 \mapsto (\text{NUO}^{-1}(t))\tilde{\omega}_3$, the choice guaranteeing in rewriting processes perseverance of analogous environments in $K\tilde{\omega}_2$ and K .
2. secondly executed rule preform (*serp*) r_2 :

left side: $\text{apex}(\text{left}(r_2)) = (\text{NUO}^{-1}(\text{apex}(\text{left}(\text{micro}(r))))\tilde{\omega}_3$ and r_2 matches $(\text{NUO}^{-1}(t))\tilde{\omega}_3$

right side: Following analogously constructing right side of $\text{micro}(r)$ we are free to choose an intervening AlpANBH, say $\tilde{\omega}_{o2}$, with the block equal with the block of $\tilde{\omega}_{o1}$, and accordingly we choose: $\text{apex}(\text{right}(\text{micro}(r)))\tilde{\omega}_{o2} = \text{apex}(\text{right}(r_2))$.

Therefore $t\tilde{\omega}_2 r_1 r_2 = K(\text{micro}(r))\tilde{\omega}_{o2}$. We have reach:

RESULT. For each RNS \mathcal{R} there is RNS $\mathcal{P} = \{\text{ferp,serp}\}$ satisfying commutative equation $\theta\mathcal{R} = \mathcal{P}\theta$ for abstraction relation θ of type T in ITG. We denoted $\mathcal{P} \circ^{\text{f}_\theta} \mathcal{R}$ and call those RNS's θ -fixed parallel RNS's, \mathcal{P} fixed to \mathcal{R} . Generalization of \circ^{f_θ} for TD's is orchestrated with accordance to relation \circ^{c_θ} . If θ has no requirements in addition to its type, say T, we denote \circ^{f_T} for this fixed parallel TD-relation or simply \circ^{f} . Clearly \circ^{f_T} is a genuine subset of \circ^{c_T} .

NET CLASS REWRITING ALGEBRA. Let A be the set of the denumerable θ -classes, \mathcal{R} is a TD over set R of RNS's and

$$\mathcal{R} = \cup(\{ \mathcal{R}_{\mathcal{W}}^* : \mathcal{W} \text{ is an ITG-type intervening RNS of } c \} : \mathcal{R} \in R, c \text{ is the centre of } Q, Q \in A)$$

be a union of macro(\mathcal{R})'s liable to A -classes. Then if θ is the distinctive abstraction relation, pair (A, \mathcal{R}) is an algebra, named *abstract algebra* or *net class rewriting algebra*.

ENTANGLEMENT

Let A be a sample of RNS's and θ of ITG-type abstraction relation, then we define

$$\text{En}(A, \theta) = \{ B \subseteq A : \cap(\mathcal{R} \circ^{\text{f}_\theta} : \mathcal{R} \in B) \neq \emptyset, |B| > 1 \}.$$

If that set is nonempty set we say that RNS's in the same element of $\text{En}(A, \theta)$ are *entangled* with each other liable to θ and A , indicating that by *entangle relation* $\overset{\text{E}}{\circ}_{\theta}$, if A is the set of all RNS's.

Theorem. $\overset{\text{E}}{\circ}_{\theta} = \circ^{\text{c}_\theta}$, where θ is of ITG-type; consequently $\overset{\text{E}}{\circ}_{\theta}$ is an equivalent relation in the set of RNS's and we say \circ^{f_T} generates \circ^{c_T} for $T \in \text{ITG}$.

Proof. “ \subseteq ”: trivial.

“ \supseteq ”: Let θ be an abstraction relation of type in ITG. Let r and s be such rule preforms that $r \circ^{\text{c}_\theta} s$ and r matches net a and s matches net d in $a\theta$. Let c be a common origin of a and d and \mathcal{W}_1 and \mathcal{W}_2 be intervening RNS's subject to type of θ , $c\mathcal{W}_1 \hat{=} a$, $c\mathcal{W}_2 \hat{=} d$. Due to type group ITG we can

construct RNS's of θ -type $\mathcal{U}_1, \mathcal{W}_{11}, \mathcal{U}_2, \mathcal{W}_{21}$ that $\mathcal{W}_1 \hat{=} \mathcal{W}_{11} \hat{\mathcal{U}}_1 \hat{}$ and $\mathcal{W}_2 \hat{=} \mathcal{W}_{21} \hat{\mathcal{U}}_2 \hat{}$ and choose θ -type intervening RNS's \mathcal{U}_{1b} and \mathcal{U}_{2b} for confluence $c\mathcal{W}_{11} \hat{\mathcal{U}}_{1b} \hat{=} c\mathcal{W}_{21} \hat{\mathcal{U}}_{2b} \hat{=} b$. We obtain (a,b) and (d,b) are in θ hence enabling to construct RNS's $\mathcal{R}_a = \{\text{ferp}_a, \text{serp}_a\} \in r \circ^f \theta$ and $\mathcal{R}_d = \{\text{ferp}_d, \text{serp}_d\} \in s \circ^f \theta$, ferp_a and ferp_d matching b. Then we construct rule preform q :

$$\text{apex}(\text{right}(q)) = \text{PI}(\{\text{apex}(\text{right}(\text{ferp}_a)), \text{apex}(\text{right}(\text{ferp}_d))\}),$$

where $\text{PI}(A) = \{\bigcap A' \cup \{\bigcap A'' : A' \subset A'', A'' \in P(A)\} : A' \in P(A)\}$ is the partition induced by jungle A.

This enables to construct RNS $\mathcal{R}(\exists q) \in r \circ^f \theta \cap s \circ^f \theta$, and hence we obtain $\text{En}(\{r,s\}, \theta)$ is nonempty. \square

Because *parallel* and *entangled* relations coincide in the set of RNS's we simply denote \circ_θ for both relations, if there is no danger of confusions. Consequently generalization of entangled relation for the set of TD's is presumed to be established as for parallel relation.

PARALLEL REALITIES

MULTIDIMENSIONAL ABSTRACTION RELATION. Let $\bar{\Theta}_0 \subseteq \text{Eq}(F_\Sigma(X, \Xi))$, *fundamental relation set*. For each $k \in \mathbb{N}$ and $t \in F_\Sigma(X, \Xi)$ we denote k-level saturation set of t

$$S_k(t) = \{s \in \theta F_\Sigma(X, \Xi) : \theta \in \bar{\Theta}_{(k-1)}\} \cap \text{Sat}(t),$$

where *multidimensional abstraction relation set*, $\bar{\Theta}_k = \{\bar{\Theta}_{ki} : i = 1, \dots, i_k\}$, $i_k \in \mathbb{N}$, is defined as the direct product of elements in $\bar{\Theta}_{(k-1)}$ such that for each s and t in $F_\Sigma(X, \Xi)$ $(s, t) \in \bar{\Theta}_{ki}$, $i = 1, \dots, i_k$, iff

$$\exists (P \in S_k(s), Q \in S_k(t)) \quad (\forall p \in P) (\exists q \in Q) (\exists \theta \in \pi(k-1, i)) \quad (p, q) \in \theta, \text{ where } \pi(k-1, i) \subseteq \bar{\Theta}_{(k-1)}$$

and revised for q and p respectively.

Gravity of t, $\text{grav}(t) = \prod(|S_n(t)| : n \in \mathbb{N})$. For any set T we denote $\text{grav}(T) = \{\text{grav}(t) : t \in T\}$ and for any family \mathcal{T} of sets $\text{grav}(\mathcal{T})$ is \mathcal{T} -Cartesian element $\prod(\text{grav}(T) : T \in \mathcal{T})$.

For TD's we define *generalized parallel TD-relation* (GPTDR) $r_1 \approx_{\bar{\Theta}_k} r_2$, ($\approx \in \{\approx^f, \approx^c\}$), iff

$\forall i \in \{1, \dots, i_k\} \exists (s, t) \in \bar{\Theta}_{ki}$ r_1 matches p and r_2 matches q and $r_1 \approx_{\bar{\Theta}_k} r_2$, whenever

$$\exists (P \in S_k(s), Q \in S_k(t)) (\forall p \in P) (\exists q \in Q) (\exists \theta \in \Pi(k-1, i)) (p, q) \in \theta.$$

TD-ABSTRACTION RELATION. We define *TD- \mathcal{A} -abstraction relation* $\theta_{TD^{\mathcal{A}}}$, $\mathcal{A} \in \text{ITG}$, in the set of the elements in abstract algebra \mathcal{A} as follows: Let H and K be two \mathcal{A} -derived TD-operations and we mark renaming algebra by \mathcal{N} . We define $H \theta_{TD^{\mathcal{A}}} K$, iff $H^{-\mathcal{N}} \theta_{\mathcal{N}^{\mathcal{A}}} K^{-\mathcal{N}}$, where $\theta_{\mathcal{N}^{\mathcal{A}}}$ is the \mathcal{A} -abstraction relation in the set of the nets and $TD^{-\mathcal{N}}$ stands for the carrier net of TD in concern. If \mathcal{A} is not specified we write simply θ_{TD} and $\theta_{\mathcal{N}}$ respectively.

FIRST ORDER ABSTRACTION ALGEBRA. Let A be a jungle, F a set of TD's, *fundamental TD set*, $\bar{\Theta}_k$ multidimensional abstraction relation in A at k -dimension ($k \in \mathbb{N}_0$) subject to $\bar{\Theta}_0$ being a singleton comprising $\theta_{\mathcal{N}} (\in \text{ITG})$ and $\approx_{\bar{\Theta}_k}$ GPTDR in F subject to $\bar{\Theta}_k$. Pair $(A\bar{\Theta}_k, F\approx_{\bar{\Theta}_k})$ is called *first order abstraction algebra*, where for each a in A and f in F is defined $a\bar{\Theta}_k f\approx_{\bar{\Theta}_k} = \{bp : b \in a\bar{\Theta}_k, p \in f\approx_{\bar{\Theta}_k}\}$. For distinct $\theta_{\mathcal{N}}$ we obtain $a\bar{\Theta}_k f\approx_{\bar{\Theta}_k} \in \{B \subseteq a\theta_{\mathcal{N}} : a \in A\}$.

SECOND ORDER RELATIONS IN ABSTRACTION ALGEBRA. Let F be a set of TD's, $f, g \in F$ and $k \in \mathbb{N}_0$. Because $\approx_{\theta_{\mathcal{N}}}$ saturates θ_{TD} , we are eligible to define quotient relation in F , *second order*

abstraction relation $\bar{\Theta}_{kTD} / \approx_{\bar{\Theta}_k}$ manifesting

$$f\approx_{\bar{\Theta}_k} \bar{\Theta}_{kTD} / \approx_{\bar{\Theta}_k} g\approx_{\bar{\Theta}_k}, \text{ if } f \bar{\Theta}_{kTD} g.$$

Next we define for each $k \in \mathbb{N}_0$ *second order parallel relation* in $P(F)$, $\approx_{(\bar{\Theta}_{kTD} / \approx_{\bar{\Theta}_k})}$:

$$(\forall S, T \subseteq F) S \approx_{(\bar{\Theta}_{kTD} / \approx_{\bar{\Theta}_k})} T, \text{ if}$$

$$(f\approx_{\bar{\Theta}_k})S \bar{\Theta}_{kTD} / \approx_{\bar{\Theta}_k} (g\approx_{\bar{\Theta}_k})T, \text{ whenever } (f\approx_{\bar{\Theta}_k}, g\approx_{\bar{\Theta}_k}) \in \bar{\Theta}_{kTD} / \approx_{\bar{\Theta}_k}.$$

Now we define binary relation \odot in F :

$$(\forall s, t \in F) s \odot t = (s^{-\mathcal{N}} t)^{\mathcal{N}}.$$

Setting requisite $\theta_{\mathcal{N}}$ is distinct demonstrates a closure system:

$$\begin{aligned}
(\forall s \in S) \quad s(\bar{\Theta}_{k_{TD}} / \infty \bar{\Theta}_k) \circ T^{\infty}_{(\bar{\Theta}_{k_{TD}} / \infty \bar{\Theta}_k)} &= \{ h^{\infty} \bar{\Theta}_k \circ t : h^{\infty} \bar{\Theta}_k \in s\theta_{TD}, t \in T^{\infty}_{(\bar{\Theta}_{k_{TD}} / \infty \bar{\Theta}_k)} \} \\
&\in \{ B \subseteq k \in f(\bar{\Theta}_{k_{TD}} / \infty \bar{\Theta}_k) : f \in F \},
\end{aligned}$$

and we are able to constitute *second order abstraction algebra* $(F(\bar{\Theta}_{k_{TD}} / \infty \bar{\Theta}_k), \circ P(F)^{\infty}_{(\bar{\Theta}_{k_{TD}} / \infty \bar{\Theta}_k)})$.

N:th ORDER ABSTRACTION ALGEBRA. First we enumerate multiple order abstraction relations.

For each $n \in \mathbb{N}_0$ we define $k_n \in \mathbb{N}_0$ and $\bar{\Theta}_{n, k_n, TD}$ is such a relation in $P^{n-1}(F)$ that

$$\begin{aligned}
\bar{\Theta}_{0, k_0, TD} &= \bar{\Theta}_{k_0, TD} \quad \text{and} \\
(\forall H, K \in P^{n-1}(F)) \quad H \bar{\Theta}_{n, k_n, TD} K, &\text{ if } (U^n(H))^{-\mathcal{N}} \bar{\Theta}_{n-1, k_{n-1}, TD} (U^n(K))^{-\mathcal{N}}.
\end{aligned}$$

We agree with the notations:

$$\begin{aligned}
\langle \theta / \infty \rangle^{\langle 0, k_0 \rangle} &= \bar{\Theta}_{0, k_0, TD}, \\
\langle \theta / \infty \rangle^{\langle n, k_n \rangle} &= \bar{\Theta}_{n, k_n, TD} / \infty_{\langle \theta / \infty \rangle^{\langle n-1, k_{n-1} \rangle}}.
\end{aligned}$$

Next for each $n \in \mathbb{N}_0$ and $k_n \in \mathbb{N}_0$ we keep assumed $\bar{\Theta}_{n, k_n, TD}$ is distinctive.

Let $T_n \in P^n(F)$, $n \in \mathbb{N}_0$ and $S_n = S_{n-1} \cup T_n$, $n \in \mathbb{N}$, $S_0 = T_0$.

$$\mathfrak{R}^{(0)}(S_0, k_0) = T_0 \bar{\Theta}_{0, k_0, TD}$$

$$\mathfrak{R}^{(n)}(S_n, k_n) = \mathfrak{R}^{(n-1)}(S_{n-1}, k_{n-1}) \langle \theta / \infty \rangle^{\langle n, k_n \rangle} \circ T_n \infty_{\langle \theta / \infty \rangle^{\langle n, k_n \rangle}} \in \{ B \subseteq k \in q \langle \theta / \infty \rangle^{\langle n, k_n \rangle} : q \in P^{n-1}(F) \}.$$

We define *n:th order k_n -dimensional abstraction algebra*

$$(\mathfrak{R}^{(n-1)}(S, k_{n-1}) \langle \theta / \infty \rangle^{\langle n, k_n \rangle}, \circ P^n(F)^{\infty_{\langle \theta / \infty \rangle^{\langle n, k_n \rangle}}}), \text{ where } S = \cup(P^i(F) : i = 0, 1, \dots, n-1),$$

and find out partial closure property:

$$\begin{aligned}
&\mathfrak{R}^{(n-1)}(S, k_{n-1}) \langle \theta / \infty \rangle^{\langle n, k_n \rangle} \circ P^n(F)^{\infty_{\langle \theta / \infty \rangle^{\langle n, k_n \rangle}}} \\
&\subseteq \{ B \subseteq k \in q \langle \theta / \infty \rangle^{\langle n, k_n \rangle} : q \in P^{n-1}(F) \} \\
&\subseteq \mathfrak{R}^{(n-1)}(S, k_{n-1}) \langle \theta / \infty \rangle^{\langle n, k_n \rangle}.
\end{aligned}$$

$(i, \bar{\delta}(i))$ -Crust $(A, \bar{\varrho}, Y)$ is set

$$\{ t : grav(t) \in A, t \in \mathfrak{R}^{(i-1)}(\cup(P^k(Y) : k = 0, 1, \dots, i-1), \bar{\delta}(i-1)) \langle \theta(\bar{\varrho}) / \infty^f \rangle^{(i, \bar{\delta}(i))} \},$$

where $i \in \mathbb{N}_0$, $\bar{\delta}$ is a mapping in \mathbb{N}_0 , A a set of gravity values, $\bar{\varrho}$ a fundamental relation set and Y a fundamental TD set, and where $\bar{\delta}(i)$ -level θ subject to $\bar{\varrho}$ representing “horizontal” $\bar{\delta}(i)$ -dimensional structure of elements with A -gravity in the concerning abstraction algebra is liable to i :th order “vertical” process iteration.

Conceptual $(i, \bar{\delta}(i))$ -reality $(A, \bar{\varrho}, Y)$ is i :th order $\bar{\delta}(i)$ -dimensional partially quotient algebra over $(A, \bar{\varrho}, Y)$

$$((i, \bar{\delta}(i))\text{-Crust}(A, \bar{\varrho}, Y), \odot P^i(Y) \infty_{\langle \theta(\bar{\varrho}) / \infty^f \rangle}^{(i, \bar{\delta}(i))}).$$

Inverse distance between crusts is a pair comprising intersections of fundamental relation sets in concern and TD sets respectively. If that distance is nonempty, conceptual realities in question is said to be *parallel with each other*. If furthermore gravity value sets share elements we say those realities are *entangled* with each other. *Conceptual multiverse* is set of pairs

$$\{ (\mathfrak{R}^{(i-1)}(\cup(P^k(\mathcal{F}) : k = 0, 1, \dots, i-1), \bar{\delta}(i-1)) \langle \theta(\bar{\varrho}) / \infty \rangle^{(i, \bar{\delta}(i))}, \odot P^i(\mathcal{F}) \infty_{\langle \theta(\bar{\varrho}) / \infty \rangle}^{(i, \bar{\delta}(i))}) : i \in \mathbb{N}_0, \bar{\delta} \in \Psi \},$$

where \mathcal{F} is the set of all TD's and Ψ is the set of mappings in \mathbb{N}_0 .

RESULT. Conceptual multiverse is generated by entangled parallel realities for ITG-type fundamental relation sets.

Proof. Fixed parallel TD-quotient relation $\langle \theta / \infty^f \rangle^{(i, j)}$ generates $\langle \theta / \infty \rangle^{(i, j)}$, whenever $i, j \in \mathbb{N}_0$, because according to our prerequisite abstractions and parallel relations in concern are of the same ITG-types and mutual gravity value for realities of parallel type guarantees equal partition element numbers yielding common abstraction classes, accordingly satisfying commutative property. \square

A-perceptual multiverse is realization of conceptual multiverse over set of algebras \mathcal{A}

COROLLARY. Perceptual multiverse is generated by realizations of ITG-type entangled parallel realities, and as algebra forms a closure structure.

CONCLUSIONS

Perceptual multiverse manifested as realizations of conceptual realities over set of algebras is shown to be generated by realizations of entangled parallel realities and by satisfying commutative property as ITG-types forms a closure system.

ACKNOWLEDGEMENTS

I own the unparalleled gratitude to my family, my wife and five children for the cordial environment so very essential on creative working.

REFERENCES

Feynman RP (1987) "Negative Probability" in Quantum Implications : Essays in Honour of David Bohm, by F. David Peat (Editor), Basil Hiley (Editor) Routledge & Kegan Paul Ltd, London & New York, pp. 235–248.

Hawking SW (2014) Information Preservation and Weather Forecasting for Black Holes. [Arxiv.org/abs/1401.5761](https://arxiv.org/abs/1401.5761).

Tegmark M (2007) The Mathematical Universe. [Arxiv.org/abs/0704.0646](https://arxiv.org/abs/0704.0646).

Tirri SI (2013 May) Algebraic Net Class Rewriting Systems, Syntax and Semantics for Knowledge Representation and Automated Problem Solving. [Arxiv.org/abs/1305.5637](https://arxiv.org/abs/1305.5637).

Tirri SI (2013 Aug) Evolution Theory of Self-Evolving Autonomous Problem Solving Systems. [Arxiv.org/abs/1308.5321](https://arxiv.org/abs/1308.5321).