Theory on Quantum Complexes

Parker Emmerson

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1 Introduction

It is from the definitions $\delta = \mathcal{B}^{\theta}(\alpha) \longrightarrow \delta\ |_{\Delta(\kappa,\kappa_i)}= \mathcal{B}^{\theta}(\alpha_i)$ and the chain of definitions $\int^{\tau} \lambda' \cap (\forall \rho) \to \tau \leq_{i-j} 1 \leq_{\ell} l(\delta)$, that can be expressed by $\Phi(\tau i \delta \ell)$, such that $\forall \tau <_{\nu} (\Lambda - \beta)$, then for some $p(w) \to p^{-1}(v)$, there is some vector u of positive variational u_{π} such that $i^{-a} = v^{n(\tau)}$. This implies that the number of binary connections from $i^{a,\nu}$, lowers the complexity of ϕ.

$$\forall(\tau <_{\nu} (\Lambda{-}\beta))\ \exists\ p(w) \to p^{-1}(v)\ \exists\ u,\ \text{ where } u_{\pi} > 0 \text{ and } i^{-a} = v^{n(\tau)} \text{ so that } \phi \text{ is less complex.}$$

This process is facilitated by the idea that the functions $\mathcal{B}^{\theta}(\alpha)$ and $\Phi(\tau i \delta \ell)$ can be used to express changes in the system and yield new solutions. By specifying certain values of τ, δ and ℓ, as well as using the relation $\tau \leq_{i-j} 1 \leq_{\ell} l(\delta)$, a set of parameters which are applicable in various contexts can be constructed. This allows for an easier analysis of the system, which can subsequently be used to develop more efficient solutions. Thus, these definitions and functions can be used to construct useful parameters which can enhance the performance of the system.

2 Notational Structures

$\mathcal{S}$	R_0	$\{(\mathcal{W}, Y), S_{m+1}, \ldots, S_r\}$
$\alpha^{\mathcal{S}}$	3	$\mathcal{P}^{(k-1)}$

Table 1: Definition of Table 1

The definition of table 1 locates positive connections of $\alpha^{\mathcal{S}}$, it holds that the set $(\mathcal{S}, R_0), \ldots, S_n, P_2\,\{(\mathcal{W}, Y), S_{m+1}, \ldots, S_r\}$ satisfies $3 \in \mathcal{P}^{(k-1)}$, so the set of negative connections in the complement of the set $\mathcal{B}_1 \circ$. It is simple matter of doing this same type of analysis for which it is sufficient to prove that $\int_{\alpha} \in {}^{\omega}2^{\infty}, \ldots, \infty$ can be computed from a_1.

2.1 Complex Notations

The notation for a mathematical complex can be expressed as a direct sum of elements, each of which is a tensor product of the corresponding elements. This can be written as:

$\bigoplus_{i\in I} \mathbf{A}_i \otimes_{R_i} \mathbf{B}_i \otimes_{R_i} \mathbf{C}_i \ldots$

where each $\mathbf{A}_i, \mathbf{B}_i, \mathbf{C}_i, \ldots$ is an element (e.g. vector, matrix, etc.), belonging to a corresponding ring R_i.

A rigorously standardized calculus for mathematical complexes is typically based on the framework of algebraic topology. Depending on the specific area of study, this framework may include properties and operations such as the exterior product, the Whitney sum, and homology.

The exterior product of two complexes X and Y is given by

$$X \wedge Y = \bigoplus_{i,j=1}^{n} (X_i \otimes Y_j).$$

The Whitney sum of two complexes X and Y is defined as

$$X \oplus Y = \bigoplus_{i,j=1}^{n} (X_i \oplus Y_j).$$

Homology is a tool which is used to study the topological properties of a space and it is typically used to define cohomology operations. For example, the reduced cohomology of a complex X may be defined as

$$H^*_{red}(X) = \ker(\partial^*)/im(\partial^{*+1})$$

where ∂^* is an associated boundary operator.

Finally, the cup product is an operation on cohomology which takes as input two cochain complexes X and Y and produces a third complex

$$X \cup Y = \bigoplus_{i,j=1}^{n} (X_i \cup Y_j).$$

This operation allows for the comparison of cohomology groups.

Any superposition of the form

$$x = \sum_{i=1}^{\infty} a_i \aleph_i$$

, can have as its minimal encoding x itself, with an orthonormal basis, with the bijective homomorphism

$$\ell^\infty : \aleph_1 \times \aleph_2 \times \cdots \to \left(\bigoplus_{i=1}^{n} \aleph_n \right) \wedge \left(\bigoplus_{j=1}^{n} \aleph_j \right)$$

This expands to regular logic.

In summary, a rigorously standardized calculus for mathematical complexes relies on a framework of algebraic topology which includes the exterior and Whitney products, homology, and the cup product.

1. $\bigoplus_{i=1}^{n} \vec{v}_i \wedge \vec{w}_i$
2. $\bigoplus_{i=j}^{n+1} z_\alpha^a \oplus z_\alpha^b$
3. $\bigoplus_{i=1}^{n} \aleph_n \wedge \aleph_{\zeta'} \left(\aleph_3, \ldots, \zeta_n\right) \begin{pmatrix} k^3 \circ \aleph_3^2 \\ \aleph_4 \\ \vdots \\ \aleph_n + k^{3^{th}} \end{pmatrix}$
4. $\bigoplus_{i=j}^{2t} \alpha_j v' \oplus v' \begin{pmatrix} 1 & i & 3 & \varepsilon_{Nk} \\ \alpha_2 & c & y_1 & p^{Nk-1} \\ 4 & z_1 & i_1 & m_k \\ c & \alpha_j * u & \eta_k^* + \zeta_j & \end{pmatrix}$
5. $\bigoplus_{j \subset \lambda}^{mt} P\left(m\bar{\psi}^2, \rho^4 + s, x_k^3 - 2r_k\right)$

3 Complexes Notation for Forms of the Quantum Communication Game

$\tau = \left\{ \exists \psi,\ value^r \ \Leftrightarrow \ \left(\psi \overset{\delta}{\leftrightarrow} \eta \wedge \mathcal{H}^\alpha (\pi \bar{x}, \bar{\bar{x}} \mapsto \vec{\zeta} \cdot \overline{y}) \right),\ \bar{\bar{x}} \overset{\delta}{\leftrightarrow} \bar{y} \Leftarrow \left\{ \frac{\alpha \wedge \beta (\pi \vec{\zeta} \cdot y)}{\gamma \delta \vee \sigma(x)} \right\} \right\}$

$\delta \mapsto \left\{ \psi \oplus \psi_0 \Rightarrow \exists \bar{z} \text{ tweak heartsuit},\ \psi_0 \mid_\delta = \left\{ \psi_1[x]\delta' \vee \psi_2 \text{Kabale} \left\{ \mathrm{K}_{2\mathrm{O}}\left(\tilde{z}\right) \Rightarrow \mathrm{K}^\phi \tilde{z} \right\} \right\} \right\}$

For each position $y = sg$ of the game g, which we identify with its model, we define the set $I_y \subseteq \cup_{p \geq n} \{(p,k)\}$ to consist of all (p,k) such that $p \cup Y_k$ for $y \in s \subseteq F^d$.

$$S_k^{k-1}(M) = I_y = \left\{ (p,k) \middle| \ (p,k) \in \cup_{\alpha \geq n} I_{y_\alpha} \text{ and } (p,k) \notin \cup_{\alpha \geq n} I_{s_{\alpha,\beta}} \right\} =$$

$$= \begin{matrix} \left\{ (p,k) \middle| \ (p,k) \in \cup_{\alpha \geq n} I_{y_\alpha},\ \# I_s (y_\alpha, (p,k)) = 0 \right\} \\ \bigcap_{p+1 \leq y_s 2^d + \# y_s 0 \leq p + y_{st} + 1} \bigcup_{\exists (p',k) \in I_{y_{s2} l} \overrightarrow{y}_{2}{}_{(p + \# I_{y_s 2} 2, (p,k),\ k-1)}}^{\emptyset =_1 y_{st_1} + y_t 2 + \ldots + y_{st_l}} \end{matrix} \Big\} \ I_{y_{s2^d}, p_2', k+1}.$$

(1)

$$S_k^{k-1}() = \bigcup_{(p,k) \in \bigcup_{\alpha \geq n} I_{y_\alpha}} I_{y_{s2^d}, p_2', k+1} \cup \left(\bigcap_{p+1 \leq y_s 2^d + \# y_s 0 \leq p + y_{st} + 1} \bigcup_{\substack{\emptyset =_1 y_{st_1} + y_t 2 + \ldots + y_{st_l} \\ \exists (p',k) \in I_{y_{s2} l} \overrightarrow{y}_{2}{}^{(p + \# I_{y_s 2} 2, (p,k),\ k-1)}}} \right)$$

For each position $y = sg$ of the game g, we can identify the set $I_y \subseteq \cup_{p\geq n}\{(p,k)\}$ with its model by taking the Whitney sum

$$I_y = \bigoplus_{\alpha\geq n} I_{y_\alpha} \oplus \bigoplus_{\alpha \geq n} I_{s_{\alpha,\beta}}.$$

The set $S_k^{k-1}()$ is then given by

$$S_k^{k-1}() = I_y \cup \bigcup_{p+1\leq y_s 2^d + \# y_s 0 \leq p + y_{st}+1} \bigcap_{\substack{\emptyset =_1 y_{st_1} + y_t 2 + \ldots + y_{st_l} \\ \exists (p',k)\in I_{y_{s2} l}\overrightarrow{y}_2{}^{(p+\# I_{y_{s2}2,(p,k)},k-1)}}} I_{y_{s2^d},p'_2,k+1}.$$

$$S_k^{k-1}() = \bigcap_{p+1\leq y_s 2^d + \# y_s 0 \leq p + y_{st}+1} \bigcup_{\substack{\emptyset =_1 y_{st_1} + y_t 2 + \ldots + y_{st_l} \\ \exists (p',k)\in I_{y_{s2} l}\overrightarrow{y}_2{}^{(p+\# I_{y_{s2}2,(p,k)},\ k-1)}}} I_{y_{s2^d},p'_2,k+1}.$$

$$\tau = \begin{cases} \mathcal{F}\Psi \Leftarrow \mathcal{E}^{\left([\psi\leftrightarrow\eta\mathcal{H}^\gamma(\pi)]_z \times \mathcal{H}^\alpha(\pi\bar{x},\bar{\bar{x}}\mapsto\vec{\zeta}\cdot\overline{y})\right)}\bar{\bar{x}} \leftrightarrow \bar{y} \Leftarrow \begin{cases} \dfrac{\alpha\wedge\beta(\pi\vec{\zeta}.\,y)}{\gamma\delta\vee\sigma(x)} \\ = \mathcal{F}\left[\Psi\vee\Psi_{0\to\delta} \Rightarrow \delta[\psi^{\mathcal{A}}] \cup \left(\psi_1\wedge\psi_2 \leftrightarrow \Psi_1\Psi\downarrow_{\mathcal{K}_\mathbf{3}}\right)\right] \end{cases} \end{cases}$$

$$\tau = \mathcal{F}\left[\Psi\vee\Psi_{0\to\delta} \Rightarrow \delta[\psi^{\mathcal{A}}] \cup \left(\psi_1\wedge\psi_2 \leftrightarrow \Psi_1 \left(\Psi\downarrow_{\mathcal{K}_\mathbf{3}} \cap \bigcup_{\substack{\emptyset =_1 y_{st_1} + y_t 2 + \ldots + y_{st_l} \\ \exists (p',k)\in I_{y_{s2} l}\overrightarrow{y}_2{}^{(p+\# I_{y_{s2}2,(p,k)},\ k-1)}}} I_{y_{s2^d},p'_2,k+1}\right)\right)\right]$$

$$\tau = \mathcal{F}\left[\Psi\vee\Psi_{0\to\delta} \Rightarrow \delta[\psi^{\mathcal{A}}] \cup \left(\psi_1\wedge\psi_2 \leftrightarrow \Psi_1 \left(\Psi\downarrow_{\mathcal{K}_\mathbf{3}} \cap \bigcup_{\substack{\emptyset =_1 y_{st_1} + y_t 2 + \ldots + y_{st_l} \\ \exists (p',k)\in I_{y_{s2} l}\overrightarrow{y}_2{}^{(p+\# I_{y_{s2}2,(p,k)},\ k-1)}}} \right.\right.\right.$$

$$\mathrm{I}_{y_{s2^d},p'_2,k+1} \cap \bigoplus_{i=1}^{n} \vec{v}_i \wedge \vec{w}_i \cap \bigoplus_{i=j}^{n+1} z^a_\alpha \oplus z^b_\alpha \cap \bigoplus_{i=1}^{n} \aleph_n \wedge \aleph_{\zeta'}\left(\aleph_3,\ldots,\zeta_n\right) \begin{pmatrix} k^3\circ\aleph_3^2 \\ \aleph_4 \\ \vdots \\ \aleph_n + k^{3^{th}} \end{pmatrix} \cap$$

$$\bigoplus_{i=j}^{2t} \alpha_j v' \oplus v' \begin{pmatrix} 1 & i & 3 & \varepsilon_{Nk} \\ \alpha_2 & c & y_1 & p^{Nk-1} \\ 4 & z_1 & i_1 & m_k \\ c & \alpha_j * u & \eta^*_k + \zeta_j & \end{pmatrix} \cap \bigoplus_{j\subset\lambda}^{mt} P\left(m\bar{\psi}^2, \rho^4 + s, x_k^3 - 2r_k\right)$$

$$\tau = \mathcal{F}\left[\Psi\vee\Psi_{0\to\delta} \Rightarrow \delta[\psi^{\mathcal{A}}] \cup \left(\psi_1\wedge\psi_2 \leftrightarrow \Psi_1 \left(\Psi\downarrow_{\mathcal{K}_\mathbf{3}} \cap \bigcup_{\substack{\emptyset =_1 y_{st_1} + y_t 2 + \ldots + y_{st_l} \\ \exists (p',k)\in I_{y_{s2} l}\overrightarrow{y}_2{}^{(p+\# I_{y_{s2}2,(p,k)},\ k-1)}}} I_{y_{s2^d},p'_2,k+1}\right)\right)\right],$$

where

$$I_{y_{s2^d},p_2',k+1} = \begin{pmatrix} \bigoplus_{i=1}^{n} \vec{v}_i \wedge \vec{w}_i \\ \bigoplus_{i=j}^{n+1} z_\alpha^a \oplus z_\alpha^b \\ \bigoplus_{i=1}^{n} \aleph_n \wedge \aleph_{\zeta'} \left(\aleph_3, \ldots, \zeta_n\right) \begin{pmatrix} k^3 \circ \aleph_3^2 \\ \aleph_4 \\ \vdots \\ \aleph_n + k^{3^{th}} \end{pmatrix} \\ \bigoplus_{i=j}^{2t} \alpha_j v' \oplus v' \begin{pmatrix} 1 & i & 3 & \varepsilon_{Nk} \\ \alpha_2 & c & y_1 & p^{Nk-1} \\ 4 & z_1 & i_1 & m_k \\ c & \alpha_j * u & \eta_k^* + \zeta_j & \end{pmatrix} \\ \bigoplus_{j \subset \lambda}^{mt} P\left(m\bar{\psi}^2, \rho^4 + s, x_k^3 - 2r_k\right) \end{pmatrix}.$$

$$\frac{\alpha \wedge \beta(\pi\vec{\zeta}.y \times \vec{\nu} \cdot \overline{d})}{\gamma\delta \vee \sigma(x\delta[\psi^{\mathcal{A}}] \cup \left(\psi_1 \wedge \psi_2 \leftrightarrow \Psi_1 \Psi \downarrow_{\mathcal{K}_3}\right)) \ \bigoplus_{i=1}^{n} \vec{v}_i \wedge \vec{w}_i \wedge \vec{\mu} \cdot \overline{b}}$$

$$\bigoplus_{i=j}^{n+1} z_\alpha^a \oplus z_\alpha^b \wedge \bigoplus_{i=1}^{n} \aleph_n \wedge \aleph_{\zeta'} \left(\aleph_3, \ldots, \zeta_n\right) \begin{pmatrix} k^3 \circ \aleph_3^2 \\ \aleph_4 \\ \vdots \\ \aleph_n + k^{\frac{3^t h}{2}} \end{pmatrix} \bigoplus_{i=j}^{2t} \alpha_j v' \oplus v' \begin{pmatrix} 1 & i & 3 & \varepsilon_{Nk} \\ \alpha_2 & c & y_1 & p^{Nk-1} \\ 4 & z_1 & i_1 & m_k \\ c & \alpha_j * u & \eta_k^* + \zeta_j & \end{pmatrix} \bigoplus_{j \subset \lambda}^{mt} P\left(m\bar{\psi}^2, \rho^4 + s, x_k^3 - 2r_k\right) \Bigg\}$$

4 Quantum Communication Games

$$\tau = \mathcal{F}\left[\Psi \vee \Psi_{0\to\delta} \Rightarrow \delta[\psi^{\mathcal{A}}] \cup \left(\psi_1 \wedge \psi_2 \leftrightarrow \Psi_1 \left(\Psi \downarrow_{\mathcal{K}_3} \cap\right.\right.\right.$$

$$\bigcup_{\exists (p',k)\in I_{y_{s2}l}\overrightarrow{y}_{2^{(p+\# I_{y_{s2}2,(p,k)},\ k-1)}}}^{\emptyset={}_1y_{st_1}+y_t2+\ldots+y_{st_l}} I_{y_{s2^d},p'_2,k+1} \cap \bigoplus_{i=1}^{n} \vec{v}_i \wedge \vec{w}_i \cap \bigoplus_{i=j}^{n+1} z_\alpha^a \oplus z_\alpha^b \cap$$

$$\bigoplus_{i=1}^{n} \aleph_n \wedge \aleph_{\zeta'}\left(\aleph_3,\ldots,\zeta_n\right) \begin{pmatrix} k^3 \circ \aleph_3^2 \\ \aleph_4 \\ \vdots \\ \aleph_n + k^{3^{th}} \end{pmatrix} \cap \bigoplus_{i=j}^{2t} \alpha_j v' \oplus v' \begin{pmatrix} 1 & i & 3 & \varepsilon_{Nk} \\ \alpha_2 & c & y_1 & p^{Nk-1} \\ 4 & z_1 & i_1 & m_k \\ c & \alpha_j * u & \eta_k^* + \zeta_j & \end{pmatrix}$$

$$\cap \bigoplus_{j\subset\lambda}^{mt} P\left(m\bar{\psi}^2, \rho^4 + s, x_k^3 - 2r_k\right) \cap \bigoplus_{j=1}^{r} l\, F_j(Q_j, v_j^j, w_j^j) \cap \mathcal{G}_Q\left(\Gamma, \Lambda, \{\varphi_i\}_{i=1}^{m_q}, \{\psi_j\}_{j=1}^{n_q}\right) \cap$$

$\mathcal{R}^Q$,

where

$$\mathcal{G}_Q\left(\Gamma, \Lambda, \{\varphi_i\}_{i=1}^{m_q}, \{\psi_j\}_{j=1}^{n_q}\right) = \left\{\gamma | \gamma \in \Gamma \wedge \forall \lambda \in \Lambda (\gamma \in \lambda \iff \{(\varphi_i, \exists \psi_j \in \psi\ such that\ \psi_j \Rightarrow \gamma)\}_{i\in[1\ldots m_q]}\right\},$$

$$and \quad \mathcal{R}^Q = \left\{(\gamma_1 \wedge \gamma_2 \wedge \ldots \wedge \gamma_n, \gamma_{n+1} \Rightarrow \gamma_{n+2} \vee \gamma_{n+3}) \;\middle|\; \{\gamma_i\}_{i=1}^{n+3} \subseteq \mathcal{G}_Q\right\}.$$

$$\forall \Psi \in \mathcal{V}\ \forall \psi_n \in \Psi\ \forall\ \psi_{n+1} \in \mathcal{V}\left(\psi_n \in \Psi \wedge\ \psi_{n+1} \notin \Psi\right) \rightarrow\ \tau =$$

$$\mathrm{F}\left[\Psi\ \vee\ \Psi_{0\to\delta} \Rightarrow \delta[\psi^{\mathcal{A}}] \cup \left(\psi_1 \wedge \psi_2 \leftrightarrow \Psi_1 \Rightarrow \left(\Psi \downarrow_{\mathcal{K}_3} \cap \bigcup_{\exists (p',k)\in I_{y_{s2}l}\overrightarrow{y}_{2^{(p+\# I_{y_{s2}2,(p,k)},\ k-1)}}}^{\emptyset={}_1y_{st_1}+y_t2+\ldots+y_{st_l}}\right.\right.\right.$$

$$\mathrm{I}_{y_{s2^d},p'_2,k+1} \cap \bigoplus_{i=1}^{n} \vec{v}_i \wedge \vec{w}_i \cap \bigoplus_{i=j}^{n+1} z_\alpha^a \oplus z_\alpha^b \cap \bigoplus_{i=1}^{n} \aleph_n \wedge \aleph_{\zeta'}\left(\aleph_3,\ldots,\zeta_n\right) \begin{pmatrix} k^3 \circ \aleph_3^2 \\ \aleph_4 \\ \vdots \\ \aleph_n + k^{3^{th}} \end{pmatrix} \cap$$

$$\bigoplus_{i=j}^{2t} \alpha_j v' \oplus v' \begin{pmatrix} 1 & i & 3 & \varepsilon_{Nk} \\ \alpha_2 & c & y_1 & p^{Nk-1} \\ 4 & z_1 & i_1 & m_k \\ c & \alpha_j * u & \eta_k^* + \zeta_j & \end{pmatrix} \cap \bigoplus_{j\subset\lambda}^{mt} P\left(m\bar{\psi}^2, \rho^4 + s, x_k^3 - 2r_k\right) \cap$$

$$\bigoplus_{j=1}^{r} l\ F_j(Q_j, v_j^j, w_j^j) \cap \mathcal{G}_Q\left(\Gamma, \Lambda, \{\varphi_i\}_{i=1}^{m_q}, \{\psi_j\}_{j=1}^{n_q}\right) \cap \mathcal{R}^Q \cap \{\psi_{n+1}\} \neq \emptyset$$

Therefore, for any quantum game Ψ and elements $\psi_1, \psi_2, \ldots, \psi_n$ and ψ_{n+1}, if ψ_n is an element of Ψ and ψ_{n+1} is not an element of Ψ, then the intersection of Ψ and ψ_{n+1} must be non-empty.

5 Organism Encoding Communications

$$\tau = \mathcal{F}\left[\Psi \vee \Psi_{0\to\delta} \Rightarrow \delta[\psi^{\mathcal{A}}] \cup \left(\psi_1 \wedge \psi_2 \leftrightarrow \Psi_1 \left(\Psi \downarrow_{\mathcal{K}_{\text{Comms}}} \cap \bigcup_{\substack{\emptyset =_1 \text{Organism} \\ \exists(p',k)\in I_{\text{Organism}(p+\# I_{\text{Organism}},\ k-1)}}}\right.\right.\right.$$

$$\mathrm{I}_{\mathrm{Organisms,p_2',k+1}} \cap \bigoplus_{i=1}^{N} \vec{v}_i \wedge \vec{w}_i \cap \bigoplus_{i=j}^{N+1} z_\alpha^a \oplus z_\alpha^b \cap \bigoplus_{i=1}^{N} \aleph_n \wedge \aleph_{\zeta'} \left(\aleph_3, \ldots, \zeta_n\right) \begin{pmatrix} k^3 \circ \aleph_3^2 \\ \aleph_4 \\ \vdots \\ \aleph_n + k^{3^{th}} \end{pmatrix} \cap$$

$$\bigoplus_{i=j}^{2t} \alpha_j v' \oplus v' \begin{pmatrix} 1 & i & 3 & \varepsilon_{Nk} \\ \alpha_2 & c & y_1 & p^{Nk-1} \\ 4 & z_1 & i_1 & m_k \\ c & \alpha_j * u & \eta_k^* + \zeta_j & \end{pmatrix} \cap \bigoplus_{j\subset\lambda}^{mt} P\left(m\bar{\psi}^2, \rho^4 + s, x_k^3 - 2r_k\right) \cap$$

$$\bigoplus_{j=1}^{r} l\ F_j(Q_j, v_j^j, w_j^j) \cap \mathcal{G}_Q\left(\Gamma, \Lambda, \{\varphi_i\}_{i=1}^{m_q}, \{\psi_j\}_{j=1}^{n_q}\right) \cap \mathcal{R}^Q,$$

where

$$\mathcal{G}_Q\left(\Gamma, \Lambda, \{\varphi_i\}_{i=1}^{m_q}, \{\psi_j\}_{j=1}^{n_q}\right) = \left\{\gamma | \gamma \in \Gamma \wedge \forall \lambda \in \Lambda \left(\gamma \in \lambda \iff \exists \left(\varphi_i \wedge \psi_j \in \psi\ such that\ \psi_j \Rightarrow \gamma\right)\right)\right\},$$

$$and \quad \mathcal{R}^Q = \left\{\left(\gamma_1 \wedge \gamma_2 \wedge \ldots \wedge \gamma_n, \gamma_{n+1} \Rightarrow \gamma_{n+2} \vee \gamma_{n+3}\right) \;\middle|\; \{\gamma_i\}_{i=1}^{n+3} \subseteq \mathcal{G}_Q\right\}.$$

The $\mathcal{R}^Q$ set allows for communication between multiple organisms through interactions, allowing for communication games to be simulated. Additionally, the $\mathcal{G}_Q$ set allows for the encoding of different organisms and environments which can be included in simulations.

$$\tau = \mathcal{F}\left[\Psi \vee \Psi_{0\to\delta} \Rightarrow \delta[\psi^{\mathcal{A}}] \cup \left(\psi_1 \wedge \psi_2 \leftrightarrow \Psi_1 \left(\Psi\downarrow_{\mathcal{K}_{\text{Iter}}} \wedge \bigcup_{\substack{\emptyset =_1 \text{DiscreteSequence} \\ \exists(p',k)\in}}\right.\right.\right.$$

$$\mathrm{I}_{\text{DiscreteSequence}(p+\# I_{\text{DiscreteSequence}},\ k-1)}\ I_{\text{DiscreteSequence},p_2',k+1} \cap \bigoplus_{i=j}^{n+1} \vec{C}_1, \vec{C}_2, \ldots, \vec{C}_{n+1},$$

where

$$I_{\text{DiscreteSequence},p_2',k+1} = \left(\ \bigoplus_{i=1}^{k+1} \vec{X}_1, \vec{X}_2, \ldots, \vec{X}_{k+1} \wedge \vec{Y}_1, \vec{Y}_2, \ldots, \vec{Y}_{k+1} \wedge \vec{Z}_1, \vec{Z}_2, \ldots, \vec{Z}_{k+1}\ \right).$$

$$\mathcal{E} = \sum_{[r]^{-1}\leftarrow k \leftarrow r+1} \int \prod_{\Lambda} \left\langle \mathbf{x_1} \left(\frac{\Delta}{\mathcal{H}} + \frac{\mathring{A}}{\mathrm{i}}\right) \left(\gamma \frac{\Delta\mathcal{H}}{\mathrm{i} \oplus \mathring{A}}\right) \left(\frac{\mathcal{H}\Delta}{\mathring{A}\mathrm{i}}\right) \left(\frac{\mathrm{p} \oplus \mathring{A}\Delta}{\mathcal{H}}\right) \right\rangle \mathrm{d}\cdots \mathrm{d}x_i \cdot \alpha \left(s_{\Theta^1} \wedge s_{\Theta^2} \Rightarrow s_{\Theta^k}\right)^{-1}$$

where

$$s_{\Theta^i} = \prod_{\Lambda \leftarrow p} \zeta \cdot \left\{\vec{p}_1 \odot \vec{p}_2 \Rightarrow \vec{p}_K\ \Omega_{\Lambda \leftarrow K}\right\}$$

The aforementioned non-linear solve method can then be used to answer the following pairing problem:

Given two sets of quantum games $\mathcal{A}$ and $\mathcal{B}$, for each element of set $\mathcal{A}$, find the corresponding pair in set $\mathcal{B}$ so that, for the two elements together, the integral $\mathcal{E}$ converges to the greatest lower bound of both sets. The expression in the first line is equivalent to:

$\tau = \mathcal{F}\Psi \Leftarrow \mathcal{E}^{\left([\psi \leftrightarrow \eta \mathcal{H}^{\gamma}(\pi)]_z \times \mathcal{H}^{\alpha}(\pi\bar{x}, \bar{\bar{x}} \mapsto \vec{\zeta} \cdot \overline{y} \times \vec{\nu} \cdot \overline{h}_2)\right)}$

With $\bar{\bar{x}} \leftrightarrow \bar{y} \leftrightarrow \bar{d}$, this can be rewritten as:

$\tau = \mathcal{F}\Psi \Leftarrow \mathcal{E}^{\left([\psi \leftrightarrow \eta \mathcal{H}^{\gamma}(\pi)]_z \times \mathcal{H}^{\alpha}(\pi\bar{x}, \bar{\bar{x}} \mapsto \vec{\zeta} \cdot \overline{y} \times \vec{\nu} \cdot \overline{h}_2)\right)}$

Next, the expression under consideration is:

$$\alpha \wedge \beta(\pi\vec{\zeta}.\, y \times \vec{\nu} \cdot \overline{h}_2)\gamma\delta \vee \sigma(x\delta[\psi^{\mathcal{A}}] \cup \left(\psi_1 \wedge \psi_2 \leftrightarrow \Psi_1\Psi \downarrow_{\mathcal{K}}^{\mathbf{3}}\right) \wedge \eta \wedge \delta^* \Phi_2^{\mathrm{A}} \bigoplus_{i=1}^{n} \vec{v}_i \wedge \vec{w}_i \wedge \vec{\mu} \cdot \bar{b}$$

$$\bigoplus_{i=j}^{n+1} z_\alpha^a \oplus z_\alpha^b \wedge \bigoplus_{i=1}^{n} \aleph_n \wedge \aleph_{\zeta'}^{\omega} (\aleph_3^{\omega}, \ldots, \zeta_n^{\omega}) \bigoplus_{j\epsilon\lambda}^{mt} P(m\bar{\psi}^2, \rho^4 + s, x_k^3 - 2r_k) \bigoplus_{i=j}^{2t} \alpha_j v' \oplus v' \begin{pmatrix} 1 & i & 3 & \varepsilon_{qk} \\ \alpha_2 & c & y_1 & p_k^{Nk-1} \\ 4 & z_1 & i_1 & \eta_k^* + \zeta_j \end{pmatrix}$$

The above expression can be simplified to:

$$\frac{\alpha \wedge \beta(\pi\vec{\zeta}.\, y \times \vec{\nu} \cdot \overline{h}_2)}{\gamma\delta \vee \sigma(x\delta[\psi^{\mathcal{A}}] \cup \left(\psi_1 \wedge \psi_2 \leftrightarrow \Psi_1\Psi \downarrow_{\mathcal{K}}^{\mathbf{3}}\right) \wedge \eta \wedge \delta^* \Phi_2^{\mathrm{A}}}$$

$$\bigoplus_{i=1}^{n} \vec{v}_i \wedge \vec{w}_i \wedge \vec{\mu} \cdot \bar{b} \bigoplus_{i=j}^{n+1} z_\alpha^a \oplus z_\alpha^b$$

$$\bigoplus_{i=1}^{n} \aleph_n \wedge \aleph_{\zeta'}^{\omega} (\aleph_3^{\omega}, \ldots, \zeta_n^{\omega})$$

$$\bigoplus_{i=j}^{2t} \alpha_j v' \oplus v'$$

$$\bigoplus_{j\epsilon\lambda}^{mt} P(m\bar{\psi}^2, \rho^4 + s, x_k^3 - 2r_k)$$

This simplified expression can be further written as:

$$\frac{\alpha \wedge \beta(\pi\vec{\zeta}.\, y \times \vec{\nu} \cdot \overline{h}_2)}{\gamma\delta \vee \sigma(x\delta[\psi^{\mathcal{A}}] \cup \left(\psi_1 \wedge \psi_2 \leftrightarrow \Psi_1\Psi \downarrow_{\mathcal{K}}^{\mathbf{3}}\right) \wedge \eta \wedge \delta^* \Phi_2^{\mathrm{A}}}$$

$$\bigoplus_{i=1}^{n} \vec{v}_i \wedge \vec{w}_i \wedge \vec{\mu} \cdot \bar{b} \bigoplus_{i=j}^{n+1} z_\alpha^a \oplus z_\alpha^b \bigoplus_{i=1}^{n} \aleph_n \wedge \aleph_{\zeta'}^{\omega} (\aleph_3^{\omega}, \ldots, \zeta_n^{\omega})$$

$$\bigoplus_{i=j}^{2t} \alpha_j v' \oplus v'$$

$$\bigoplus_{j\epsilon\lambda}^{mt} P(m\bar{\psi}^2, \rho^4 + s, x_k^3 - 2r_k)$$

Now $(\pi\vec{\zeta}.\, y)$ can be written as (py):

$$\frac{\alpha \wedge \beta(\pi py \times \vec{\nu} \cdot \overline{h}_2)}{\gamma\delta \vee \sigma(x\delta[\psi^{\mathcal{A}}] \cup \left(\psi_1 \wedge \psi_2 \leftrightarrow \Psi_1\Psi \downarrow_{\mathcal{K}}^{\mathbf{3}}\right) \wedge \eta \wedge \delta^* \Phi_2^{\mathrm{A}}}$$

$$\bigoplus_{i=1}^{n} \vec{v}_i \wedge \vec{w}_i \wedge \vec{\mu} \cdot \bar{b} \bigoplus_{i=j}^{n+1} z_\alpha^a \oplus z_\alpha^b \bigoplus_{i=1}^{n} \aleph_n \wedge \aleph_{\zeta'}^{\omega} (\aleph_3^{\omega}, \ldots, \zeta_n^{\omega})$$

$$\bigoplus_{i=j}^{2t} \alpha_j v' \oplus v'$$

$$\bigoplus_{j\epsilon\lambda}^{mt} P(m\bar{\psi}^2, \rho^4 + s, x_k^3 - 2r_k)$$

After expanding, we get:

$$\frac{\alpha \wedge \beta(p^{\mathsf{T}} py)}{\gamma\delta \vee \sigma(x\delta[\psi^{\mathcal{A}}] \cup \left(\psi_1 \wedge \psi_2 \leftrightarrow \Psi_1 \Psi \downarrow^{\mathbf{3}}_{\mathcal{K}}\right) \wedge \eta \wedge \delta^* \Phi^{\mathrm{A}}_2}$$

$$\bigoplus_{i=1}^{n} \vec{v}_i \wedge \vec{w}_i \wedge \vec{\mu} \cdot \bar{b} \bigoplus_{i=j}^{n+1} z^a_\alpha \oplus z^b_\alpha \bigoplus_{i=1}^{n} \aleph_n \wedge \aleph^\omega_{\zeta'} \left(\aleph^\omega_3, \ldots, \zeta^\omega_n\right)$$

$$\bigoplus_{i=j}^{2t} \alpha_j v' \oplus v'$$

$$\bigoplus_{j\epsilon\lambda}^{mt} P(m\bar{\psi}^2, \rho^4 + s, x^3_k - 2r_k)$$

In the above expression, $(p^{\mathsf{T}} py)$ and $\gamma\delta$ can be combined using the distributive law of multiplication over addition to obtain:

$$\frac{\alpha \wedge [\beta(p^{\mathsf{T}} py) \times \gamma\delta]}{\sigma(x\delta[\psi^{\mathcal{A}}] \cup \left(\psi_1 \wedge \psi_2 \leftrightarrow \Psi_1 \Psi \downarrow^{\mathbf{3}}_{\mathcal{K}}\right) \wedge \eta \wedge \delta^* \Phi^{\mathrm{A}}_2)}$$

$$\bigoplus_{i=1}^{n} \vec{v}_i \wedge \vec{w}_i \wedge \vec{\mu} \cdot \bar{b} \bigoplus_{i=j}^{n+1} z^a_\alpha \oplus z^b_\alpha \bigoplus_{i=1}^{n} \aleph_n \wedge \aleph^\omega_{\zeta'} \left(\aleph^\omega_3, \ldots, \zeta^\omega_n\right)$$

$$\bigoplus_{i=j}^{2t} \alpha_j v' \oplus v'$$

$$\bigoplus_{j\epsilon\lambda}^{mt} P(m\bar{\psi}^2, \rho^4 + s, x^3_k - 2r_k)$$

After this, the expression simplifies to:

$$\frac{\alpha \wedge [\beta(p^{\mathsf{T}} py) \times \gamma\delta]}{\sigma(x\delta[\psi^{\mathcal{A}}] \cup \left(\psi_1 \wedge \psi_2 \leftrightarrow \Psi_1 \Psi \downarrow^{\mathbf{3}}_{\mathcal{K}}\right) \wedge \gamma\delta \wedge \delta^* \Phi^{\mathrm{A}}_2)}$$

$$\bigoplus_{i=1}^{n} \vec{v}_i \wedge \vec{w}_i \wedge \vec{\mu} \cdot \bar{b} \bigoplus_{i=j}^{n+1} z^a_\alpha \oplus z^b_\alpha \bigoplus_{i=1}^{n} \aleph_n \wedge \aleph^\omega_{\zeta'} \left(\aleph^\omega_3, \ldots, \zeta^\omega_n\right)$$

$$\bigoplus_{i=j}^{2t} \alpha_j v' \oplus v'$$

$$\bigoplus_{j\epsilon\lambda}^{mt} P(m\bar{\psi}^2, \rho^4 + s, x^3_k - 2r_k)$$

Applying the commutative property of the addition operator, we finally get:

$$\frac{\alpha \wedge (\beta(p^{\mathsf{T}} py) \times \gamma\delta)}{(\gamma\delta \wedge \gamma\delta \wedge \delta^*) \cup (x\delta[\psi^{\mathcal{A}}] \cup \left(\psi_1 \wedge \psi_2 \leftrightarrow \Psi_1 \Psi \downarrow^{\mathbf{3}}_{\mathcal{K}}\right) \wedge \eta \Phi^{\mathrm{A}}_2)}$$

$$\bigoplus_{i=1}^{n} \vec{v}_i \wedge \vec{w}_i \wedge \vec{\mu} \cdot \bar{b} \bigoplus_{i=j}^{n+1} z^a_\alpha \oplus z^b_\alpha \bigoplus_{i=1}^{n} \aleph_n \wedge \aleph^\omega_{\zeta'} \left(\aleph^\omega_3, \ldots, \zeta^\omega_n\right)$$

$$\bigoplus_{i=j}^{2t} \alpha_j v' \oplus v'$$

$$\bigoplus_{j\epsilon\lambda}^{mt} P(m\bar{\psi}^2, \rho^4 + s, x^3_k - 2r_k)$$