2001 math-ph/0101012

Dakić and Brukner
Dakić and Brukner
Masanes and Müller
Chiribella, D'Arino, Perinotti
\[ \frac{A \times 1}{\quad} \]
\[ P = \lim_{N \to \infty} \frac{A \times 1}{N} \]
\[ P = \lim_{N \to \infty} \frac{N_0}{N} \]

\[ A \times 1 \]
\[ A \times 1 \]

\[ p = \lim_{N \to \infty} \frac{N_0}{N} \]

takes the same value each time.
\[ P = \lim_{N \to \infty} \frac{N_0}{N} \]
take same value each time.
\[
P = \lim_{N \to \infty} \frac{N_0}{N}
\]

This expression takes some value each time.
\[ a = P x r - c P x r + \frac{(1-c)}{2} (P_{2+} + P_{2-}) \]

\[ k \in \Omega \]

\[ |\Omega| \approx m \]
State

\[
\begin{pmatrix}
\vdots \\
P_0 \\
\vdots
\end{pmatrix}
\begin{pmatrix}
\vdots \\
P_0^* \\
\vdots
\end{pmatrix}
\]

\[
k \in \Omega
\]

\[1_{\Omega} \text{ minimal.}\]

Ex.

\[
P = \begin{pmatrix}
P_{2+} & a \\
a^* & P_{2-}
\end{pmatrix}
\]

\[
a = P_{x+} - i P_{y+} + \frac{1-i}{2} (P_{2+} + P_{2-})
\]
State

\[
\begin{align*}
\text{state} & \rightarrow (p_\omega) \\
& \rightarrow (p_k)
\end{align*}
\]

\[k \in \Omega \]

\[|\Omega| \text{ minimal} \]

\[E \times p = (p_\omega) \quad a = p_{x^t} - i p_{x^t} + \frac{1-i}{2} (p_{x^t} + p_{x^t})\]
State

\[ \text{state} \Leftrightarrow \begin{pmatrix} P_a \\ \vdots \\ P_k \end{pmatrix} \quad \text{\( k \in \Omega \)} \]

\[ |\Omega| \text{ maximal} \]

Ex.

\[ P = (P_a) \quad a = P_{x+} - iP_{y+} + \frac{1-i}{2}(P_{z+} + P_{z-}) \]
\[
\text{state } \implies \begin{pmatrix} \vdots & \vdots \\ P_0 & \vdots \\ \vdots & \vdots \\ P_k & \vdots \end{pmatrix} \quad k \in \Omega
\]

\[|\Omega| \text{ minimal}\]

Ex. \[P = (P_{2+}, a) \quad a = P_{2+} - iP_{2+} + \left(1 - \frac{i}{2}\right)(P_{2+} + P_{2-})\]

\[P = \begin{pmatrix} P_{2+} \\ P_{2-} \end{pmatrix} \]

\[P = \begin{pmatrix} P_{2+} \\ P_{2-} \\ P_{2+} \\ P_{2+} \end{pmatrix} \]
\[ P = \begin{pmatrix} p_1 \\ p_2 \\ p_3 \end{pmatrix} \]

\[ \text{prob}_m(\rho) = \frac{1}{\Delta} \cdot \rho \]

meas.

state
$N$,

\[ n = 1, 2, \ldots, N \]
\[ n = 1, 2, \ldots, N \]
\[ P = \lim_{N \to \infty} \frac{N_0}{N} \]

System having, or constrained to have, the same \( N \) have the same properties.

takes some value each time.
\[ P = \lim_{N \to \infty} \frac{N_0}{N} \]

System having, or constrained to have, the same \( N \) have the same properties.

Information
\[ N. \]

\[ K_{AB} > K_A K_B \]

\[ n = 1, 2, \ldots, N \]
\[ K_{AB} > K_A K_B \]
\[
p = \frac{c_{\phi}}{p_3}
\]

\[
\text{prob}_{\text{m}}(p) = \frac{1}{\sum p}
\]

state

meas
$P = \lim_{N \to \infty} \frac{N_0}{N}$

Ax1: Takes same value each time.

Ax2: Systems having, or constrained to have, the same $N$ have the same properties.

Ax3: $N_{AB} = N_A N_B$

Ax4: There exist a continuous or stable

$K_{AB} = K_A K_B$
Ax1
\[ P = \lim_{N \to \infty} \frac{N_0}{N} \]
takes same value each time.

Ax2
Systems having, or constrained to have, the same \( N \) have the same properties.

Information

Ax3
\[ N_{AB} = N_A N_B \]

Ax4
There exists a continuous reversible transformation between any pair of pure states.

\[ K_{AB} = K_A K_B \]
\[ K_{AB} > K_A K_B \]

\[ n = 1, 2, \ldots N \]

\[ \text{prob}_N(p) = \frac{1}{N} \cdot p \]

\[ \text{meas. state} \]
\[ N \]

\[ K = K(N) \]
\[ K(N+1) > K(N) \]
\[ K(N_A N_B) = K(N_A) K(N_B) \]

\[ K_{A_B} > K_A K_B \]
\[ N \]

\[ K = K(N) \]
\[ K(N+1) > K(N) \]

\[ K(N_a, N_b) = K(N_a)K(N_b) \]
\[ \sum_{\alpha, \beta} \]

\[ K_{AB} > K_A K_B \]
\[ K = K(N) \]
\[ K(N+1) > K(N) \]
\[ K(N_1, N_3) = K(N_1)K(N_3) \]
\[ \gamma = 1, 2, 3, \gamma = 1 \quad \text{Classical Prob. Theory} \]
\[ K = K(N) \]
\[ K(N+1) > K(N) \]
\[ K(N_aN_b) = K(N_a)K(N_b) \]
\[ K = N^\gamma \]
\[ \gamma = 1, 2, 3, \ldots \]

- \( \gamma = 1 \): Classical Prob. Theory
- \( \gamma = 2 \): Quantum case
Ax1 \[ P = \lim_{N \to \infty} \frac{N_0}{N} \text{ takes same value each time.} \]

Ax2 System having, or constrained to have, the same \( N \) have the same \( P \).

Ax3 \[ N_{AB} = N_A N_B \]

Ax4 Information \[ K_{AB} = K_A K_B \]

Ax5 Simplicity
$$A \times 1 \quad P = \lim_{N \to \infty} \frac{N_0}{N}$$

Takes same value each time.

$$A \times 2 \quad \text{Systems having, or constrained to have, the same } N \text{ have the same properties.}$$

$$A \times 3 \quad N_{AB} = N_A N_B$$

$$K_{AB} = K_A K_B$$

$$A \times 4 \quad \text{There exist a continuous spurious transformation between any pair of pure states.}$$

$$A \times 5 \quad \text{Simplicity}$$
Systems having, or constrained to have, the same \( N \) have the same properties.

There exists a continuous reversible transformation on any pair of pure states.

Simplicity \( K \) takes smallest value for each \( N \).
Systems having, or constrained to have, the same $N$ have the same properties.

There exists a continuous reversible transformation on any pair of pure states.

Simplicity $K$ takes smallest value for each $N$ consistent with other axioms.
Systems having, or constrained to have, the same $N$ have the same properties.

There exists a continuous reversible transformation on any pair of pure states.

Simplicity $K$ takes smallest value for each $N$ with other axioms.
Ax1 \[ P = \lim_{N \to \infty} \frac{N_0}{N} \]

Ax2 Systems having, or constrained to have, the same \( N \) have the same properties.

Ax3 \[ N_{AB} = N_A N_B \]

\[ K_{AB} = K_A K_B \]

Ax4 There exists a continuous reversible transformation between any pair of pure states.

Ax5 Simplicity \( K \) takes smallest value for each \( N \) consistent with the axioms.

\( \Gamma = 2 \).
\[ K > K_A K_B \]

Below the chalkboard, there are notes on the blackboard:

- "\( n = \frac{1}{2} \cdots N \)
- "\( \text{each } N \text{ consost} \)"
- "\( \text{transformation} \)"

A person is standing in front of the chalkboard, holding papers.
\[K = K(N)\]
\[K(N+1) > K(N)\]
\[K(N_A, N_B) = K(N_A)K(N_B)\]
\[K = N^c\]
\[\gamma = 1, 2, 3, \ldots\]

\(\gamma = 1\): Classical Prob. Theory
\(\gamma = 2\): Quantum race