Symplectic extension of the Haag-Araki axiomatics and its applications in the physics of causal geodesic structures.

Goal of the work: Create an axiomatic equivalent to the axiomatics of Haag-Araki and Whitman, based on the principle of causality for sticky sets.

Axioms of causality set on local geodesic structure:

Assumption (Axiom) 1.

\[ \text{Int}_+^r(q) = \text{Int}_+^r(q) \cap (\text{Int}_\cap^r(q) \cup \text{Int}_\cap^r(q)) \]

Proof of the Assumption 1.

\[ \text{Int}_+^r(q) = \text{Int}_+^r(q) \cap (\text{Int}_\cap^r(q) \cup \text{Int}_\cap^r(q)) \]

For future reference, we let:

\[ \mathcal{C}^t \rightarrow \mathcal{M} \sum_t I^+ \in \left( \text{Int}_+^r(q) \cap (\text{Int}_\cap^r(q) \cup \text{Int}_\cap^r(q)) \right) [x_p, x_{p+1}] - q)\]

Axiom 2. This axiom defines the complement of the past set in a globally hyperbolic neighborhood of an eventually periodic point.

\[ \text{Int}_+^r(q) \cap (\text{Int}_\cap^r(q) \cup \text{Int}_\cap^r(q)) \]

Corollaries from Assumption 1 and properties of nested sets:

1. Time is a Markov process

2. Controlled packed globally hyperbolic sets are completely simple

Proof of the equivalence of the formalism of the area-preserving plane transformation with infinite hierarchical structure and causal sets.

For transition between different levels of dynamic system

1. \( \text{Int}_+^r(q) \cap (\text{Int}_\cap^r(q) \cup \text{Int}_\cap^r(q)) \)

2. \( \text{Int}_+^r(q) \cap (\text{Int}_\cap^r(q) \cup \text{Int}_\cap^r(q)) \)

3. \( \text{Int}_+^r(q) \cap (\text{Int}_\cap^r(q) \cup \text{Int}_\cap^r(q)) \)

4. \( \text{Int}_+^r(q) \cap (\text{Int}_\cap^r(q) \cup \text{Int}_\cap^r(q)) \)

5. \( \text{Int}_+^r(q) \cap (\text{Int}_\cap^r(q) \cup \text{Int}_\cap^r(q)) \)

Traceless tensor of momentum-energy matrix

\[ \sup_{\text{Crit}_{\text{Geod}} \cap \text{Int}_+^r(q) \cap (\text{Int}_\cap^r(q) \cup \text{Int}_\cap^r(q))} \max_{y \in \text{Crit}_{\text{Geod}} \cap \text{Int}_+^r(q) \cap (\text{Int}_\cap^r(q) \cup \text{Int}_\cap^r(q))} \]