Qeios

Peer Review

Review of: "Functional Information of a Driven Cellular Automaton"

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Overall assessment:

The study presents a convincing experimental setting and conducts a detailed, multi-perspective analysis. It effectively demonstrates how even simple local informational bindings can give rise to the emergence of stable structures.

However, the connection between the specific rules governing the dynamics and broader, generalizable concepts or conclusions remains less clear. Clarifying this link would strengthen the study's impact and applicability or perhaps be attempted in a future work.

Overall, the work is well-deserving of publication, given its rigorous approach and insightful findings.

Specific comments:

Introduction

"Even though thermodynamics plays no role in PE dynamics."

I would challenge this statement, as maintaining the structure and rules in physical space inherently requires an energy influx and entropy balance. While this may lie outside the direct and immediate scope of the analysis, it remains a fundamental aspect of the underlying physical reality. For instance, removing physical energy inflow would cause any PE dynamics to collapse immediately.

p. 3

"This new model is analogous to how the primordial elements created by stellar evolution in the early universe[18] eventually gave birth, ..."

I would suggest a more cautious phrasing here unless each claim is substantiated by robust evidence or arguments.

doi.org/10.32388/89XUW4

Figure 1

Figure 1 appears before the model description, which may hinder immediate comprehension, particularly for readers less familiar with cellular automata.

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A simple clarifying statement would greatly improve understanding of the proposed model.

For example: *"In contrast to (or extension of) the standard (canonical) model, we introduce an additional cell type (PE) that satisfies ..."*

This would eliminate the need for readers to infer essential changes based on prior familiarity with Game of Life (GoL).

Figure 3 (Statistics Legend) The legend in Figure 3 requires clarification:

- How were the subsets of soups generated, e.g., randomly or according to a specific rule?
- Were the subsets balanced in any way?
- Does the diagram illustrate an essential finding, or is it an artifact of the experimental setup?

Declarations

Potential competing interests: No potential competing interests to declare.