A method for visualizing functional dynamics and operational scenarios

FRAMily 2018

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The idea

A couple moments from previous FRAMily meetings inspired this idea

- “A FRAM graph by its self can not describe the way things happen. The graph is representative of potential, the way things could potentially happen.”
- We rely on variability to show how things are happening. And “work as done” to show how things are “actually” happening.
- This means that not all the “potential” functions need to occur for a given case.

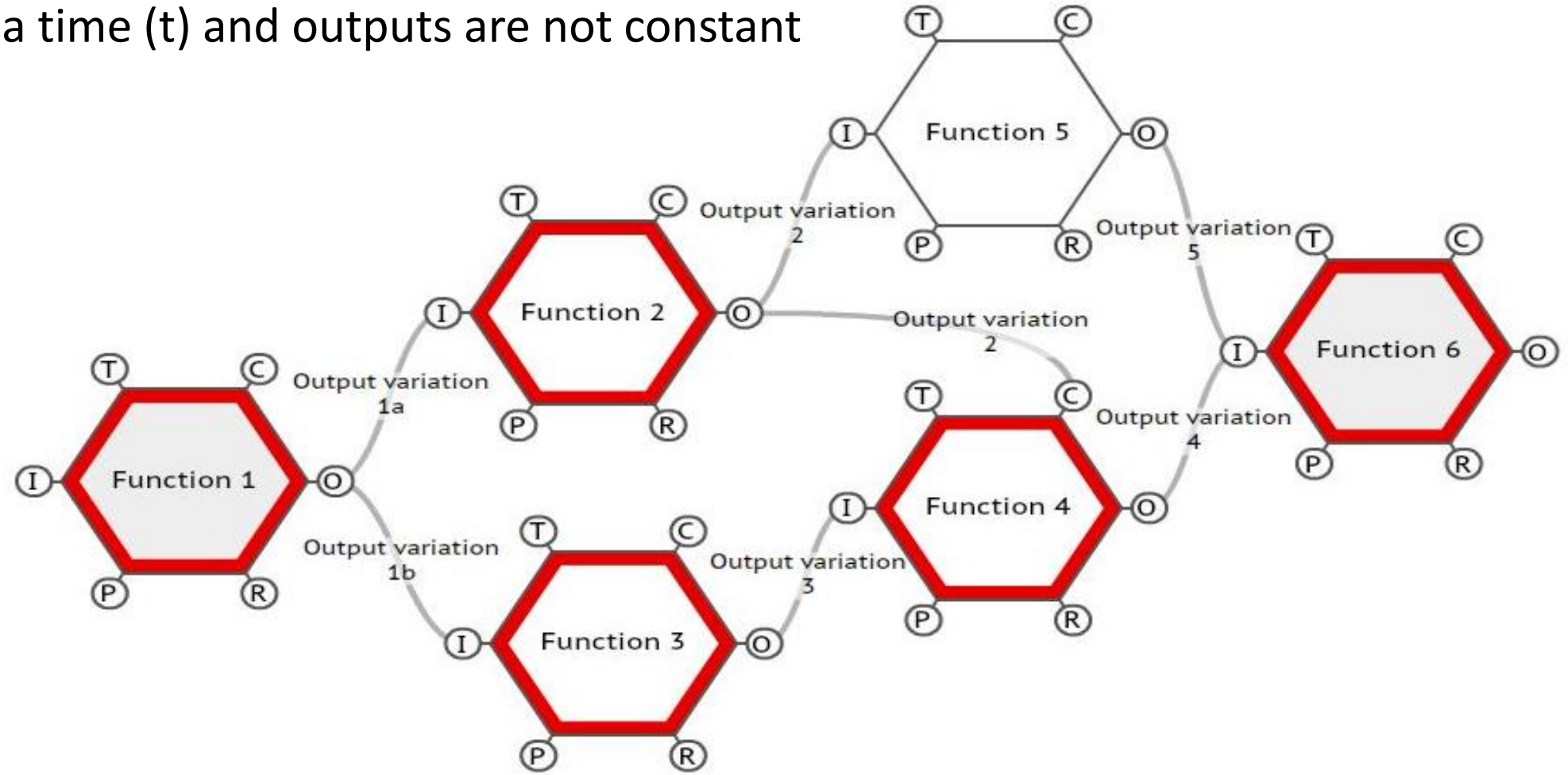
- “What is the difference between variance and variability?”
- In FRAM, the term variability is used in a more general sense. Maybe variety is a more appropriate word.
- Variability has 2 forms: Functional path and Functional output

A simple analogy – Driving to work

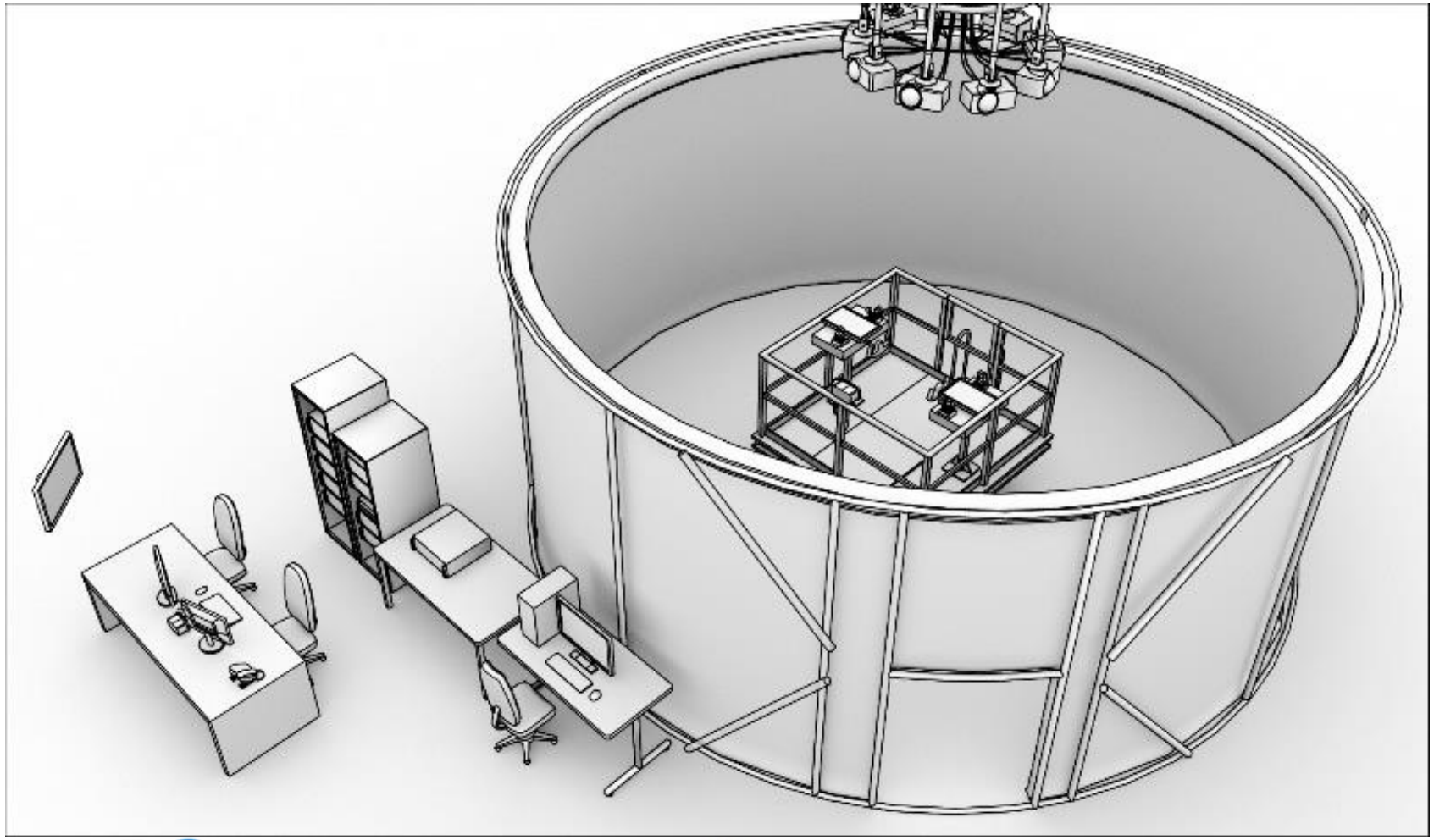
- Generalized Map (FRAM model) and Case specific data (Variability)
- A combination of Route variability and output variability

Functional Signature

Functional Signature – only a portion of the functions may be active at a time (t) and outputs are not constant



Example – Ice management simulator



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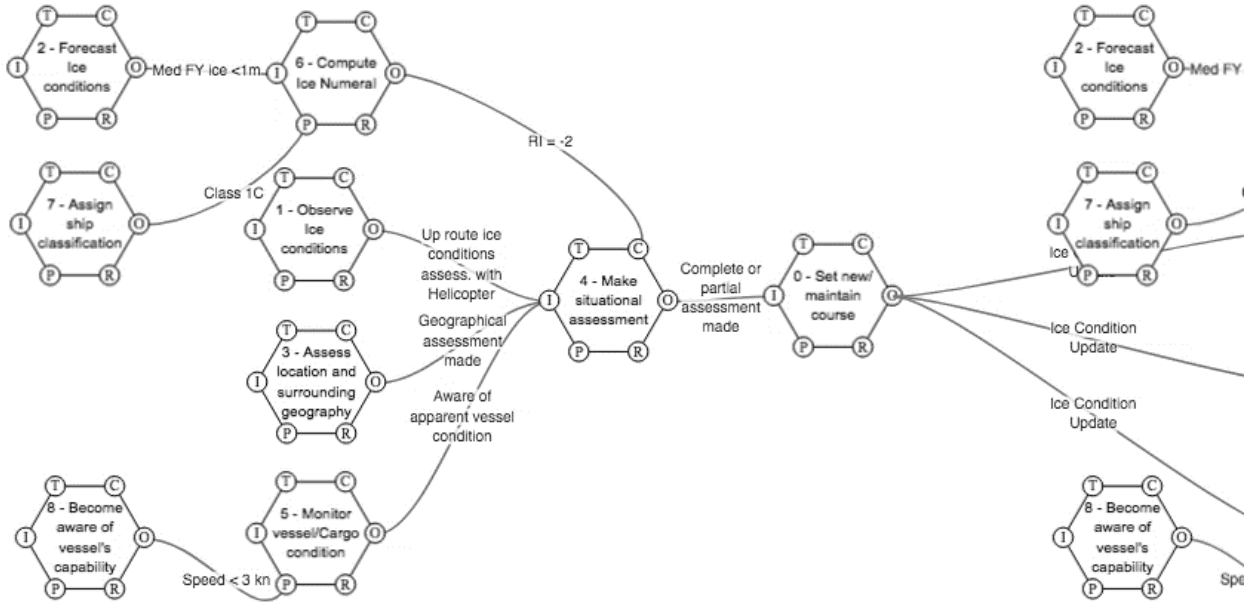
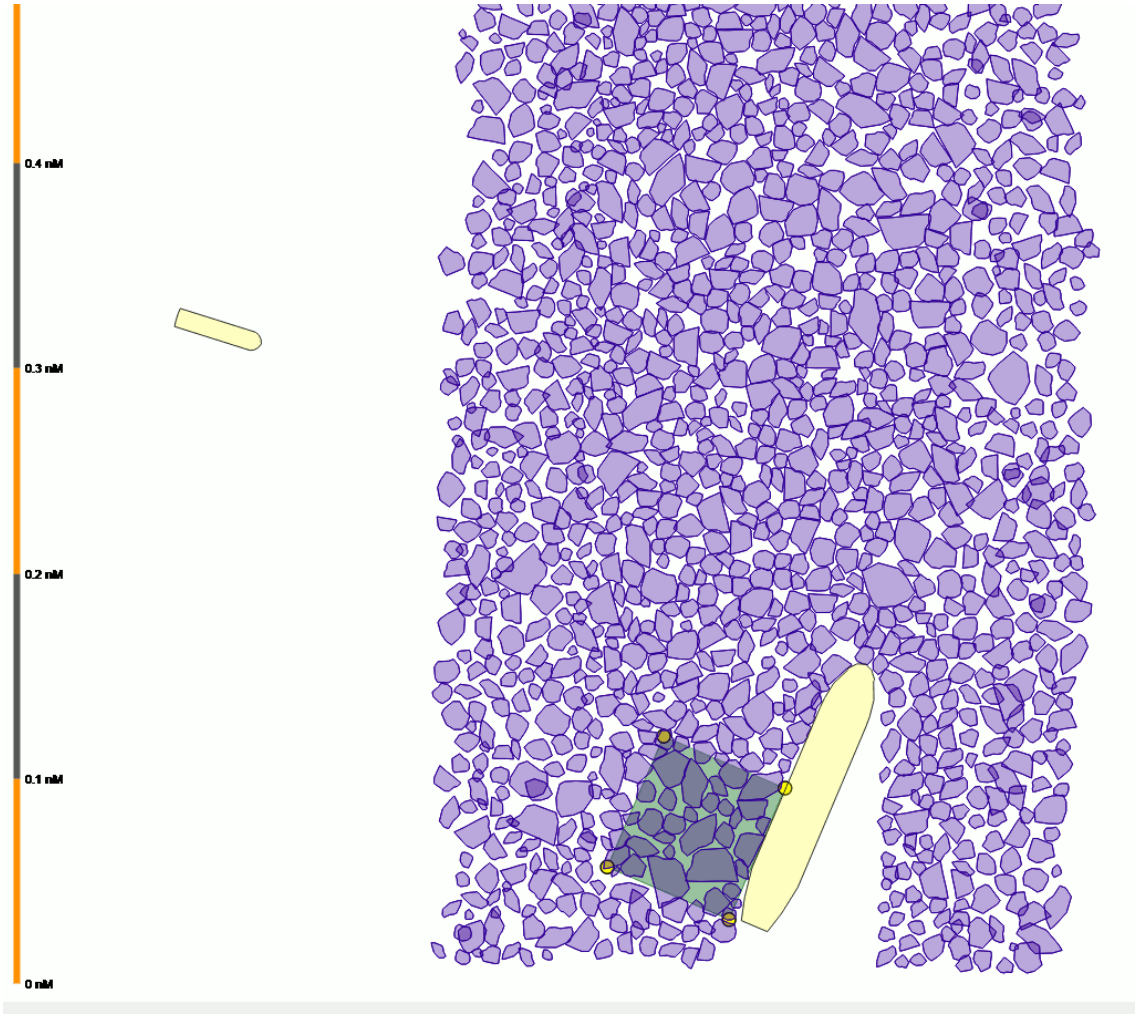
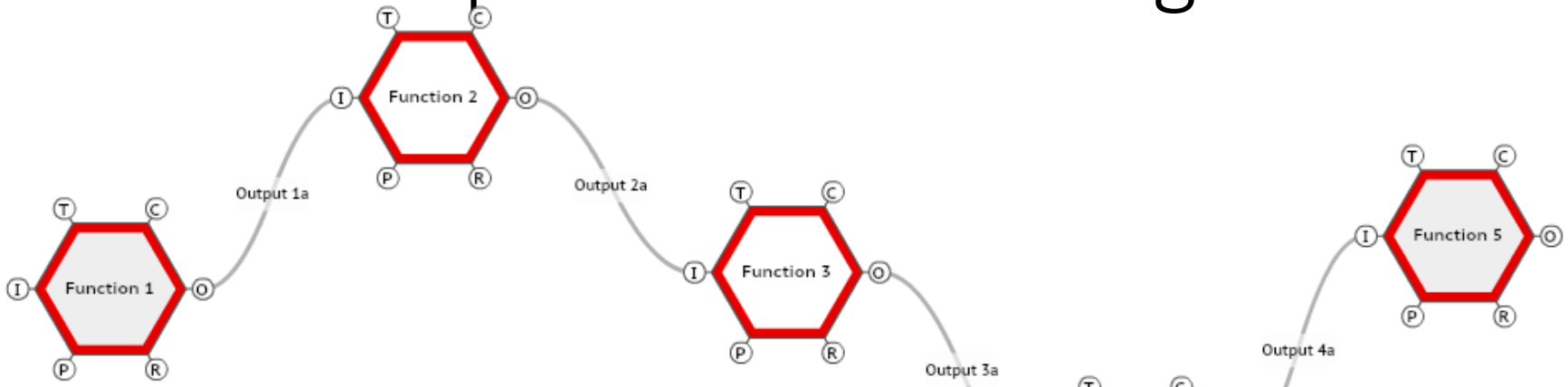
Example – Ice management simulator

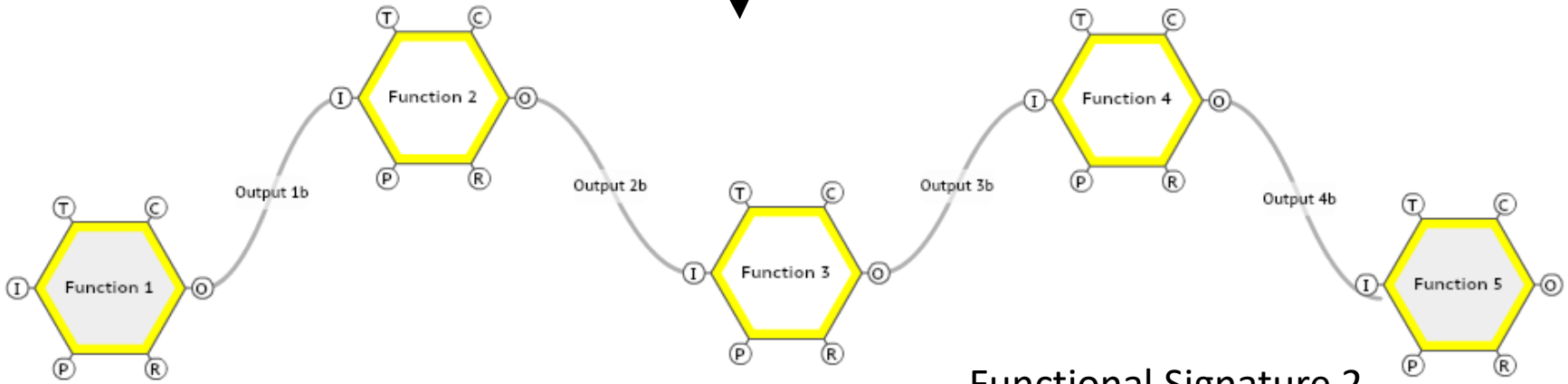




Compare Functional Signatures



Functional Signature 1



Functional Signature 2

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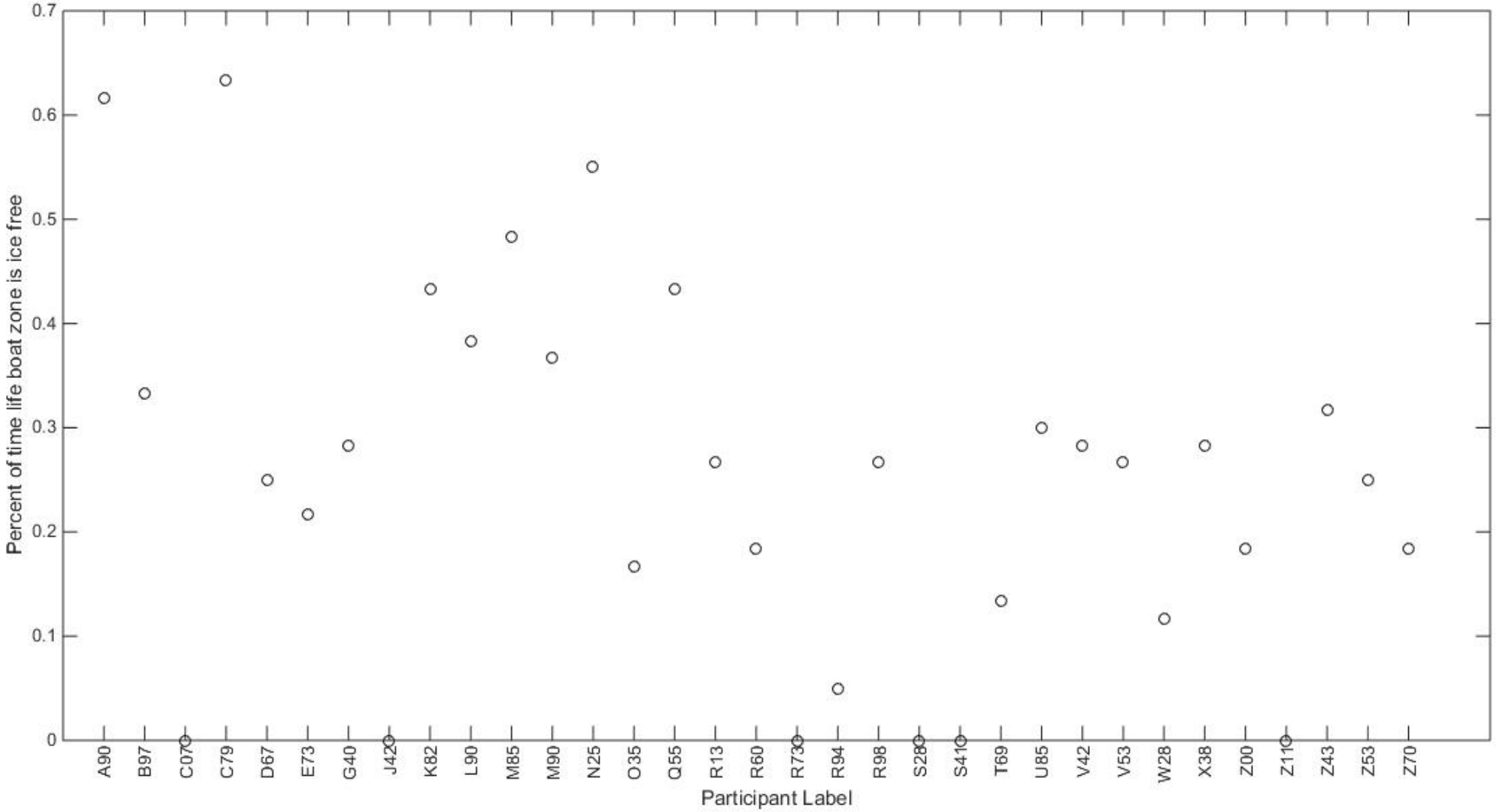
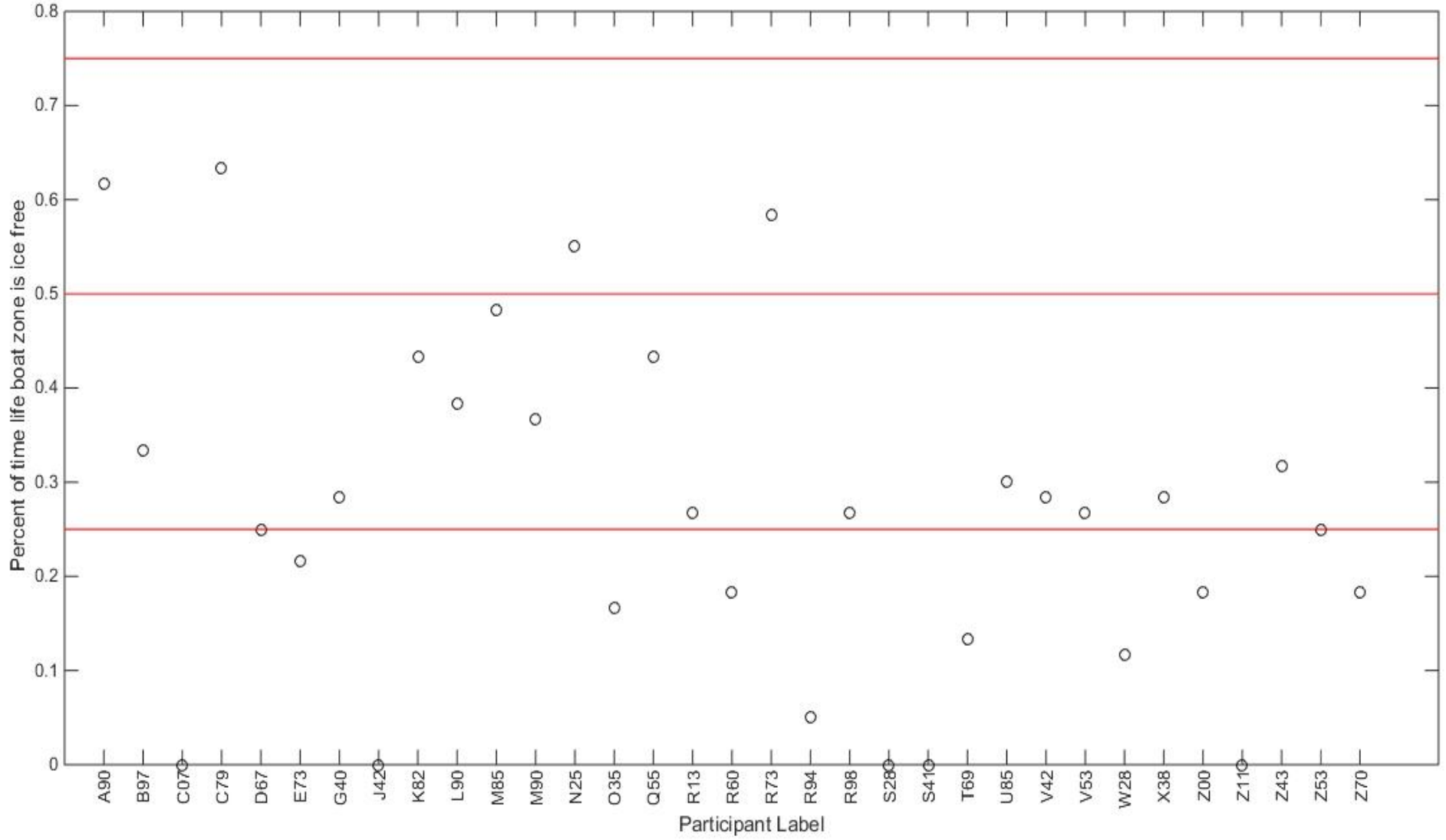
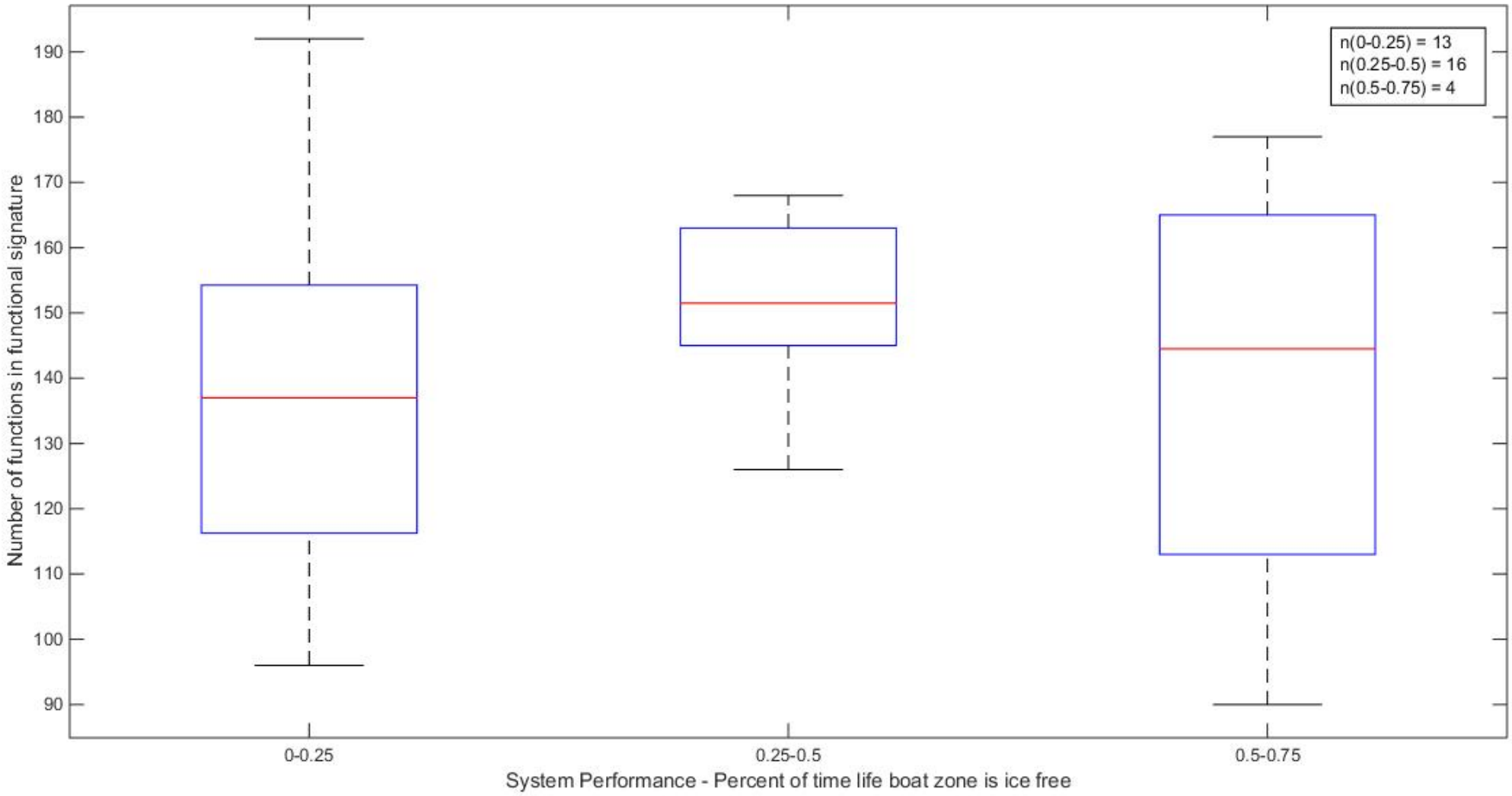
Ice management simulator – System Performance



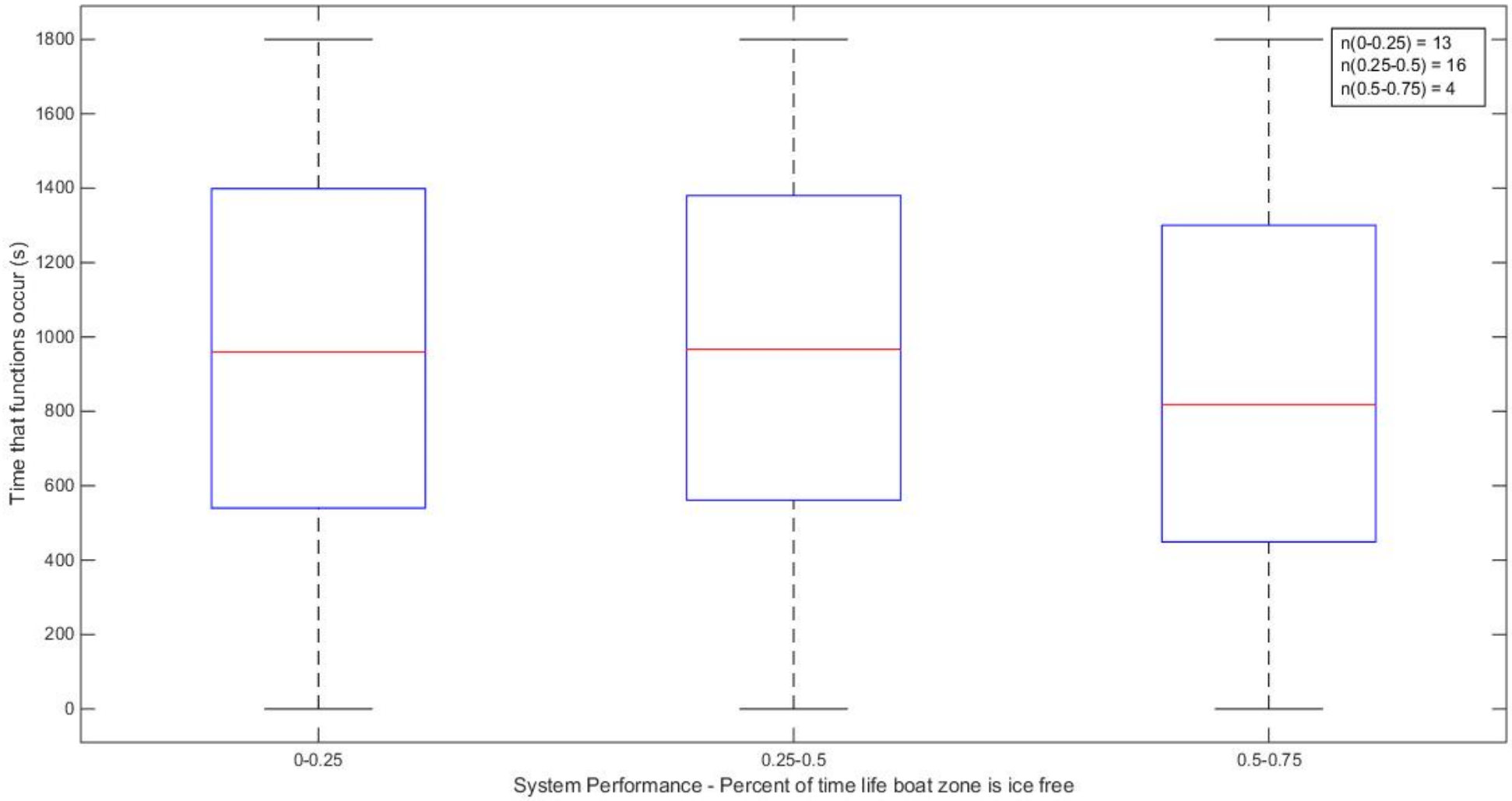
Ice management simulator – System Performance



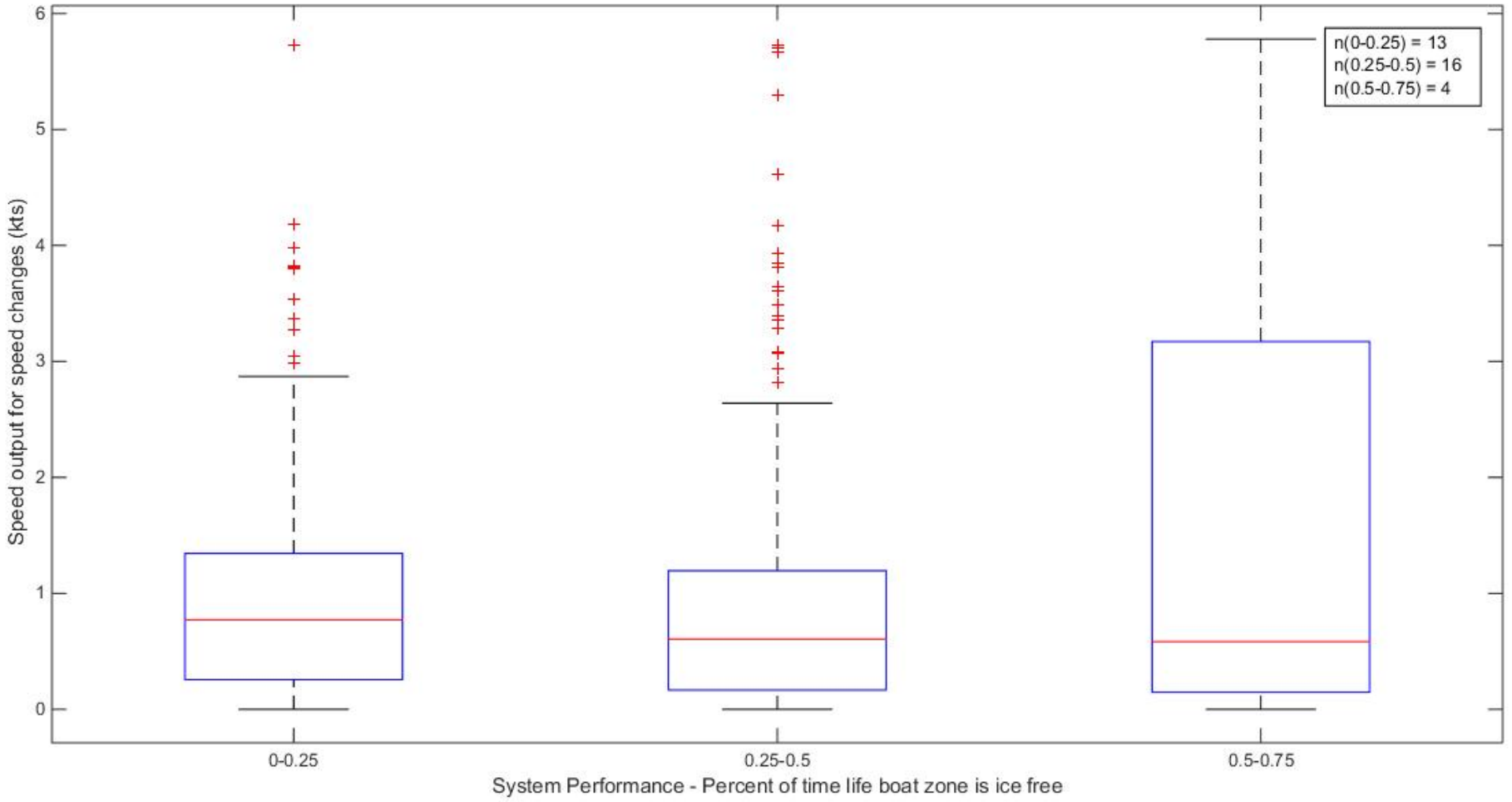
Ice management simulator – Functional Activity



Ice management simulator – Time distribution of Functional Activity



Ice management simulator – Speed output variability of speed changes



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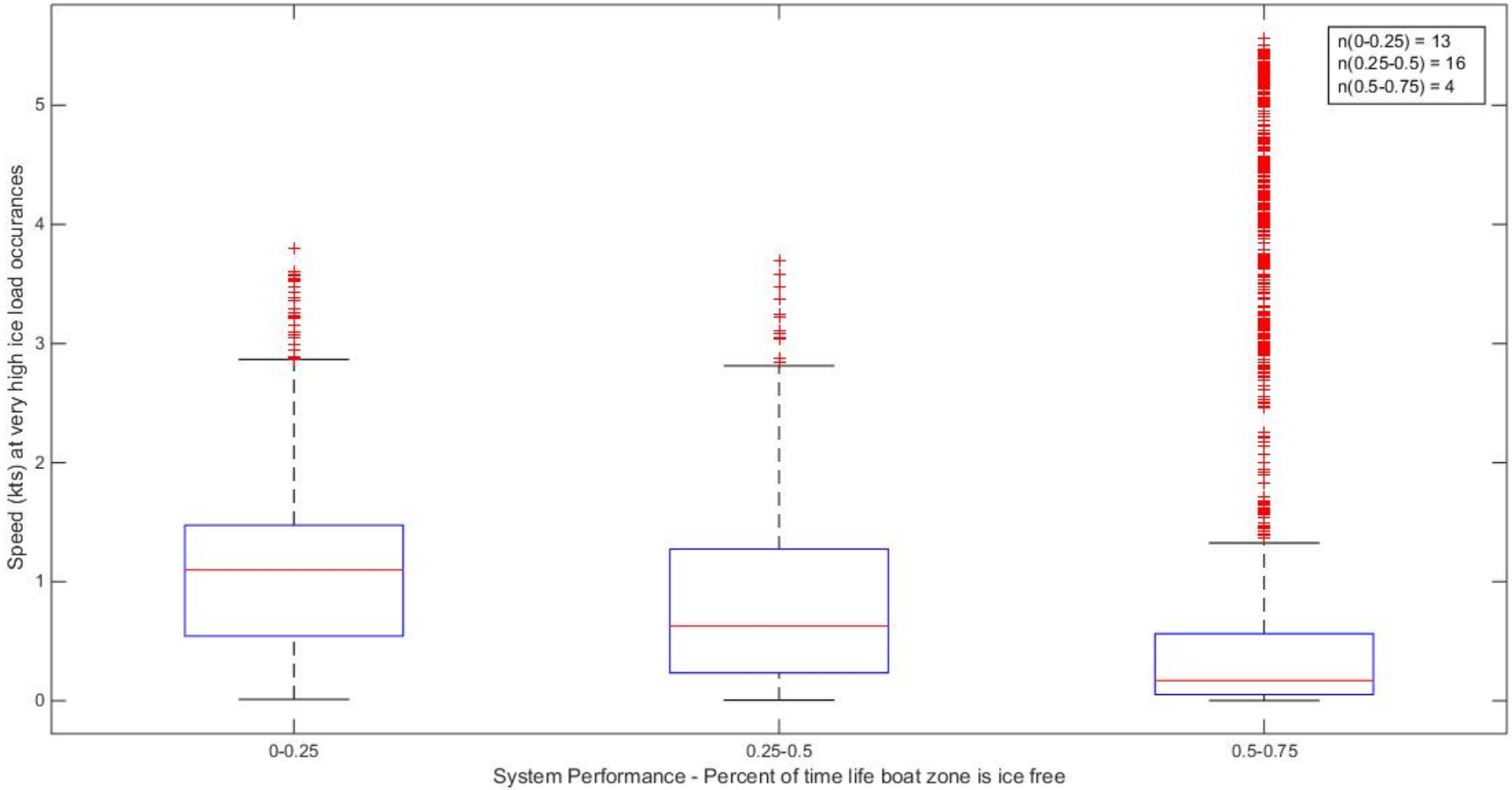
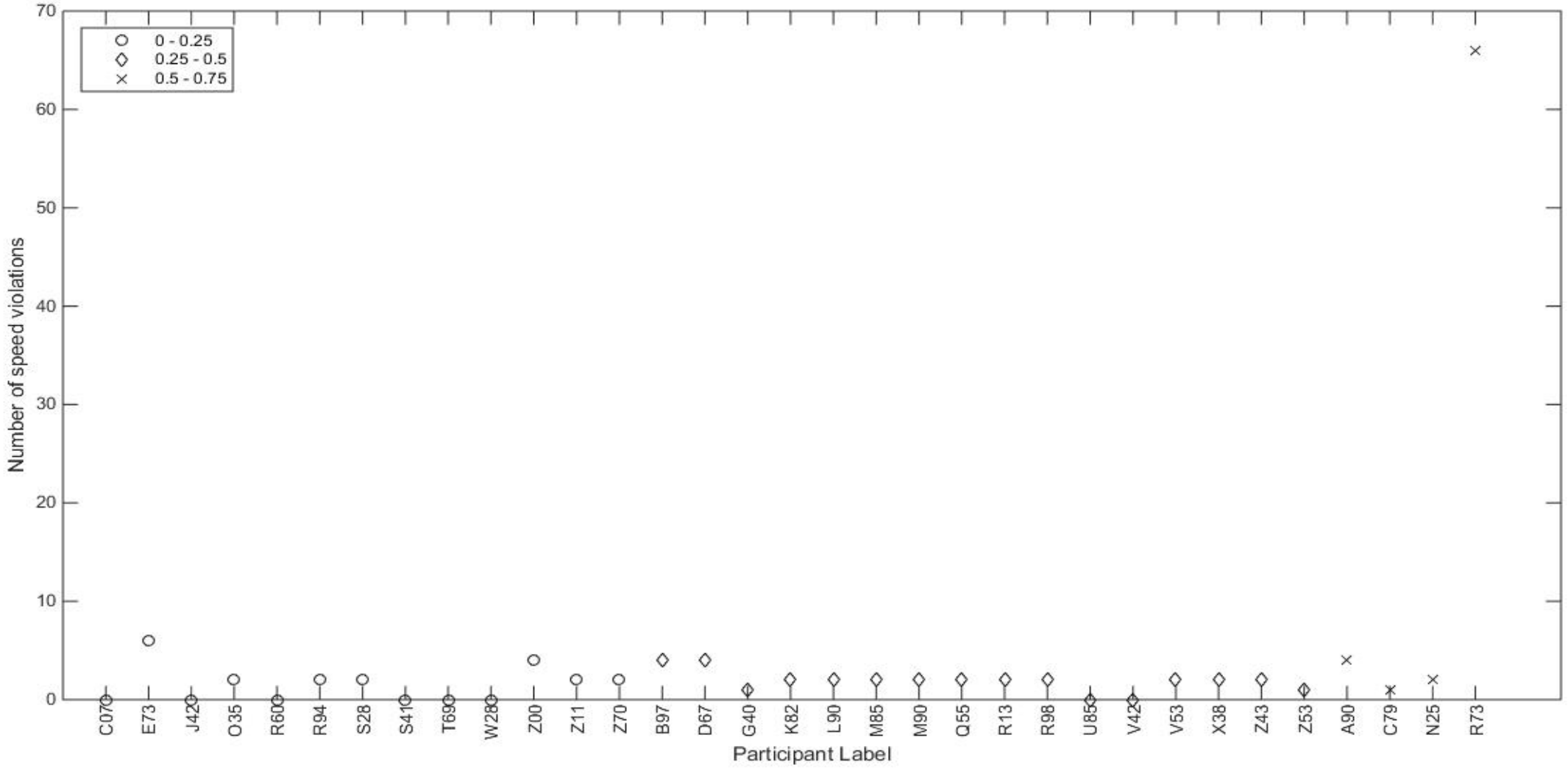
Ice management simulator – Speed when very high ice loads were measured



Ice management simulator – Individual speed violations



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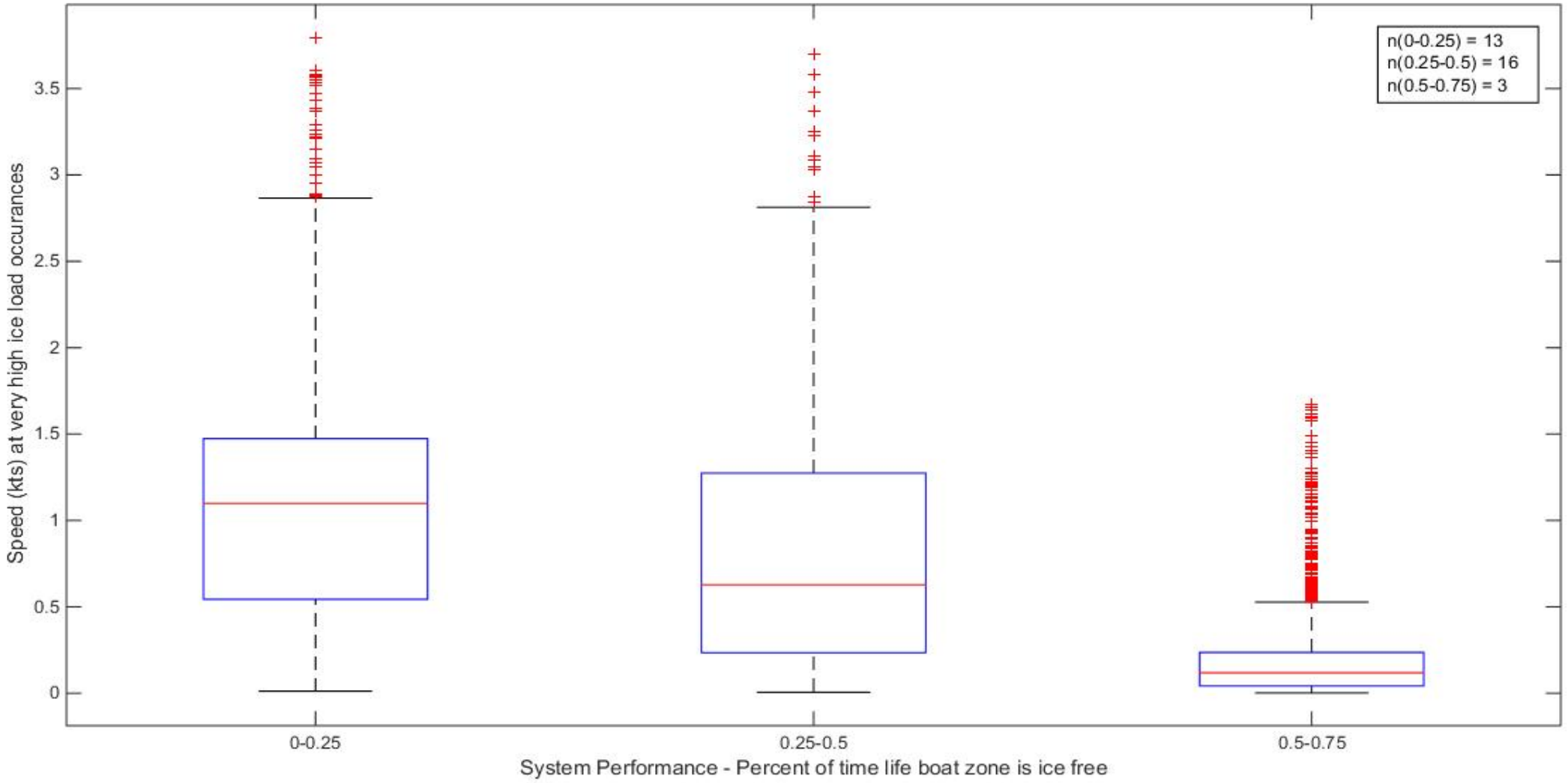
Ice management simulator – Speed at very high ice load occurrences without R73



Concluding Remarks

- Analysis of functional signatures are still ongoing
- Is this method of combining system performance and functional signatures useful for your work? Practical?
- Are functional signatures a good way to visualize the FRAM?
- Working on developing a executable to allow users to visualize the FRAM this way

Acknowledgements

The Lloyd's Register Foundation

- Lloyd's Register Foundation helps to protect life and property by supporting engineering-related education, public engagement and the application of research.