

1 Summary

In this paper, which Leslie Lamport admits may have been his best writing (<https://www.microsoft.com/en-us/research/publication/simple-approach-specifying-concurrent-systems/>), he attempts to explain the important concepts of an approach to formal specification of concurrent systems he calls the "**transition axiom**" method. Complex systems, Lamport claims, can only be understood if they are composed of simple parts; likewise, the transition axiom method provides a simple conceptual basis used as a method to specify the behavior of complex systems. Specifically, the axioms specify two classes of behavioral properties separately for complex systems: (1) *safety* properties that declare the allowed/forbidden actions, and (2) *liveness* properties that declare what the system must do. In accordance with keeping the formalism and related complexities to a minimum, Lamport extensively uses the specification of a soda machine and a database concurrency control mechanism as examples to employ the method.

2 Strengths of the paper

The first thing that stood out to me about this paper was the question-answer style in which it is written. It makes it so much easier for me, as a reader, to comprehend Lamport's argument when he guides me with my own questions and his answers to them. I wish more papers were written in this format. Of course, it helps that Lamport is one of the preeminent scientific writers, especially in terms of syntax and comprehensibility. Another thing that I appreciate about this paper is the consistent use of the soda machine as an example of a concurrent system throughout the paper. Knowing that other top papers related to this work inadvertently obscured "the fundamental principles in the mass of details needed to rigorously describe its formal basis," the soda machine as a system described by Lamport is simple enough to convey his main points but can be extended further to highlight his more minute points.

3 Major weakness of the paper

I think including a conclusion would have benefited the reader. Obviously, there was a lot of information discussed throughout the 30+ pages of the paper so a short summary and highlighting the most important aspects would have been nice; though one could argue that's done in the capsule review section in the beginning but to that I'd say those aren't Lamport's words. . .

4 Future work opportunities

The first-principles sort of work done in this paper has served and will continue to serve as a building block for anyone dealing with complex systems as defined by Lamport. The very nature of axioms, I believe, prevent them from being extended; they are limited to either being refuted by new, valid arguments or simply reinforced/expanded upon by more modern examples.