I'm presenting this paper in class on 10/18...

1 Summary

Lamport's most often cited paper is about the synchronization of **logical clocks**. He examines the ordering of events in a distributed system and classifies the concept of one event preceding another as a **partial ordering** of events. The distributed algorithm given for synchronizing the system of clocks, he shows, can be used for **total ordering**. Finally, he also specializes the algorithm for synchronizing **physical clocks**.

2 Strengths of the paper

Like most of Lamport's papers, it is clear that he writes through the lens of a theoretician. No claim made is unsupported by mathematical proofs, and hand waving is not something Lamport is familiar with in any way whatsoever. For example, despite the application of the algorithm to physical clocks being somewhat of an afterthought in the paper, Lamport still includes the theorem about real-time synchronization, the proof of which, even he notes, was surprisingly difficult.
To illustrate the implementation of an arbitrary distributed state machine, Lamport uses the simple example of a distributed mutual exclusion algorithm. By using this example, Lamport is able to convey the 5 rules of his algorithm sequentially, without introducing additional complexity to the reader.

3 Weakness of the paper

Lamport keeps making the point about this notion of **partial** and **total** ordering of events in a distributed system. A reader who is unfamiliar with any knowledge regarding the theory of special relativity formed by Einstein will be unable to grasp the intuitive understanding of what Lamport attempts to make distinct in terms of these orderings. Lamport writes in his Microsoft webpage about this paper, "Special relativity teaches us that there is no invariant total ordering of events in space-time; different observers can disagree about which of two events happened first. There is only a partial order in which an event e1 precedes an event e2 iff e1 can causally affect e2" [1] . Personally, I think if Lamport even included only these two sentences in his paper, it would make lives easier for those readers in terms of gaining a more intuitive understanding of what exactly separates partial and total ordering of events in the way Lamport describes.

4 Future work opportunities

Lamport notes that the problem of failure is beyond the scope of this paper. He does not distinguish between a failed process versus one that is paused/hung, as doing so would require the use of physical time. At the time, increasing the algorithm's resiliency to fault tolerance by extending it in some way may be within scope.

[1] L. Lamport, "Time, Clocks and the Ordering of Events in a Distributed System - Microsoft Research." https://www.microsoft.com/en-us/research/publication/time-clocks-ordering-events-distributed-system/ (accessed Oct. 16, 2022).