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Title: Distributed Problems: Concurrent Specifications beyond Binary Relations

Abstract: Much discussion exists about what is computation, but less about what is a computational problem. In the sequential setting, Turing's definition of computational problem was based on functions. In a concurrent setting, various notions of distributed problems have been used, often for non-terminating interaction. It is argued here that already in one-shot input/output specifications one can appreciate how different distributed computation is from sequential computation. In a *decision problem* each process of a distributed system starts with an initial private input value, and after communicating with other processes in the system, produces a local output value. An input/output relation is needed, to specify which output values are legal for a particular assignment of input values to the processes. An overview is provided of how rich the topic of distributed decision problems can be, when asynchronous processes can fail. We are in a world very different from that of the functions of sequential computation; moving away from graphs representing binary relations, to the world of simplicial complexes.