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Concurrent Stochastic Lossy Channel Games

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Lossy channel systems is a classical model of infinite state space systems used for representing processes communicating through unbounded FIFO channels[2, 7, 13, 6, 1]. In this formalism, we assume the channels to be unreliable, that is to say, there is always a small fixed probability for a message to be dropped before being read. This assumption is crucial to regain decidability for simple problems such as reachability checking of a configuration/state, through the use of well-quasi-orderings [9, 12] and backward reachability techniques [3]. After a recall of these methods, we introduce an extension where two or more players control the transitions and operations on the channels, concurrently. This concurrent settings enables the players to play mixed strategies, which are more likely to interesting equilibrium concepts [14, 11, 10].

In this talk, we focus on the 2.5-player zero-sum case, and first revisit algorithms for solving such games with qualitative probabilistic objectives. For reachability and safety, we extend algorithms known in the finite case [8], to the infinite state space case. As opposed to previous work on turn-based games [4, 5], the presence of concurrent actions requires a more careful analysis of winning strategies, whose suitable classes are depicted in Figure 1. We further discuss the computation of winning regions for more complex objectives such as almost-sure Büchi/co-Büchi objectives, as well as conjunctions of qualitative objectives. These results are finally compared to the non-deterministic setting –that is to say "exists/for all" winning modes– which are surprisingly harder, or even undecidable [13].

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Irgendein Projekt kann hier eingefügt werden.

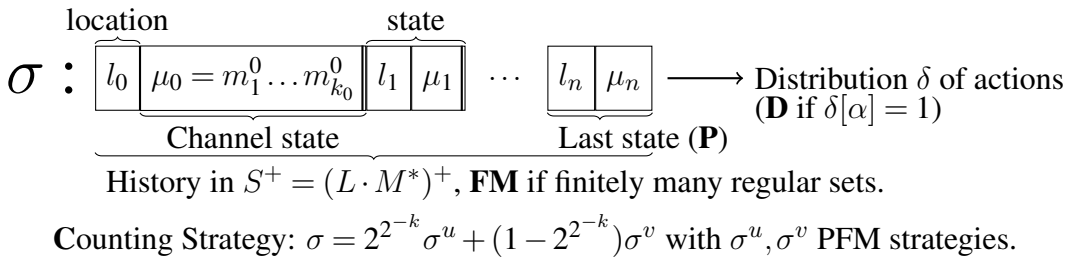

Figure 1: Summary of useful strategy classes.

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