Possession as Linear Knowledge

Frank Pfenning
Carnegie Mellon University
Pittsburgh, Pennsylvania, U.S.A.

Epistemic logic analyzes reasoning governing localized knowledge, and is thus fundamental to multi-agent systems. Linear logic treats hypotheses as consumable resources, allowing us to model evolution of state. Combining principles from these two separate traditions into a single coherent logic allows us to represent localized consumable resources and their flow in a distributed system. The slogan “possession is linear knowledge” summarizes the underlying idea.

We walk through the design of a linear epistemic logic and discuss its basic metatheoretic properties such as cut elimination. We illustrate its expressive power with several examples drawn from an ongoing effort to design and implement a linear epistemic logic programming language for multi-agent distributed systems; see [GBB+06, DP09] for preliminary logic design and examples.

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References
