The dynamic logic of policies and contingent planning

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In classical deterministic planning, solutions to planning tasks are simply sequences of actions. This is not sufficient for non-deterministic environments: in so-called contingent planning, the action to be performed may depend on the non-deterministic outcomes of preceding actions. Semantically, contingent plans are modelled as policies, alias strategies, that map states to actions [3]. A natural question is whether policies can be specified as programs in the syntax of Propositional Dynamic Logic (PDL). However, it can be shown that none of the standard PDL modalities directly captures contingent planning.

We add a modality to PDL that had previously only been introduced for sequential programs [4], simplifying the extension of [1]. We show that the new modality correctly captures policies. More precisely, we show how a policy solution to a planning task gives rise to a program solution expressed via the new modality, and vice versa. We also provide an axiomatisation.

We finally discuss an epistemic extension that captures the notion of implicitly coordinated plans as recently proposed in [2].

References

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