instance, in simple cases such as additive Gaussian noise, tighter bounds can be given [4] and used in Eq. 1.

To enforce collision avoidance, our method modified the agent's plans until no collisions could be detected. To coordinate the detection and avoidance efforts of the agents, we employed an auction-based as well as a fixed-priority method.

Our experiments are a first indication that our approach can succeed in finding collision-free plans with high-certainty with the number of required coordination rounds scaling mildly in the number of agents. While in its present form, the coordination mechanism does not come with a termination guarantee, in none of our simulations have we encountered an infinite loop. For graph routing, [5] provides a termination guarantee of the lazy auction approach under mild assumptions. Current work considers if their analysis can be extended to our continuous setting. Moreover, if required, our approach can be combined with a simple stopping criterion that terminates the coordination attempt when a computational budget is expended or an infinite loop is detected.

The computation time within each coordination round depends heavily on the time required for finding a new setpoint and for collision detection. This involves minimizing $(t,s) \mapsto c^{\mathfrak{a}}_{plan}(p^{\mathfrak{a}}_{\uparrow(t,s)})$ and $c^{\mathfrak{a}}_{coll}$, respectively. The worst-case complexity depends on the choice of cost functions, their domains and the chosen optimizer. Fortunately, we can draw on a plethora of highly advanced global optimisation methods (eg [12, 21]) guaranteeing rapid optimization success. In terms of execution time, we can expect considerable alleviations from implementation in a compiled language. Furthermore, the collision detection and avoidance methods are based on global optimization and thus, would be highly amenable to parallel processing – this could especially benefit the auction approach.

While our exposition was focussed on the task of defining setpoints of feedback-controlled agents, the developed methods can be readily applied to other policy search settings, where the first two moments of the probabilistic beliefs over the trajectories (that would result from applying the found policies) can be computed.

6. REFERENCES

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