

## Optimal Control of Left-Invariant Multi-Agent Systems with Asymmetric Formation Constraints

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We study an optimal control problem for a multi-agent system modeled by an undirected formation graph with nodes describing the kinematics of each agent, given by a left invariant control system on a Lie group. The agents should avoid collision between them in the workspace. This is accomplished by introducing appropriate potential functions into the cost functional for the optimal control problem, corresponding to fictitious forces, induced by the formation constraint among agents, that break the symmetry of the individual agents and the cost functions, and render the optimal control problem partially invariant by a Lie group of symmetries.

Reduced necessary conditions for the existence of normal extrema are obtained using techniques from variational calculus on manifolds and partial reduction by symmetries.

## References

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