

Multi-robot Configuration Planning – Update 1

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I have implemented multi-robot configuration planning using Mathematical Program(MP) in Pydrake, along with a range of extensions to MP and visualization tools. I have tested planning paths for 1 through 4 boats starting from an initial configuration towards a final configuration over a range of boat models, 4 input (real-system) nonlinear, x-y-theta acceleration nonlinear, x-y double integrator.

Some of the configurations require plans with non-trivial behavior such as crossing paths to reach the final desired states. Behavior has been reliable for the double integrator system, but the nonlinear versions work reliably for some configurations, but unpredictably for final configurations that require 3 or 4 boats to adjust their relative positions significantly in a highly non-convex space. For next week I will try using solutions to the double integrator as initializations to the planner for the non-linear model. I will also attempt a parallel experiment to incorporate mixed integer terms to capture pairwise rotations that are required to achieve the final configuration, in an attempt to make the problem more convex. Using these results I will commence writing my final report next weekend. I plan to analyze the planning results of these methods, providing a critical look at which model and planner / combination of planners would meet the needs of the real world system.