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Route Planning Problems and Hybrid Control

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Abstract: In its simplest formulation, the so-called “route planning problem” for sailing boats consists in minimizing the expected time to reach a given target for a vessel sailing in a partly stochastic wind field. A change of direction (especially when tacking) might be associated to a time loss, which is in fact a crucial point in short-course races. This transition cost makes it natural to formulate the problem in term of stochastic hybrid control. In this talk, we will discuss a detailed hybrid model to formulate the optimal route planning in the case of both fleet races and match races, provide a convergent numerical approximation and present an efficient solver of “fast sweeping” type.

We will also show numerical examples in perfect agreement with the heuristically known features of the optimal strategy.

This is a joint work with Simone Cacace and Adriano Festa.

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