The Glider Routing and Trajectory Optimisation Problem

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Abstract

Unmanned Aerial Vehicles (UAVs) are increasingly popular. Their use can be cost-effective and they can perform missions in locations inaccessible by terrestrial vehicles. UAVs are suitable, for example, for disaster assessment. Detailed pictures of the areas affected by a disaster can be taken quickly. While the utilisation of powered UAVs has been investigated, routing unpowered UAVs such as gliders has not been broadly studied. Gliders are much cheaper, they glide for long distances without the need for batteries, and they do not require a pilot or landing strip. On the other hand, specialised control systems to optimise their trajectories have to be utilised. We define the Glider Routing and Trajectory Optimisation Problem (GRTOP) as the problem in which a fleet of gliders is required to fly over a set of waypoints subject to operational constraints, such as the influence of wind. Motivated by a flooding assessment application, we present a Mixed-Integer Second-Order Cone Programming (MISOCP) formulation for the GRTOP. Preliminary results show that this formulation is able to provide solutions for small instances based on real world flooding maps.

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