Stony Brook University
The Graduate School

Doctoral Defense Announcement

Abstract

Aircraft Routing in the Presence of Hazardous Weather

By

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Air traffic control in the 21st century will require the application of modern computer science techniques in order accommodate the future air travel demands of a more mobile population. One of the biggest challenges to air travel throughput is the presence of hazardous weather, which causes delays, cancellations, and rerouting of aircraft. The Flow-Based Route Planner (FBRP) is an algorithmic system designed to route flows of aircraft between designated origin and destination points while avoiding hazardous, time-varying weather systems. The objective is to compute shortest (minimum-time) routes that are available for safe passage of aircraft during a specified window of time, while avoiding time-varying hazardous weather constraints that come from a weather prediction model. To maximize throughput, multiple routes are required, and these routes must be chosen to avoid conflicts arising among aircraft on different routes. While the general form of this constrained optimal routing problem is NP-complete, the FBRP applies heuristics to constrain the path search algorithm in order to obtain good solutions within a reasonable running time. The FBRP is examined as a tool for solving routing problems, as a method for resolving airspace conflicts, and as a capacity estimation tool. It is shown to be practical and is compared with historical flight data and with alternative methods.

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Place: Computer Science Building, Room 2311, Wireless Seminar Room