**Coordinating to Reduce Congestion – A Complexity Miniproject**

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Every Autumn each skier must book his ski resort for the Winter. He wants an uncrowded one and has information on crowding levels at each resort for the previous Winter. Obviously if everyone simply chooses the least crowded resort from last year, it will be maximally crowded, so this is not a good strategy (for the individual or the group). A similar problem arises with the daily choice of bridge or tunnel for commuters from New Jersey into New York City. A general formulation of this ‘anti-coordination’ problem was presented in S. Alpern and D. Reyniers, “Spatial Dispersion as a Dynamic Coordination Problem”, *Theory and Decision*, Vol. 53 (2002), 29-59. In that paper the general problem was formalized by asking for the group strategy (choice of next ‘location’ based on current distribution of population over locations) which minimizes the expected time to reach an ‘equidistribution’ (populations proportional to capacities, or perhaps equal population at each location).

This project involves reading the referenced article and working out the optimal group strategy in some special cases. In larger cases, some simulation could be tried. The article has some conjectures which could be considered. For students who know some game theory (or who want to learn some), a variation of the problem in which equilibrium strategies which lead each player to least crowded locations are sought.

Students should have some knowledge of elementary probability theory, some programming experience, and curiosity. New variations of the crowding problem could be formulated (and attacked?) by the student. I would be happy if a student with specialized knowledge (e.g. artificial intelligence, economics, politics) could apply this to the problem.