Sequential Network Interdiction with Incomplete Information

Oleg Prokopyev

University of Pittsburgh, USA

Abstract

We study sequential interdiction when the interdictor has incomplete initial information about the network and the evader has complete knowledge of the network, including its structure and arc costs. In each time period, the interdictor blocks at most k arcs from the network observed up to that period, after which the evader travels along a shortest path between two (fixed) nodes in the interdicted network. By observing the evaders actions, the interdictor learns about the network structure and arc costs and adjusts its actions to maximize the cumulative cost incurred by the evader. A salient feature of our work is that the feedback in each period is deterministic and adversarial. In addition to studying the regret minimization problem, we also discuss time stability of a policy, which is the number of time periods until the interdictors actions match those of an oracle interdictor with prior knowledge of the network. We propose a class of simple interdiction policies that have a finite regret and detect when the instantaneous regret reaches zero in real time. More importantly, we establish that this class of policies belongs to the set of efficient policies. This is a joint work with Juan Borrero (University of Pittsburgh) and Denis Saure (University of Chile).