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Multi-Agent Networked Systems with Adversarial Elements

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Abstract

The recent emergence of multi-agent networks has brought about several non-traditional and non-standard requirements on strategic decision-making, thus challenging the governing assumptions of traditional control and game theory. Some of these requirements stem from factors such as: (i) limitations on memory, (ii) limitations on computation and communication capabilities, (iii) heterogeneity of decision makers (machines versus humans), (iv) heterogeneity and sporadic failure of channels that connect the information sources (sensors) to decision units (strategic agents), (v) both temporal and spatial limitations on the exchanges between different decision units and the actions taken by the agents, (vi) operation being conducted in a hostile environment where some of the disturbances are controlled by adversarial agents, (vii) lack of cooperation among multiple decision units, and (viii) lack of a common objective shared by multiple control stations. These all lead to substantial degradation in performance and loss in efficiency unless appropriate mechanisms are put in place. The talk will identify the underlying challenges, particularly those that are brought about by the adversarial nature of the environment. One specific problem that will be addressed is distributed averaging and consensus formation in the presence of an adversary with limited actions. Another problem that will be discussed is that of connectivity maintenance in vehicular networks in the presence of mobile jammers, where the problem is formulated as a multi-player pursuit-evasion game. The talk will conclude with a discussion of some other selected problems in this general area.