Cooperative Control of Multiple Agents and Search Strategies

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Multiple agent control problems have proven difficult to solve using classical control methods partly because first, in non-cooperative problems different agents may disagree about what constitutes ''optimality'' and second, even when agents cooperate, an optimal solution may be computationally unsolvable. Satisficing solutions present an alternative approach based on a procedurally rational decision methodology using a geometrical approach. In problems which are inherently ''rationality limited'', a perspective frequently encountered in multiple agent problems, procedurally rational strategies are required. We discuss mathematical aspects of the unified game theory (UGT) and theory of the control structures (TCS). We analyze a game as a hierarchical structure. It is assumed that each agent can be described by a fiber bundle. We also present a design mechanism for generating multi-agent satisficing strategies that not only performs well in cooperative problems, but also allows agents to make decisions with partial information in competitive environments. We demonstrate the power of the satisficing solution methodology for cooperative control problems regarding many-target search. An appropriate search strategy for the whole system can be embodied: hierarchical, coordinated or cooperative. Geometrical and computational aspects of many-target search problems are considered.