Title: The control of Multi-Agent Systems (MAS)

Topic: C2 Decision-Making & Cognitive Analysis (alternatively, system or organization theory)

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Abstract.

Doubt continues that current theories and practices can produce agent or multi-agent system (MAS) autonomy (Lawless & Grayson, 2003; Pynadath et al., 2001), imperiling future MAS missions. To construct a mathematical theory of organization for the control of MAS’s sufficient to generate agent autonomy, we begin with the disputed (Christensen & Walczynski, 1997) complementarity theory of long-term intimate, business, or social relationships known colloquially as “hand and glove” or “lock and key” relationships. We account for the failure of complementarity with the widespread recognition that the methodology of survey questionnaires to study group dynamics, having run aground theoretically (Levine & Moreland, 1998), has never been able to rationally distinguish an arbitrary sum of “individuals” from the “members” of an organization (Luce & Raiffa, 1967). To this recognition we add Kelley’s (1992) failure with exchange (game) theory to map one-to-one between strongly stated preferences and the results from given matrices such as the prisoner’s dilemma game; add the lack of theory to account for individual self-reports from those under social influence (SI), such as Milgram’s (1974) obedience to authority, or Asch’s (1951) line judgment in the presence of dissenting others; and add the inability of even perfect interviews to reconstruct an interaction without a convergence aligned with the meaning structures of the interviewers (Eagly & Chaiken, 1993; e.g., as indirect support, there is a clear ideological divide in the decisions of judges appointed by Republican and Democratic Presidents; in Sunstein et al., 2003). Then we revise these theories into a functioning theory of organizations to control an MAS by accounting for the uncertainty in states as agents shift during an interaction between the “individual” state into the organization.
“member” state, this shift being one of the oldest, unsolved problems in social psychology (Allport, 1967).

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References for the full paper:


Lawless, W.F. (2001). The quantum of social action and the function of emotion, Proceedings, pp. 73-78, AAAI.


