# Simulation of Automated Negotiation

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## Abstract

Automated negotiation is argued to improve negotiation outcomes by replacing humans and to enable coordination in autonomous systems. As operative systems do not yet exist scholars rely on simulations to evaluate potential systems for automated negotiation. This dissertation reviews the state of the art literature on simulation of automated negotiation along its main components – negotiation problem, interaction protocol, and software agents. Deficiencies of existing approaches concerning the practical application in an open environment as the Internet – where automated negotiation proceeds fast, with changing opponents, and for various negotiation problems – are identified.

To address these deficiencies we develop and simulate automated negotiation systems, consisting of software agents that follow generic offer generation and concession strategies and protocols that allow these agents to interrupt their strategy to avoid exploitation and unfavorable agreements. Outcomes of simulation runs are compared across systems and to human negotiation along various outcome dimensions – proportion of agreements, dyadic and individual performance, and fairness – for various negotiation problems derived from negotiation experiments with human subjects.

Though there exist trade-offs between the different outcome dimensions, systems consisting of software agents, that systematically propose offers of monotonically decreasing utility and make first concession steps if the opponent reciprocated previous concessions, and an interaction protocol that enables to reject unfavorable offers – without immediately aborting negotiations – in order to elicit new offers from the opponent, performed best. These systems performed very well in all outcome dimensions when compared with other systems and were the only that outperformed negotiation between humans in all dimensions.