Project No.	Project Title	
2022-01-218	Moral Equilibrium in Multi Agent Optimization Problems	
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Abstract

Agent-based modeling (ABM) is an approach for modeling systems constructed by autonomous, interacting agents. It is a powerful simulation modeling technique for real-world problems. The system monitors agent's interactions and decisions. The decisions must be consistent with real behavior of individuals.

In game theory and multi agent systems studies, it is common to model agents either as purely rational self-interested entities, or as fully cooperative altruistic entities. However, in many real-world scenarios involving humans, while every individual aims to maximize its well-being, i.e., gain as much utility as possible, the agent also takes under consideration the impact of its actions on its surroundings.

We study the ability of a single agent within a society of socially motivated agents, to affect by its action its own outcome and the outcome of the agents that interact with it. We assume that the agent is not willing to harm the overall outcome of the system and examine how different strategies influence its own outcome.

We built a simulator including 49 socially motivated agents to serve as the environment and one agent that we study its preferred strategy. Each simulation runs for 1000 iterations. we preformed 50 simulations with connectivity level of 20% and 50 more with connectivity level of 70%.

We proposed six strategies for an agent to decide on the level of cooperation with its peers: simple, careful, generous, selfish, random and calculated. For each of those, we examined the effect the 50^{th} agent performing these strategies had on the other 49 agents, the specific agents with whom it interacts and how much does its strategy affects its own outcome.

Keywords: Agent-based modeling (ABM), Multi agent systems (MAS), Distributed constrains optimization problems (DCOP), Distributed artificial intelligence.