# Meta-ABS
# Recursive Agent-Based Simulation

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## Abstract

In this paper we ask what influence recursive Agent-Based Simulation has on the dynamics of a simulation. We investigate the famous Schelling Segregation and implement our agents with the ability to anticipate their actions by recursively running simulations. Based on the outcomes of the recursions they are then able to determine whether their move increases their utility in the future or not. We investigate the dynamics of the MetaABS implementation and compare it to the movement-strategy of the original model. We hypothesize that in the case of a deterministic future this approach allows the agents to increase their utility as a group but we hypothesize that this is not the case when the future is non-deterministic as the power to predict is simply lost in this case. Also we show that alone by looking at the implementation we can raise interesting philosophical questions about agents, anticipation, information, determinism. The main contribution of this paper is the introduction of recursive agent-based simulation, a completely new method in ABS, which we termed MetaABS.

## 1  Introduction

The 'meaning' of MetaABS is not really clear: how can it be interpreted? It is not so much about the dynamics but more on the philosophical questions it raises. But also we wanted to check if the same happens as in the recursive simulation paper [1] : deterministic vs. non-deterministic AND one-agent recursion or all-agents recursion

we are spanning up 3 dimensions: recursion-depth, replications, and time-steps

the agent who is initiating the recursion can be seen as 'knowing' that it is running inside a simulation, but the other agents are not able to distinguish between them running on the base level of the simulation or on a recursive level

## 2  Background

### 2.1  Schelling Segregation

### 2.2  Extension to Schelling Segregation: movement strategies

## 3  Meta ABS

TODO: an explanation what Meta ABS is,

### 3.1  Interpretation

TODO: how can be Meta ABS be interpreted?

## 4  Results

TODO: first show the dynamics of a difficult but solvable problem e.g. 51x51, 0.75 density, 0.5 similarity TODO: show that global movement can solve extremely difficult cases: 51x51, 0.9 density, 0.9 similarity TODO: can MetaABS solve this as well?

# 5 Conclusion and further research

# References

[1] GILMER, JR., J. B., AND SULLIVAN, F. J. Recursive Simulation to Aid Models of Decision Making. In *Proceedings of the 32Nd Conference on Winter Simulation* (San Diego, CA, USA, 2000), WSC '00, Society for Computer Simulation International, pp. 958–963.