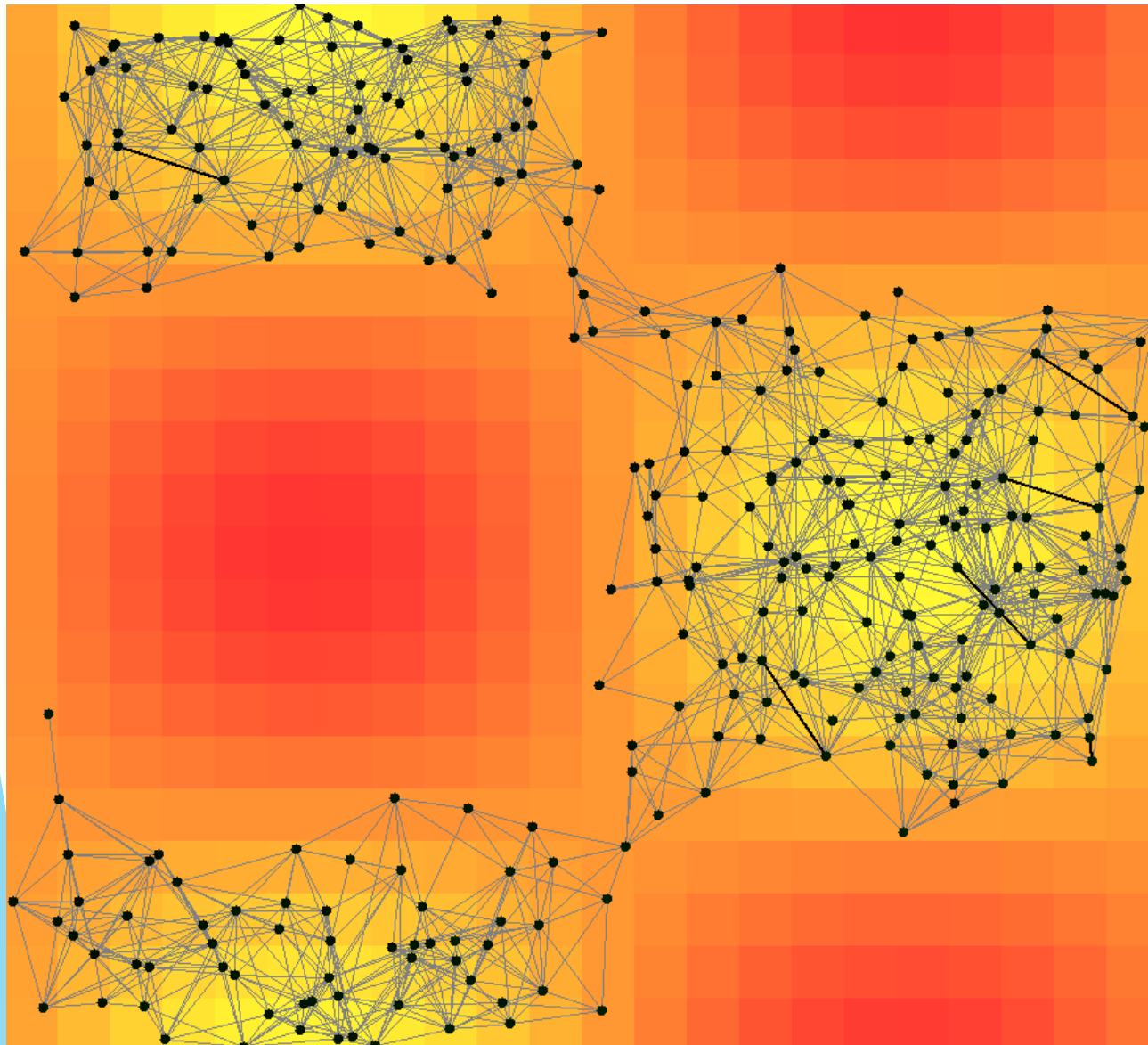


Spatial Graph-Based Social Trade Transaction Simulation

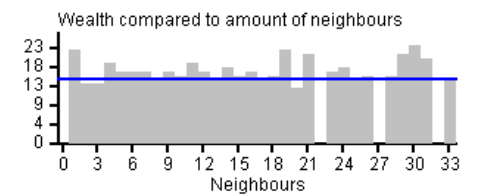
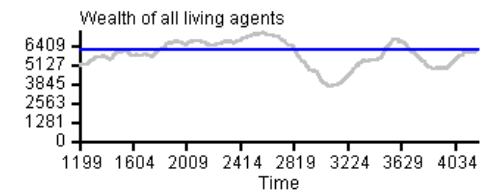
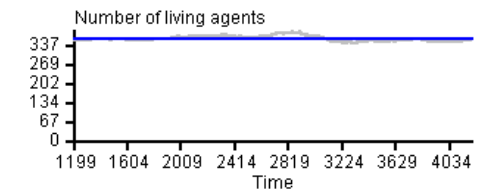
Manuel Bröchin, Renato Menta, Oliver Blaser



Number of Agents: 315

TPS: 87

Number of Edges: 1792



Some Terminology

- ▶ Willingness-to-trade factor (WTF): The probability of an agent to accept a trade
- ▶ Gold-Dig-Factor (GDF): A value between 0 and 1 which quantifies the preference of an agent towards money or sympathy respectively.
- ▶ Resource: A general resource (could be food, money...). If it sinks below 0 the agent dies

Agent behaviour



ID: 0
GDF: 0.5
WTF: 0.5

Each agent has:

- ▶ Data:
 - ▶ List of neighbours: [(id, sympathy, resource)]
 - ▶ Own resource count
- ▶ Input:
 - ▶ List of proposed trades from neighbours
 - ▶ Harvest (how much resource he gets by tick)
- ▶ Independent variables
 - ▶ Willingness-to-trade factor (WTF)
 - ▶ Gold-Dig-Factor (GDF)
- ▶ Outputs
 - ▶ Propose trades to neighbours
 - ▶ Accept trades from neighbours
 - ▶ Update position

Decision making

- ▶ In order to decide to whom the agent wants to propose, he computes:

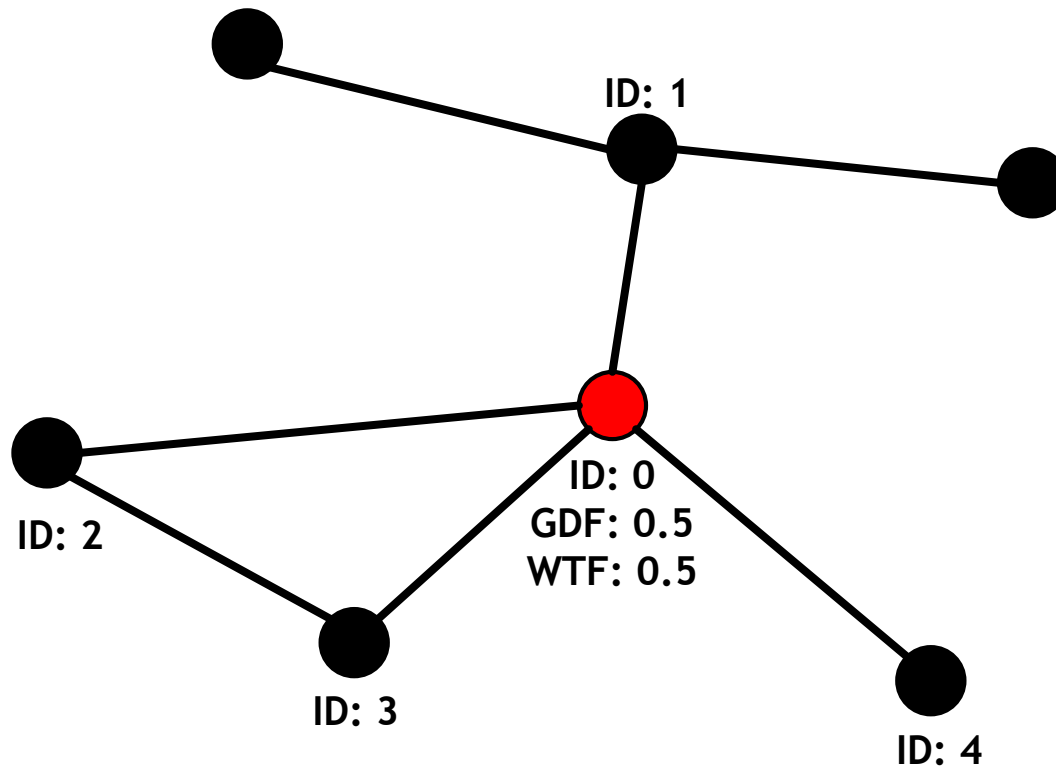
$$\arg \max_{a \in \text{Neighbours}} \left(\text{GDF} \cdot a.\text{resource} + (1 - \text{GDF}) \cdot a.\text{sympathy} \right)$$

- ▶ In order to decide which trade to accept, he computes:

$$\arg \min_{a \in A'} \left(\text{GDF} \cdot a.\text{resource} - (1 - \text{GDF}) \cdot a.\text{sympathy} \right)$$

$$A' = \left\{ a \mid a \in \text{Neighbours}, a.\text{resource} \leq \frac{1}{2} \text{resource} \right\}$$

Propose trade



ID	Resource	Sympathy from Agent 0
0	42	-
1	100	40
2	120	105
3	90	-30
4	34	-1

Computation Example

- ▶ Agent 0 decides which neighbour he wants to ask to trade

ID	Resource	Sympathy from Agent 0	$GDF * resource + (1 - GDF) * sympathy$
0	42	-	-
1	100	40	70
2	120	105	<u>112.5</u>
3	90	-30	30
4	34	-1	16.5

- ▶ When Agent 0 has received all trade requests from his neighbours, he decides which one to accept

ID	Resource	Sympathy from Agent 0	$GDF * resource - (1 - GDF) * sympathy$
1	100	40	<u>30</u>
3	90	-30	60

Emerging behaviour of our agents

- ▶ Clustering around profitable places
- ▶ Few agents are able to initiate mass migration (building bridges)
- ▶ Achieving of an equilibrium in certain scenarios

The background features abstract, overlapping geometric shapes in various shades of blue, ranging from light sky blue to deep navy blue. These shapes are primarily located on the left and right sides of the frame, creating a modern, dynamic border around the central text.

Thank you for your
attention!