

# Using simulation models to explore change in social practices

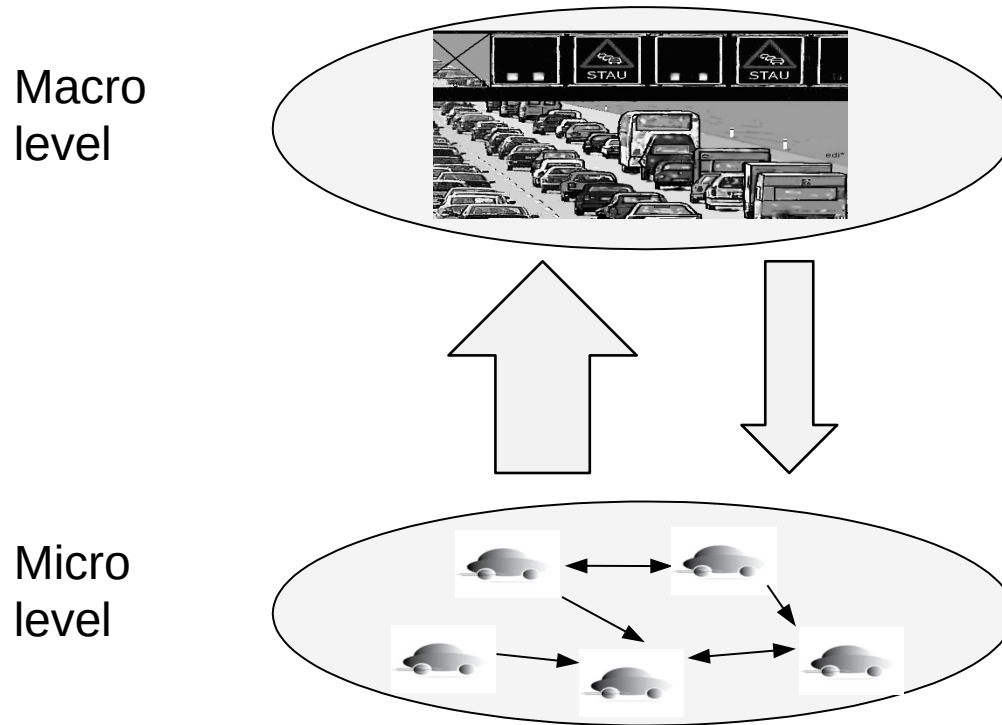
Modelling on the Move 4

Social Theory, Transport and Energy Modelling

# Structure of talk

- A) Ontology / epistemological approach / method  
(Emergence, mechanisms, agent-based modelling)
  
- B) A models to study change in social practices

# Ontological perspective: Relational Emergence



# Epistemological approach: Mechanisms

- Mechanisms state *how*, by what intermediate steps, a certain outcome follows from a set of initial conditions.
- Mechanisms typically involve causal regression to lower-level elements.
- Mechanisms (usually) provide only partial explanations

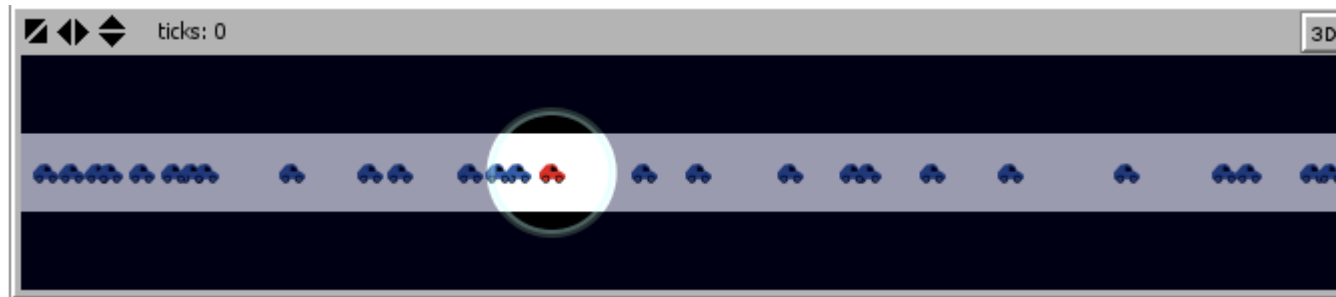
Mayntz 2004

# Method: Agent-based Modelling (ABM)

**"An agent is a **computer system** that is situated in some **environment**, and that is capable of **autonomous action** in this environment in order to meet its **design objectives**."**

Weiss 1999

# ABM: a simple example



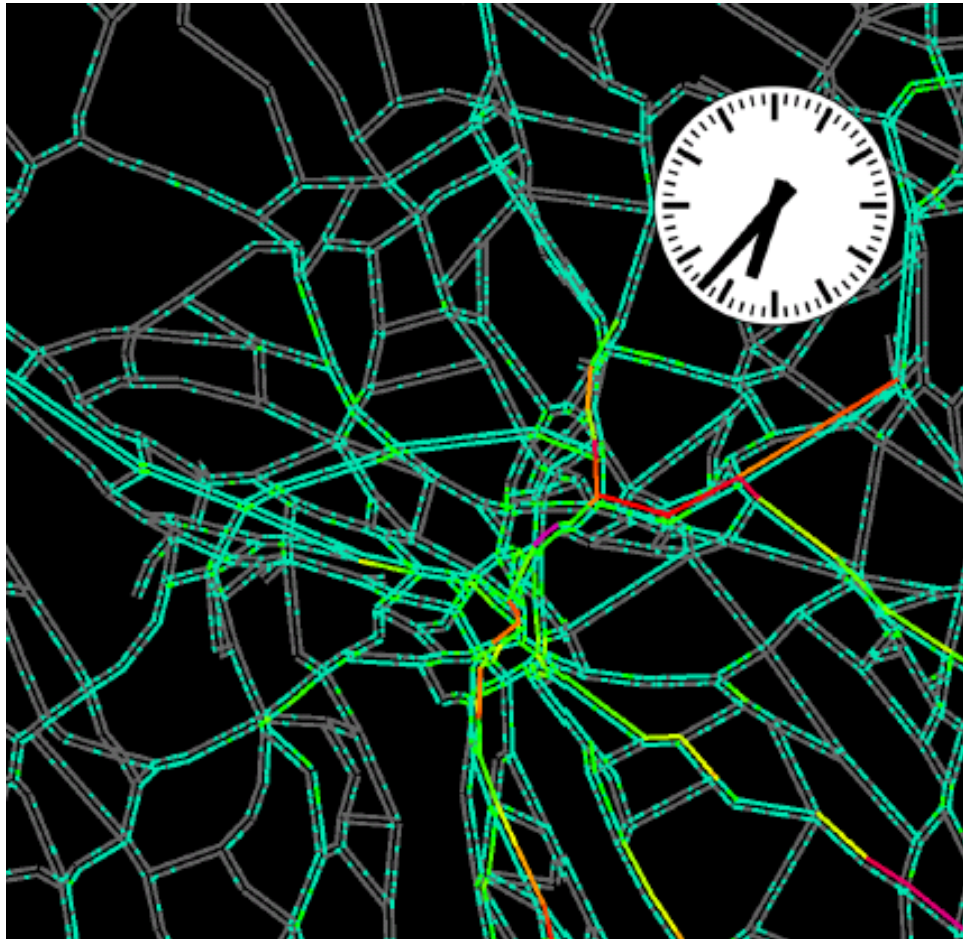
```
ifelse car-ahead != nobody  
  [ set speed [speed] of car-ahead  
    slow-down-car ]  
  [ speed-up-car ]
```

```
....  
to slow-down-car  
  set speed speed - deceleration  
end
```

```
....  
to speed-up-car  
  set speed speed + acceleration  
end
```

# ABM: a sophisticated example

*Multi Agent Transport Simulation Toolkit (MATSIM)*



[www.matsim.org](http://www.matsim.org)

*„All models are wrong but some are useful“*

(George Box)



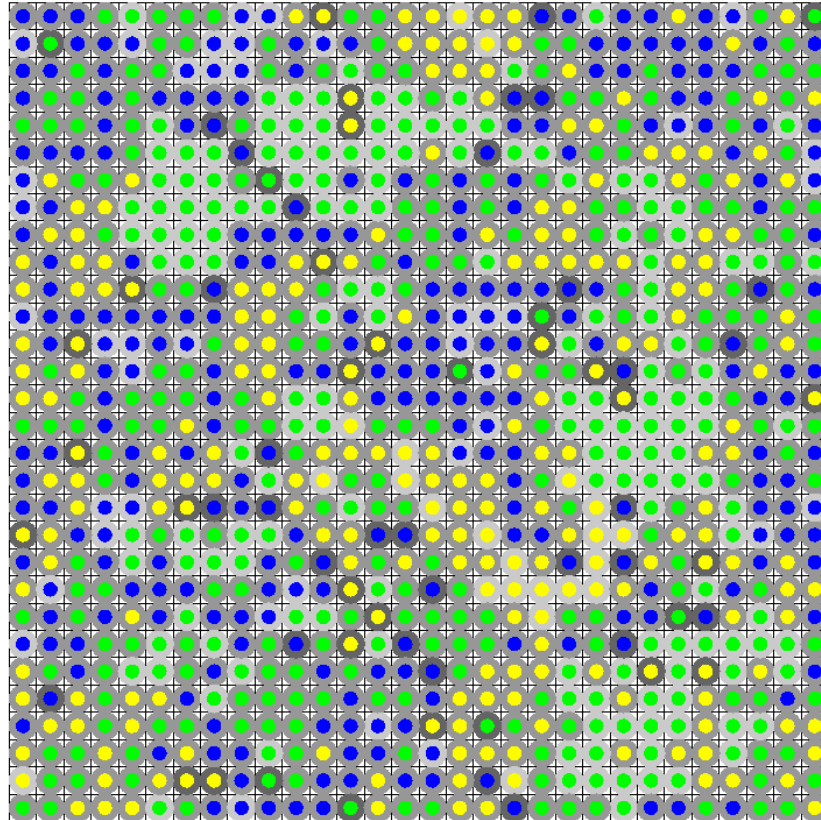
# Application: commuting as social practice

" a 'practice' ... is a **routinized type of behaviour** which consists of several elements, interconnected to one other: forms of bodily activities, forms of mental activities, 'things' and their use, a background knowledge in the form of understanding, know-how, states of emotion and motivational knowledge. A practice ... forms so to speak a 'block' whose existence necessarily depends on the **existence and specific interconnectedness of these elements**, and which cannot be reduced to any one of these single elements."

*Practices are social as they are similar for different people at different points of time and locations.*

# An agent-based model

- Identify mechanisms which are able to let social practices emerge

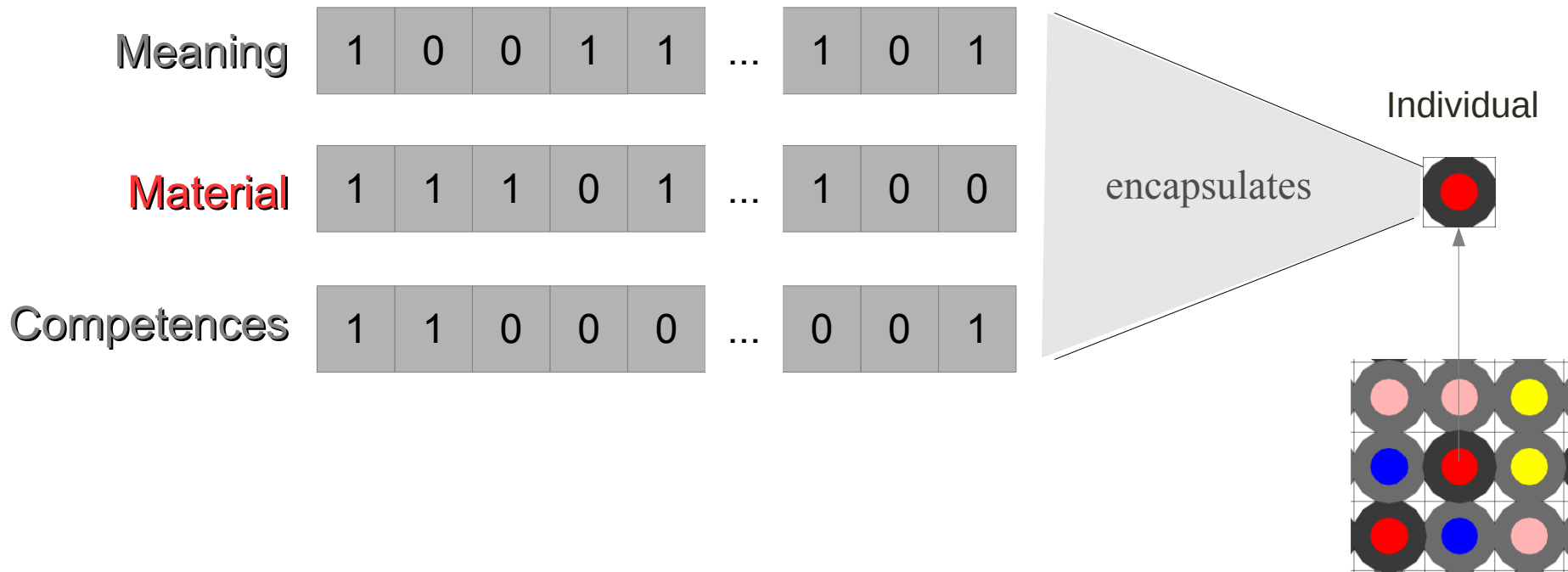


# Main model elements

Practices consist of three **components** (Example "commuting to work"):

- **Material:** sequences of activities involving material artefacts (car individually, car pool, bike, bus)
- **Meaning:** the issues considered, the understandings, beliefs and emotions involved (price, environmental effect, status, independence)
- **Competences:** skills and knowledge required (driving skills, knowledge about public transport, physical abilities)

# Implementation



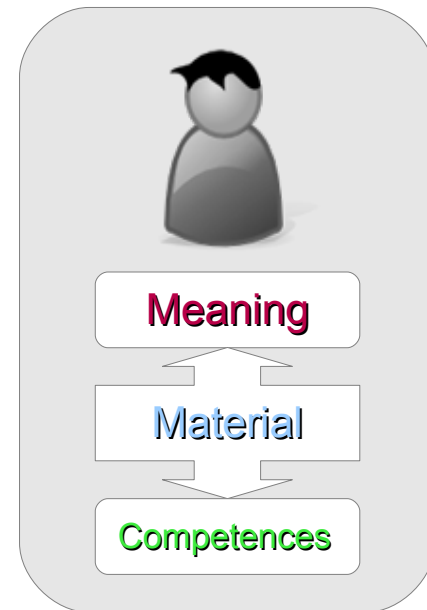
All components: bitstrings of length 50

Allows to measure similarity and mutual adaptation

# Interaction between components: intra-individual processes

Developing / maintaining  
routine behaviour requires:

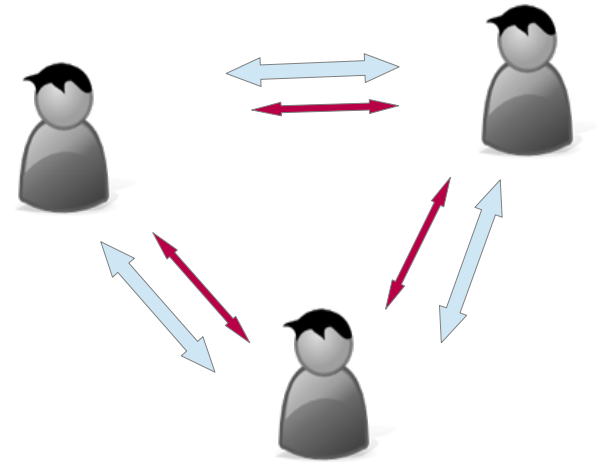
- Reduction of cognitive dissonance
- Learning



# Interaction between components: inter-individual processes

Socially shared:

- Exchange of meaning
- Imitation of material



# Adoption of Material: when and which

Routine behaviour likely if

- components are coherent
- habituation is high

Deliberate process: adoption of Material

- from local neighbourhood (8 surrounding neighb.)
- that is most coherent with own meaning and competences

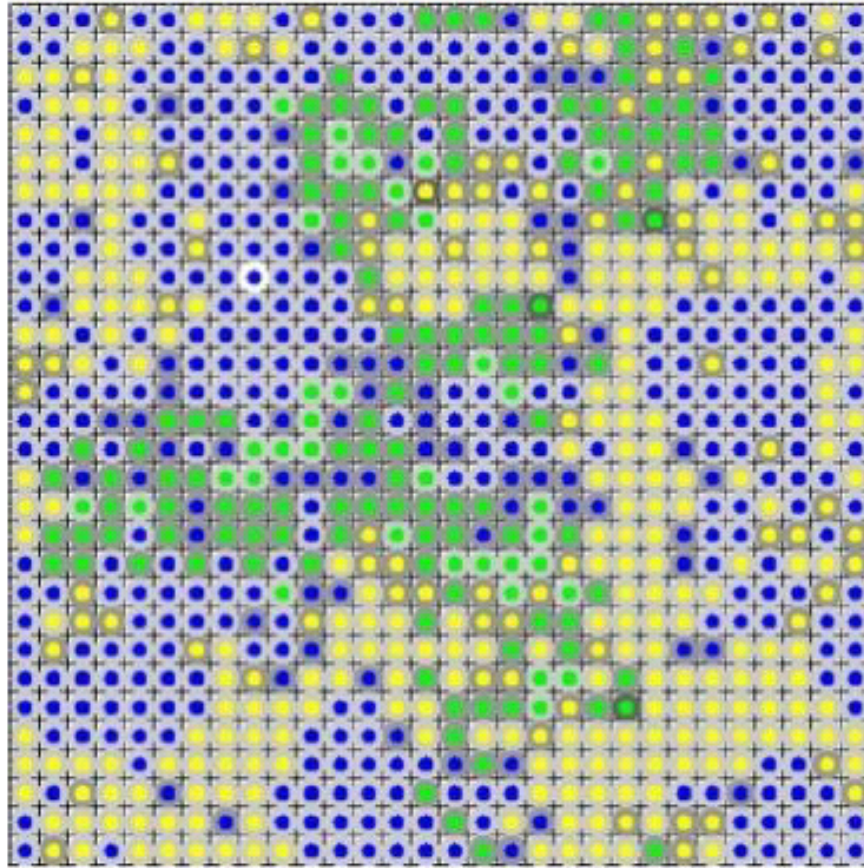
# Reflection of model

- No fixed individuals' attributes
- No pre-defined preferences
- Multiple intra- and inter-individual processes
- Co-evolution of Material, Meaning and Competences
- Path-dependency of individuals' practices

**Does this model generate socially shared routine behaviour (social practices)?**

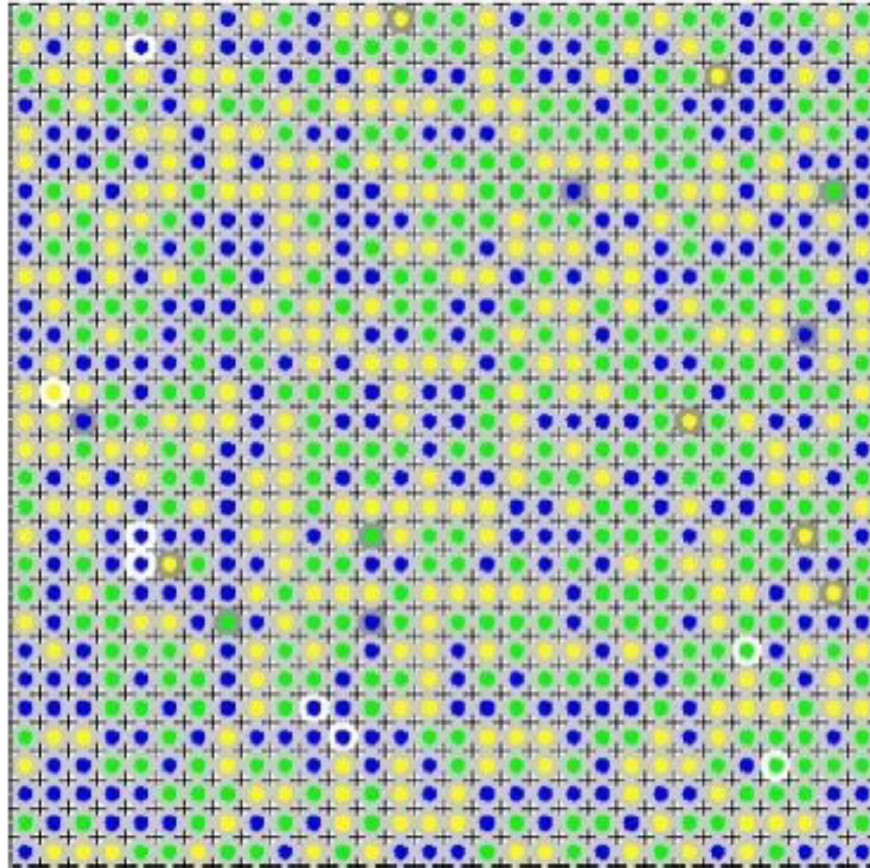


# Simulations I



- Model facilitates to let emerge socially shared routine behaviour (social practices)

# Simulations II



Some simulation runs show random distribution of various practices (not "social")

# A mechanism that blocks diffusion

- 0) (Initial phase): select Material from local neighbourhood that best fits random initialization, adapt and **develop habit**
- 1) Habit distorted** by exchange of Meaning (induces cognitive dissonance, but limited)
- 2) Alternative Material not attractive because of **(missing) Competences** → **no change** in Material
- 3) „Forget“** change in Meaning → **continuation of old habit**

To overcome:

- **alternative materials not too different (competences)**
- **strong exchange of Meaning**

➤ **Model enhances understanding of change in social practices**

# Summary and outlook

- A **framework** to study change of social practices
  - Relational emergence
  - Mechanisms
  - Agent-based modelling
  - Components + processes
- **Exploratory “toy-model”** exercise to develop „feeling“ for issue and to develop concepts
- Allows to identify **mechanisms** that generate / block / change social practices
- **Application to empirical cases** requires specification of model elements and processes

# Literature

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