Social influences on household location, mobility and activity choice in integrated micro-simulation models

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Scope and objective

- We focus on integrated land-use and transportation models
  - Micro-simulation
  - Dynamics

- Households and individuals make decisions:
  - Residence (location, dwelling)
  - Transport mode choice (car possession, etc.)
  - Work activity (time allocation, work location)
  - Daily activity scheduling and travel choices

- Objective of the study:
  - Identify areas of behavior where social interactions play a role
  - Propose concepts and mechanisms to implement them
Two main areas where social interaction is relevant

- Influence on decision making
- Influence on activity generation and scheduling

Influence on decision making
Communicate facts

Consideration of choice alternatives

Knowledge of attributes

Communicate values

Evaluation of alternatives

Communicate aspirations

Satisfaction with current choice

Influence on activity generation
Social dimensions of activities

- Task allocation
  - People are part of groups

- Joint participation in activities
  - People engage in joint activities

- Help and support activities
  - People help each other (positive or negative)

- Social externalities
  - People unintentionally annoy each other (positive or negative)

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Who conducts the activity?
- Self
- Other
- Joint

Whose need is affected?
- Self
- Other
- Shared
- No social dimension
- Giving help-support
- Receiving help-support
- Socializing
- Performing group tasks
- Annoying someone
- Being annoyed by someone

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The needs-based framework

Assume activity $A_1$ can be conducted by Self, Other or Joint

$$U_{\text{self}} = \sum b_{\text{self}}^B + w_{\text{other}} \sum b_{\text{other}}^B + w_{\text{shared}} \sum b_{\text{shared}}^B$$
### Perception of needs

<table>
<thead>
<tr>
<th></th>
<th>Self</th>
<th>Other</th>
<th>Shared</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>B</strong></td>
<td>B₁</td>
<td>B₂</td>
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<tr>
<td><strong>A</strong></td>
<td>A₁</td>
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</tbody>
</table>

### Perception of activities

- **A₁ conducted by Other**

### Formula

\[
U_{\text{other}} = \sum b_{\text{other}} B_{\text{self}} + w_{\text{other}} \sum b_{\text{other}} B_{\text{other}} + w_{\text{shared}} \sum b_{\text{other}} B_{\text{shared}}
\]

### Perception of needs

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### Perception of activities

- **A₁ conducted Jointly**

### Formula

\[
U_{\text{joint}} = \sum b_{\text{joint}} B_{\text{self}} + w_{\text{other}} \sum b_{\text{other}} B_{\text{other}} + w_{\text{shared}} \sum b_{\text{other}} B_{\text{shared}}
\]
Thus, the model represents ….

- Internalization of others’ needs and shared needs ($B_{other} - B_{shared}$)
- A single activity can have impacts on self, other and shared needs ($b_{self} - b_{other} - b_{shared}$)
- Efficiency gain (or loss) of doing task activities together ($b_{joint}$)
- Competences of persons for activities ($b_{self} - b_{other}$)
- Affinity with group needs ($w_{shared}$)
- Altruism – selfishness ($w_{other}$)

<table>
<thead>
<tr>
<th>Anticipated activities by me</th>
<th>Interaction with other</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Self</strong></td>
<td>Offer help</td>
</tr>
<tr>
<td>Satisfies need of me</td>
<td>Offer to perform group task</td>
</tr>
<tr>
<td>Satisfies need of other</td>
<td>Ask permission</td>
</tr>
<tr>
<td>Satisfies shared need</td>
<td>Ask for help</td>
</tr>
<tr>
<td>Affects need of other</td>
<td>Ask to perform group task</td>
</tr>
<tr>
<td></td>
<td>Ask to refrain from activity</td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td></td>
</tr>
<tr>
<td>Satisfies need of me</td>
<td></td>
</tr>
<tr>
<td>Satisfies shared need</td>
<td></td>
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Considerations of agents

• **Utility**
  - The immediate utility an agent expects to derive from own, other’s or joint activities

• **Credit**
  - Balance in doing each other favors
  - Can readily be modeled, since needs are related to persons
  - Indirect utility

• **Power**
  - The extent to which persons accept unbalance in credits

Conclusion

• Influence of social interaction on choice behavior relates to:
  - Decision making
  - Activity generation

• Influence on activity generation classified:
  - Who conducts the activity
  - For whose need is the activity conducted
    - 9 categories of activities – different rules of interaction

• All concepts can readily be implemented in an operational model of long-term and short-term decision making