Center for Spatial Information Science, The University of Tokyo

A STUDY ON BEHAVIOR MODELING OF PEDESTRIAN

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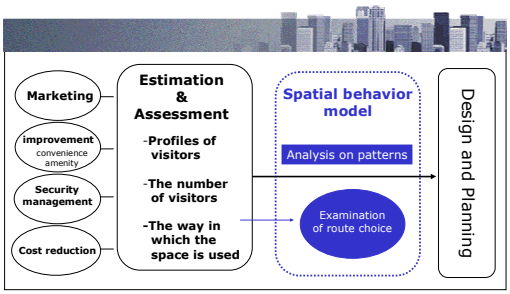
1. Increasing Needs for Pedestrian Behavior Model



There is growing needs
- to comprehend the way in which people move around
- to predict and control such spatial movements

Previous spatial model

Huff model
Disaggregate logit model
Possibility of being chosen as a destination

Marcov-chain model
Poisson regression model
Continuous shifting or transition of several destination

characterized by the concept of ***utility optimization***.

Assumption:each pedestrian as an actor who always makes the best choice.

Restrictions which prevent this concept from apply for pedestrian movement

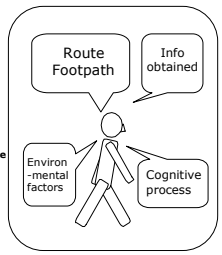
Complete rationality | Consistency of the aim of the travel | Identification of route

Cognition, Image Information processing | Plurality and change-ability of tasks | Continuous tracking

Needs to identify

-factors with critical influence
-mechanism of the influence
-how can they be measured

Prerequisites
-Micro-scale
-Flexible structure

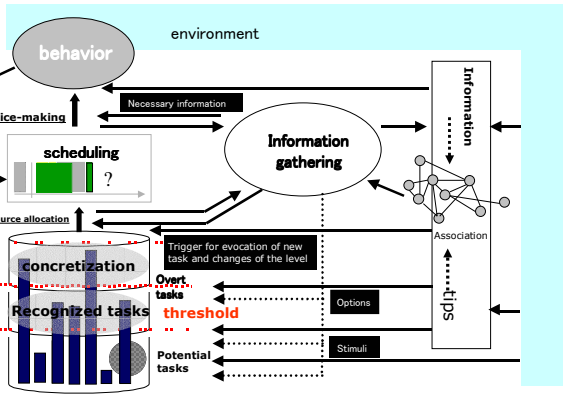


Framework of Pedestrian Behavior Modeling

2. Required Conditions for a New Model

A framework to guide future analyses on behavior modeling should meet following conditions:

1. Micro-scale arbitrary movements should be explained
2. Cognitive process should be introduced to represent interaction between pedestrians and environment.
3. The structure of the new framework must be flexible in order to represent dynamics of behavior.
4. The concept of Learning and adaptation need to be included.
5. It is necessary to include knowledge from observation and experience as a quantitative data.
6. All behavioral patterns or rules should be converted into mathematical model.
7. The new model needs to be based on the concept of Multi-agent.



A Framework of Pedestrian Behavior Model

Level of scale	Main target ① Trajectory, Footpath, Trip data, Route of travels	②Combination and correlation of ①③	③Information processing, Mental mechanism
Micro	Urban planning	DSM analysis Route choice survey	
↕	Traffic management		
Macro	Architecture Disaster prevention Ergonomics	Environmental psychology Social psychology	Cognitive science, AI, Robotics Economics, Marketing

Trans-disciplinary review provided useful schemas of human behavior

Implementation of the framework

profile
Preferences, tastes
Experience, knowledge

Each pedestrian's background defines
potential tasks

Degree of consciousness & unconsciousness

Plurality and Changeability of tasks

Concrete tasks

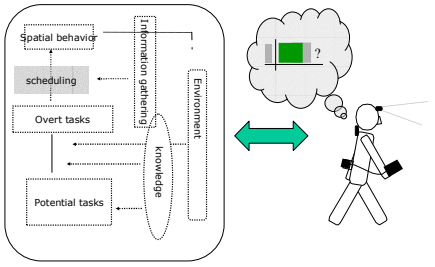
Stimuli from environment
Spatial cognition

Learning and adaptation mechanism have an influence on
Resource allocation process

Once a certain task get clear priorities among several concrete tasks in schedule, each pedestrian follows **utility optimization principle**.

3. Agenda of modeling

The framework of the model is to be revised
- by data from measurement systems
- by more detailed survey and analysis on pedestians' profile



■Demographic data
■Preferences
■Sense and tastes
Interview & Inquiry

■Route,footpath
■Field of vision
Measurement systems

Map Matching

Problems to be solved:
- improvement of Map Matching Algorism
- identification of information obtained

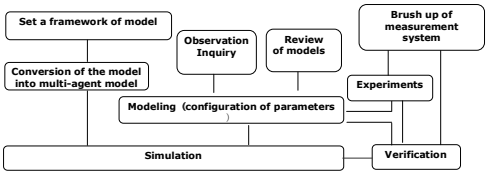
Flow of modeling

-Revised framework is to be be developed into the form, which is suitable for a simulation

-Effectiveness of any possible factors should be repeatedly examined to identify the appropriate setting of models

-Each model will go through the verification process.

-Either the simulation system or the measurement system will be improved to meet any demands from whole process.



A revised version of the full paper will be available during and after the ACRS2002 at
ftp://shiba.iis.u-tokyo.ac.jp/pub/users/kitazawa/paper/ACRS2002fullpaper3.pdf

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