

An Analysis on Explanatory Power of Vision-Driven Agent Simulations to Pedestrian Spatial Distribution

Hiroshi Hirate¹, Yoshimasa Matsumoto¹, Kasumi Susaki², Toshiyuki Kaneda¹

(1) Nagoya Institute of Technology, Gokiso, Showa, Nagoya, 466-8555, Japan, h.hirate.444@stn.nitech.ac.jp.

(2) Ryukoku University, Fukakusatsukamotocho, Hushimi, Kyoto, 612-8577, Japan

1. Research background and objectives

The visual field-driven agent model is a pedestrian agent acting based on the understanding of information in the visual field, and is expected to be utilized for predicting and research the distribution of the amusement. In this study, EVA and WOD known as visual field driven agent models are taken up, applied in Nagoya's Kanayama district, and compared with the 2017 encounter survey data to explore the explanatory power of these simulations.

2. Agent model used in this study

The External Visual Architecture (hereinafter EVA) is a natural, "vision-driven" agent model developed by Turner and others that mimics the pure, non-destination, free-research behavior. Weighted OD (hereinafter WOD) is a model that has the same mechanism as EVA, but also has destination information as an OD pair. To solve the problem that a pedestrian agent always grasps the position of a target regardless of whether the target is seen or not, and cannot act in a direction away from the target. The respective behavioral algorithms and the outline of the sight field are shown in Fig. 1.

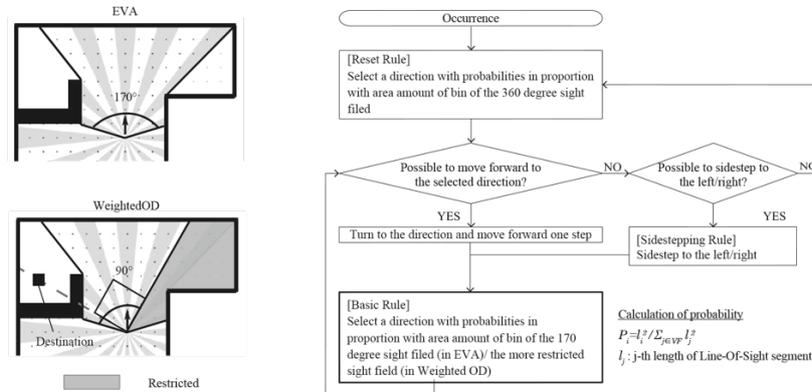


Figure 1: Algorithm and the outline of the sight field

3. Simulation implementation by EVA and WOD

The EVA simulates the subway station at eight entrances and exits. The agent's rate of occurrence was calculated based on the 2017 cross-section survey. In the WOD, simulation is performed by setting the generation of the agent as a facility in the district and setting the destination to the Kanayama general station. The rate of occurrence was calculated based on the total floor area of the ward excluding houses and parking lots. In the cases 2, 3, generation points are placed at the center of an intersection node having the shortest walking distance to the station in each upper-order proportion of the blocks in the area. In the case 4, a set of blocks surrounded by a road width of 10 m or more is considered as one unit from the Nagoya City road recognition map, and a generation point is placed similarly to the cases 2 and 3. Figure 2 summarizes each case. In each case, agents of 2000 bodies were generated.

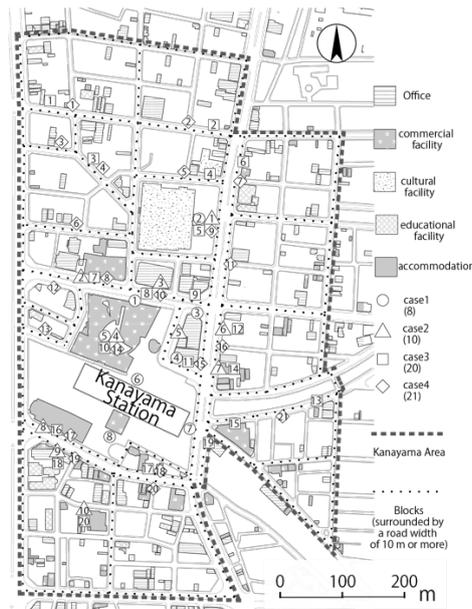


Figure 2: Kanayama area and arrangement of pedestrian generation point by case

4. Analysis of the ability to explain simulation using the Kanayama area counter survey data

Next, comparison is carried out using the encounter survey data of 2017. Since the encounter survey is a statistic on a street link, a counter is provided at the center of each street in simulation, and the cross-sectional traffic is measured and used for comparison. Table 1 summarizes the correlation coefficients between each case and the encounter survey. There was a slightly stronger correlation between EVA and the encounter survey at an average of 0.649. WOD has a weak correlation with an average of 0.307 to 0.473 cases compared to EVA. The encounter survey data can also be regarded as resident data on the street. The EVA measurement data are distributed at the center of the station, and it is possible that the correlation has been higher than that of the WOD because of its good compatibility with the survey results of the counter around commercial facilities such as *Asnal Kanayama*.

Table 1: Correlation with the 2017 encounter survey (All days -weekdays)

| Case | | Run Number | | | | | Ave |
|------|-----|------------|-------|-------|-------|-------|-------|
| | | 1 | 2 | 3 | 4 | 5 | |
| 1 | EVA | 0.635 | 0.654 | 0.652 | 0.624 | 0.651 | 0.649 |
| 2 | WOD | 0.374 | 0.512 | 0.448 | 0.381 | 0.391 | 0.473 |
| 3 | | 0.348 | 0.329 | 0.301 | 0.336 | 0.158 | 0.307 |
| 4 | | 0.361 | 0.349 | 0.344 | 0.391 | 0.371 | 0.371 |

5. Conclusion

The research concluded:

- 1) Simulation of the Kanayama area was performed using two kinds of visual field driven EVA and WOD.
- 2) For comparison with the 2017 counter survey, the cross-sectional traffic volume on the street link was calculated to obtain correlation.
- 3) EVA generated at the station has a higher correlation coefficient than WOD generated at the district facility.