Facilitating Foreign Residents' Adaptation to Japanese Local Communities Through VR Simulation Games

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● Introduction

Japan has implemented detailed waste management rules, which its citizens must follow when disposing of waste in daily life. Sorted garbage is thrown in a common disposal area of the neighborhood, which is then picked up by pickup trucks, then recycled in a recycling center. Waste sorting and disposal is a duty which every member of the neighborhood association must follow, to maintain harmonious living.

With the rules being some of the most complicated in the world, some foreign residents face difficulty in learning and adapting to the rules. From *Ishida's research (2013)*[※1], it can be understood that opinions from foreign residents directed towards resident associations imply that it is difficult to understand and learn Japan's waste sorting rules. Furthermore, *Kitahara's research (2013)*[※2] implies that some foreign residents lack awareness to follow the rules of the local communities.

This was also observed in the city of Kawagoe, Saitama Prefecture, in local communities. It is also not uncommon to see foreign residents get involved in trouble regarding waste sorting. Foreign residents may face challenges in adapting to local community life due to various difficulties encountered in neighborhood affairs.

● Objective

To clarify the effects of VR simulation games on the adaptation of foreign residents to Japanese local communities through learning / habituation to waste sorting rules.

➡ **Focus on Kawagoe City**

● Methodology

1. Pre-Research Interviews

Subject: 3 foreign residents living in Kawagoe
Interview Method: Semi-structured interview
Analysis Method: Thematic coding

2. Game Development

Develop a garbage sorting game based on the results of the pre-research interviews
Game Type: First-person VR (played using HMD)
Game Engine: Unity
HMD: Oculus Quest
Languages: English, Easy Japanese

Fig.1   Game Map

3. Test-Play

Subject: 4 foreign residents living in Kawagoe

a) Garbage sorting test #1

b) Gameplay
➡ Additional 2 visitors of Japan as a subject

c) Garbage sorting test #2

d) Post-test interview

Fig.2   Garbage Sorting Test

Fig.3   Gameplay

4. Analysis

Analyze the research based on the results of the test-play, using both qualitative and quantitative elements.
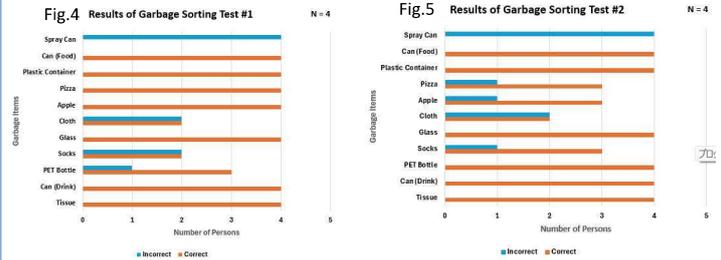
● Results

1. Pre-Research Interviews

Table 1   Interviewees' responses to difficulties experienced with Japan's waste sorting system

	Interviewee 1	Interviewee 2	Interviewee 3
Difficulties experienced with Japan's garbage sorting system	Scheduled disposal	Scheduled disposal → Had gotten accustomed to it	Scheduled disposal

In the pre-research interviews, all interview participants stated that they did not find difficulty in sorting waste to their respective recycle types, but found it difficult to dispose of waste following the city's weekly schedule. This is thought to be because the interviewees did not have prior experience with waste management systems that incorporate scheduled disposal.

2. Garbage Sorting Tests

Fig.4   Results of Garbage Sorting Test #1   N = 4

Fig.5   Results of Garbage Sorting Test #2   N = 4

However, it is observed that items that are not thrown daily (ex. spray cans, cloth, socks) are mistakenly thrown by numerous participants in the results of garbage sorting test #1. This reveals that some residents may struggle with sorting waste categories that are discarded less frequently, despite feeling accustomed to sorting waste.

The results of the garbage sorting test #2 do not show major changes in sorting behavior of participants, and habituation or learning to garbage sorting through the developed game couldn't be observed.

Post-Test Interview (selected excerpts)

- "Was hoping the game would give me some sort of feedback." (Philippines, in Kawagoe for 10 yrs.)
- "(The game)Would slightly be more helpful with real-time feedback." (American, in Kawagoe for 10 mon.)
- "Understood the waste sorting rules of Kawagoe City"(Indonesian, visitor)

● Conclusion

From this research, it can be concluded that VR simulation games may be effective in helping foreign residents get accustomed to waste sorting, with a feature that gives immediate feedback on whether the garbage was sorted correctly during gameplay. It can also be said that VR simulation games are effective in helping foreign residents understand the rules of the local communities. The first claim stems from the comments received from participants of the test-play regarding the developed game, in which all participants stated that they would have felt the game's educational effects much clearly with an immediate feedback feature. Aside from the quality of the game, the gameplay time and influence of each research subject's values and life experiences greatly affect the results. To clarify the effects of VR simulation games, further test-plays, improvements of the game and methodology must be done.

Furthermore, when the game was introduced and tested on foreign visitors to Japan, they were able to understand the waste sorting and disposal rules of Kawagoe city, smoothly progressing the game until the end. From this, it can be speculated that VR simulation games still have the potential to induce a learning or habituation effect.

● Future Outlooks

- Improvements of developed game and methodology based on test-play results acquired from this research
- Determine comparison targets and enhance academic rigor
- Utilization of game on other countries
➡ Plan to conduct further studies in Malaysia

● Citations

※1石田 みずき他. 外国人によるごみ排出問題行動の現状把握と自治体による情報提供方法に関する提案. 都市清掃 = Journal of Japan Waste Management Association. 69(330):2016.3,p.187-198.

※2北原玲子（2013）「群馬県伊勢崎市の公営住宅における外国人世帯の集住と地方自治体の取り組みに関する研究」日本建築学会計画系論文集　第78巻　第688号, pp.1241-1247

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