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IDENTIFYING KEY ATTRIBUTES FOR THE IMAGINABILITY OF PERSONA BEHAVIOR IN CITIZEN PERSONA ROLE-PLAYING GAMING SIMULATIONS

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ABSTRACT

The Societal Prototyping Design (SPD) project uses Agent-Based Social Simulation (ABSS) to support human-centered municipal policy design (Kaihara 2022). To build stakeholder trust in the ABSS model, a gaming simulation was developed where participants role-play the daily lives of virtual citizens. This study proposes a co-creative method for generating personas that enhances the imaginability of virtual citizens. Using MaxDiff analysis, we identify key attributes that support players in envisioning citizen behavior.

1 INTRODUCTION

Agent-Based Social Simulation (ABSS) is increasingly explored as a tool for supporting policy decisions by local governments. The SPD project facilitates human-centered policy design by running digital societal experiments, where stakeholders discuss policy proposals based on ABSS outputs. However, many stakeholders struggle to understand both the simulation results and the behavior models of agents that represent citizens, reducing the persuasiveness of policy simulations.

To enhance stakeholder conviction in ABSS, the SPD project adopts the GAM approach (Szczepanska et al. 2022), which integrates simulation and gaming. As part of the digital societal experiment, the project implements the Citizen Persona Role-Playing Game, where participants assume the roles of virtual citizens and choose daily activities. Because the game has an isomorphic structure of the ABSS model, participants effectively experience the behaviors of agents. By comparing their own decisions with those generated by the simulation, they develop a stronger belief that the model accurately reflects real citizen behavior.

This study aims to develop a method for generating virtual citizens personas that not only supports role-playing in the game, but also fosters stakeholders' conviction during the persona generation process through a co-creative and objective approach. This study takes Kamo City in Niigata Prefecture, as its case study.

Existing persona generation methods: Personas, detailed fictional representations of user archetypes, originated in software design (Cooper 1999). Existing methods for persona creation combine qualitative and quantitative data through manual or semi-automated techniques and have been extensively studied.

Persona evaluation metrics: To reflect the goal of increasing stakeholders' sense of conviction, we propose three persona evaluation metrics:1. Reproducibility – Can players replicate the behavior of virtual citizens? 2. Realism – Do the personas feel like real people? 3. Latitude – Are players able to make independent decisions?

2 PROPOSED PERSONA GENERATION METHOD

Our method integrates qualitative and quantitative techniques and consists of the following four steps.

Step 1: Identifying Clusters

We conducted a survey among city officials to figure out citizen types who would be affected and those would not be affected by policies. Using K-means clustering, we identified 13 citizen clusters related to three policy themes in Kamo City: promoting health activities, community participation, and revitalizing the city center. Then, we conducted long interviews with each cluster to grasp their characteristics.

Step 2: Identifying Attributes to Include in Personas

To enhance reproducibility, it is desirable to include as much information as possible in persona. However, this can increase the cognitive load on players and reduce their decision-making latitude. Therefore, we aimed to identify a set of attributes that are both useful for reproducing persona behavior and minimal enough to maintain usability. Candidate attributes were drawn from the internal model of ABSS agents, citizen profiles questionnaire items, and auxiliary elements. The auxiliary elements were extracted from Episode Maps (Sakai et al. 2025), which were created through long interviews, resulting in a total of 27 candidate attributes. We then conducted an online questionnaire consisting of the following steps. First, we randomly presented one of 12 full-specification personas, which includes all candidate attributes. To avoid bias in perceived importance due to attribute values, the values were carefully balanced across the 12 patterns. Respondents were asked to imagine a typical day's behavior sequence for the persona. Afterward, they completed MaxDiff tasks, selecting which attributes were most and least helpful for envisioning the behavior. Thus, we identified the key attributes to be included in the persona skeleton (Fig. 1).

- Area of residence:【City Center (Area A)】
- Workplace:【Area B】
- Interest in each type of facility
  - Dining:【Moderate】
  - Shopping:【High】
  - Relaxation:【Low】
  - Exercise:【High】
- Owned vehicles:【Car】,【Bicycle】
- Lifestyle:【Active】
- Interests:【Art・Culture】
- Hobbies:【Painting appreciation】
- Values:【Family-oriented】
- Consumption behavior:【Prioritize quality】
- Health consciousness:【High】
- Daily exercise:【Walking】,【Strech】
- Access importance:【Low】
- Other reasons for behavioral decisions:【Time efficiency】

Fig. 1: Example of a persona skeleton including important attributes.

Step 3: Generation of Persona Skeletons Using Interactive Genetic Algorithm (IGA)

Using IGA with loci based on key attributes and cluster centroids, we generate persona skeletons. Fitness values are assigned based on realism from evaluators, enabling personas that are both representative and realistic.

Step 4: Generation of Story-style Personas

By adding narratives expressing motivations and emotions to skeleton personas using generative AI, we create story-style personas. This reduces cognitive load and supports more intuitive decision-making in gaming simulations, thereby enhancing personas' reproducibility and realism.

3 DISCUSSION AND SUMMARY

The key attributes identified fall into three categories: behavioral tendencies, environmental factors (e.g., residential area), and decision-making criteria. On the other hand, traditional demographic attributes like age and gender were rated as less important. However, without these attributes, players will lack the ability to "picture the face" of the virtual citizen, resulting in reduced immersion and emotional acceptance. These findings suggest two kinds of realism: (1) Logical Consistency – Are the combinations of attributes logically consistent? (2) Imaginability – Can players envision a specific individual? Based on the identified key attributes, we also conduct Steps 3 and 4 to generate final personas in the form of both skeletons and stories. By using those personas in the gaming simulation in Kamo City, we will evaluate them.

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