

Olfactory Research Demonstration at the SIGGRAPH ASIA 2021 International Conference

Overview

As joint research with Tokyo Institute Visiting Professor Nathan Cohen (University of the Arts London), we have created an interactive digital game with scent emission entitled "The Aromatic Garden". We [demonstrated this content at SIGGRAPH Asia 2021](#), and approximately 100 visitors responded to the demonstration (Fig.1).



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Fig.1 Photos of Demonstration

Our digital content with scent, "The Aromatic Garden"

Concept

We are interested to learn more about how smell and image can be integrated within an interactive game utilizing digital olfactory display in a way that encourages users to navigate different virtual environments. Consequently, this first version of the game enables the 'searching for and collection of scents', where 12 scents are placed in 4 imaginary landscapes (Fig.2). The player can navigate around each landscape using an avatar, and relocate from one landscape to another by traveling through 'a scent tunnel' (each arrow in Fig.2) that connects a pair of scents.

How to play the game

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Fig.2 The 4 landscapes and the 12 scents

1. Select an avatar at the start screen
2. Navigate freely through the landscape by dragging the avatar
3. When detecting a scent, search for its source
4. The scent is collected by placing your avatar on its source image, where the scent is most intense

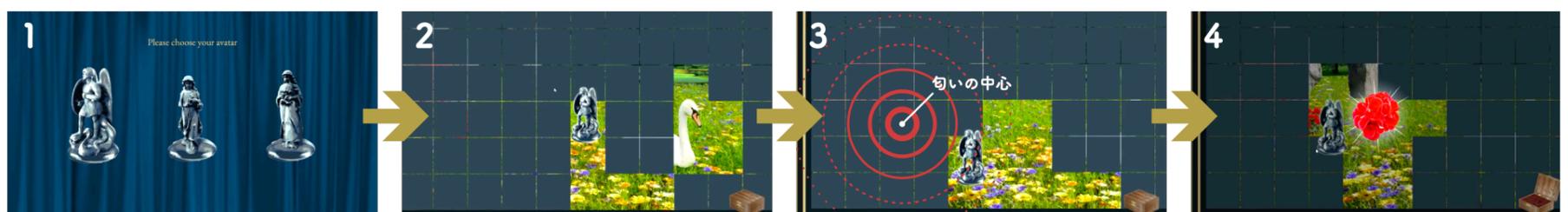


Fig.3 The screens of usual steps in this game

5. When arriving at scents that connect to tunnels (4 pairs among the 12), transition to another landscape begins
6. During this transition, the scent at the entrance of each tunnel gradually changes to the scent on arrival at the exit, where both scents are collected by the player before continuing to look for scents in the new landscape they have arrived at

7. Each imaginary landscape is a different environment with scents that relate to what can be seen (some landscapes explore pollution and others natural or fantastic environments)

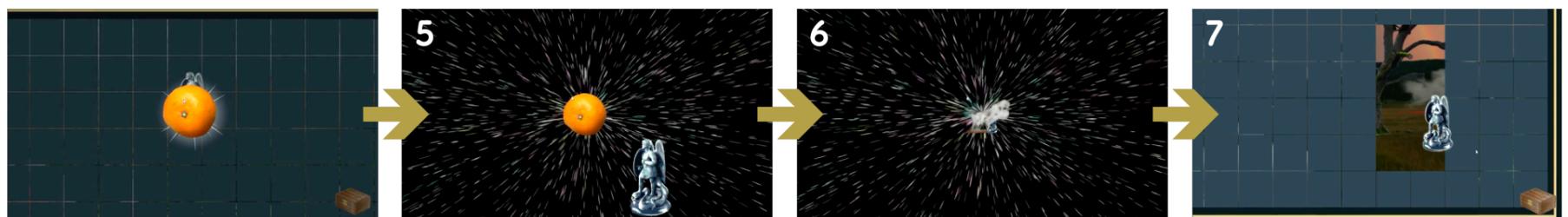


Fig.4 The inside of the tunnel

8. The goal of this game is to collect all 12 scents located across the 4 landscapes

9. (An overview of the 4 landscapes is shown)



Fig.5 The screens shown when the player clears the game

Questionnaire survey and comments

We asked visitors to our demonstration at SIGGRAPH ASIA 2021 to answer a questionnaire survey as they played 'The Aromatic Garden' olfactory game. This included:

- 14 questions for evaluating the experience while playing the game (2 each for 7 factors, rating from 0 "not at all" to 4 "very much")
- 4 questions related to the scents (1 asking which were the most impressive scents among 12, and 3 asking for descriptions of their perception of the scents)
- 1 free comment about the whole game

Fig.6 shows the result of ratings from 0 - 4 for the first 14 questions. Many of the participants rated around 2 in most factors. In contrast, most people answered 0 or 1 in 2 factors; Tension/Annoyance and Negative affect, indicating that the game did not give a negative impression to the players. Possible reasons for why many questions were rated around 2 might be ambiguity of the questionnaire texts, or a cultural response to grading (the majority of respondents were Japanese due to covid restrictions of access to Japan at the time of the event).

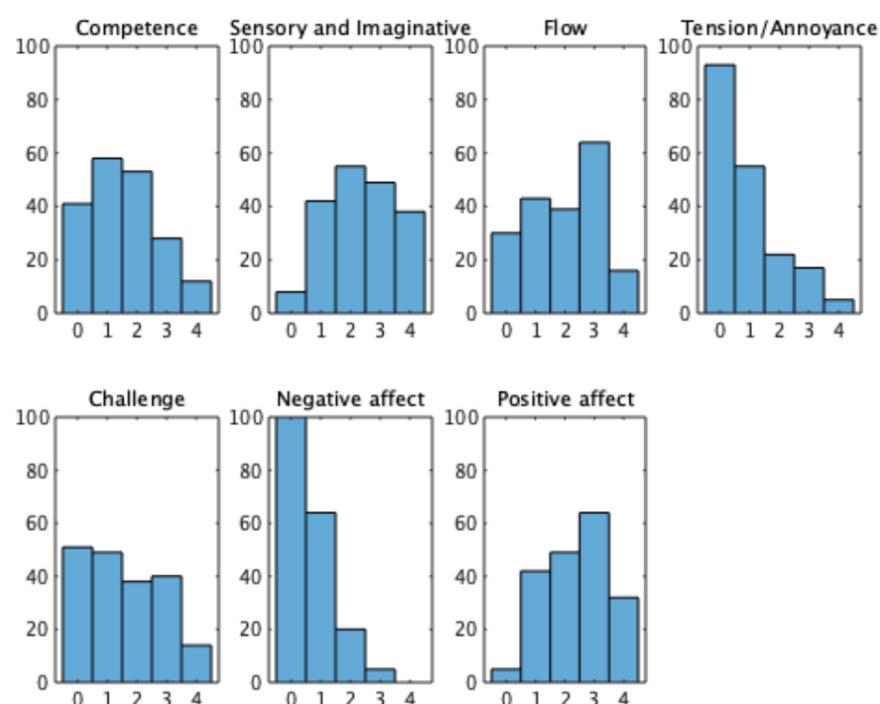


Fig.6 The ratings of the game experience

Fig.7 shows the histogram of scent impression related to the 12 scents presented in the game. From these results it is apparent that many of the participants felt the orange and apple scents were identifiably impressive as they are familiar, whereas other scents result in various levels of impression for different reasons.

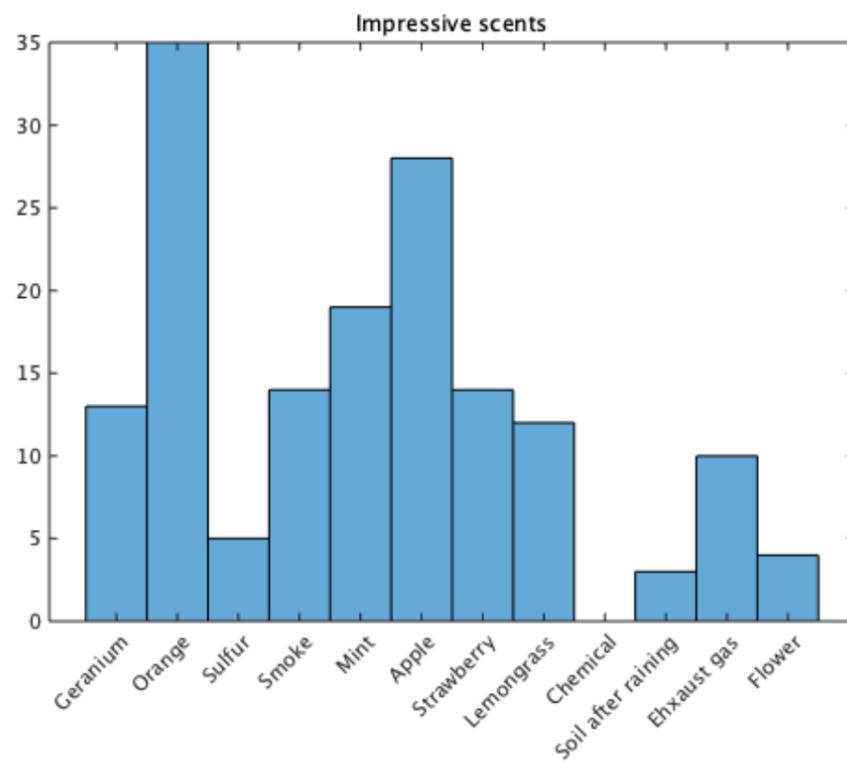


Fig.7 The impressive scents

Most visitors described their feelings in response to the free-comment questions. The comments below are just a part of the feedback:

- The concept of the game was interesting and the game itself was a new experience
- Anticipating further development of the game (with suggestions such as setting the theme of the game as a police dog, emitting scents according to the player's direction, using the relationship between each scent and the player's personal memory)
- More exciting elements could be included in the game
- The change of scents was easy/difficult to detect

While many comments compliment the novelty of the game concept, others suggest improvements to enhance the game narrative and enjoyability of engagement. Given a wide distribution of individual olfactory acuity in the perception of scents, we should consider implementing functions for adjusting the levels of intensity of scent emission.

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