# Scented Days: A Scent-Based Persuasive Narrative Game

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Scented media and technology offer a unique way to engage users, specifically to convey information and provide alternative sensory experiences. In addition to serious applications, scents can be used to augment games and playful technologies, enrich the play experience, and evoke specific emotional responses. However, scent can also serve as an effective storytelling tool by itself and be a game narrative mechanism. In this paper, we present *Scented Days*, where we showcase the use of olfactory cues to deliver narrative elements and explore the significance of the sense of smell. The game is a scent-focused narrative experience, where the focus is placed on the loss of olfactory senses, a common consequence of COVID-19. This demonstration sheds light on engaging scents to promote empathy in a game context, particularly in scenarios involving smell loss. Further, it offers design insights and considerations for empathetic scent narratives.

CCS Concepts: • **Human-centered computing** → **Scenario-based design**; **Interaction techniques**.

Additional Key Words and Phrases: Scent Technology; Olfactory Narrative; Multisensory Design

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## 1 INTRODUCTION

Smell stimulation operates closely with the brain and has a powerful connection with emotion and memory [16]. Scents serve as an indicator to discern toxic or poisonous hazards, and they can also serve as triggers for memories and emotional responses [18]. Their impacts on increasing immersion, amplifying the emotional journey, and training cognitive function such as memories showcase their potential in applications for learning technologies and serious games [1, 9], and could help establish empathy in games and storytelling [6]. Previous examples of such applications include notably the Smell-o-Vision, odor-based cinema, and iSmell for scented internet [9]. Examples of this applied in games include employing gunpowder, fire, or smoke smell stimuli in video games or virtual reality [14], using 'off-smells' as clues in the game [10], and adding food scents in a cooking game [8].

Incorporating olfactory senses has proven potential to be an effective and engaging game mechanism, particularly due to their pivotal roles in exploration, navigation, and adaptability to a game's penalty and reward systems. [17].

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Furthermore, smell can serve as a core game mechanic, supporting player decision-making and enriching the overall game experience beyond merely assisting other sensory stimuli [9]. It is also known that humans form meaningful, scent-based memories toward odors than other cues [4]. Similarly, smell can play a crucial sensory cue in understanding diseases and impairments such as the loss of smell itself—anosmia. Due to the nature of the symptom, aligning the existence of smell (as memory training) and its smell can be a valuable exploration of the emotional impact of scent.

In order to further explore how scent can be incorporated into games to enhance narrative and enhance mechanics, we developed the game *Scented Days*—a narrative-driven game about anosmia as a result of COVID-19. Olfactory loss is an often overlooked side effect of COVID-19 affecting 34% - 86% of individuals that contract COVID [3, 5, 13]. The nature of the symptoms is explored through the use of scent (or lack thereof) in the gameplay. Through this narrative framing, *Scented Days* is designed to explore two key aspects of a scent-based game: 1) leveraging scent-based memory to enhance player empathy and understanding, and 2) crafting a cohesive narrative design that combines olfactory engagement with other sensory elements. This demo paper presents a detailed discussion of the current design of *Scented Days*, as well as design considerations for future scent-based narratives.

## 2 GAME DESIGN

*Scented Days* is a serious game that aims to simulate the day-to-day experiences of contracting and recovering from COVID-19, with a particular focus on olfactory impairment. Players are immersed in a 2D-pixel art environment, navigating through the narrative via point-and-click interactions. The gameplay unfolds over six loops, each representing a one-week interval in the game's narrative time, and is segmented into three distinct narrative phases: 'No Smell Impairment', 'Smell Impairment', and 'Recovered Smell' (Figure 1). The game incorporates a physical 'Smellbox' that emits scents corresponding to in-game events in reality. Additionally, it features a phone interface to portray the social challenges of illness and situational consciousness of the player's health, raising awareness of the under-recognized consequences of smell loss. The 'Smell Impairment' phase of the game introduces 'friction'—challenges and modifications to interactions that represent the protagonist's diminished sensory abilities. For example, more effort is required to open the laundry machine with additional mouse movements, a challenge is imposed with a blinking effect while frying bacon, obstructing the cooking interface. These mechanics are designed to depict the protagonist's reduced motivation and struggle with daily routines, reflecting the protagonist's low motivation in their daily routine. Finally, the design of *Scented Days* is guided by two fundamental principles:

- Emotion, Relatability, and Empathy
- Olfactory feedback as the narrative

### 2.1 Emotion, Relatability, and Empathy

Prior research has demonstrated a strong link between human olfactory senses and key psychological domains such as empathy [12] and memory [1]. Our design objective is to create a novel emotional experience for players by centering on empathy and enhancing this focus through the integration of olfactory feedback.

In the game, olfactory feedback is triggered by two specific events: 1) flipping bacon on a pan, emitting a bacon scent and, 2) opening a washing machine, emitting a detergent scent to represent laundry. These interactions are repeated throughout the game's progression. Our aim is for players to form a connection between these in-game interactions and their daily routines, using olfactory cues as a bridge. In the future, we aim to expand the variety of scents used in the game to ensure relevance with a broader audience of different cultural and personal preferences.

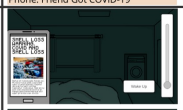
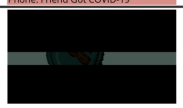
| Phase | Week (Loop) Number | Process | | | |
|---|---|---|---|---|---|
| **No Smell Impairment (Initial Phase):**<br><br>Player will be trained to get used to the general game experience and the olfactory pattern.<br><br>Player will get a good understanding about the context and the theme of the game. | Week 1 |  <br>Theme: Wake Up<br>Interaction: Button Mashing<br>Phone: COVID - 19 News<br>Smell Narrative: Null |  <br>Theme: Start Laundry<br>Interaction: Click and Drag<br>Phone: Null<br>Smell Narrative: Laundry (small) |  <br>Theme: Cooking<br>Interaction: Click and Drag<br>Phone: Null<br>Smell Narrative: Bacon, Bread |  <br>Theme: Pick Up Laundry<br>Interaction: Drag<br>Phone: Null<br>Smell Narrative: Laundry (Regular) |
| | Week 2 | Repeat Week1<br>Phone: Friend Got COVID-19 | Repeat Week1<br>Phone: Friend Got COVID-19 | Repeat Week1<br>Phone: Friend Got COVID-19 | Repeat Week1<br>Phone: Friend Got COVID-19 |
| **Smell Impairment (Sick Phase):**<br><br>Player will find the interaction they used to start to become harder, sometimes not even available.<br><br>Olfactory Feedback to Interaction mapping breaks.<br><br>Friction added to interactions as indication of depression after being sick. All the animation becomes dull and slow. | Week 3 |  <br>Theme: Wake Up Sick<br>Interaction: Button Mashing (Hard)<br>Phone: Smell Loss Symptom<br>Smell Narrative: Null |  <br>Theme: Start Laundry Sick<br>Interaction: Click and Drag (Hard)<br>Phone: Friend Text (Worry)<br>Smell Narrative: Water (small) |  <br>Theme: Cooking Sick (Sleepy)<br>Interaction: Click and Drag (Blink)<br>Phone: Null<br>Smell Narrative: Water (Regular) |  <br>Theme: Pick Up Laundry (Sick)<br>Interaction: Drag (Hard)<br>Phone: Null<br>Smell Narrative: Water (Regular) |
| | Week 4 | Theme: Wake Up Sick (Cannot Wake Up)<br>Interaction: Button Mashing (Impossible)<br>Phone: Friend Text (Worry)<br>Smell Narrative: Null | Sleeping, Skip | Sleeping, Skip | Sleeping, Skip |
| | Week 5 | Repeating Week 3 | No Motivation (Affordance) of doing laundry. Ended up not doing laundry. | Repeating, with the affordance (motivation) to skip cooking | Didn't do laundry, staring at laundry machine |
| **Recovered Smell (Recovering Phase):**<br><br>Player recovered from the COVID-19. The Olfactory Feedback to Interaction mapping recovered,<br><br>All the animation becomes dynamic and vivid. | Week 6 |  <br>Theme: Wake Up Recovered<br>Interaction: Button Mashing (Easy)<br>Phone: Friend Text (Worry)<br>Smell Narrative: Null |  <br>Theme: Start Laundry<br>Interaction: Click and Drag<br>Phone: Null<br>Smell Narrative: Laundry (small) |  <br>Theme: Cooking<br>Interaction: Click and Drag<br>Phone: Null<br>Smell Narrative: Bacon, Bread |  <br>Theme: Pick Up Laundry<br>Interaction: Drag<br>Phone: Null<br>Smell Narrative: Laundry (Regular) |

Fig. 1. Narrative Structure and Interaction Map: From left to right, the map illustrates the progression of narrative phases, with annotations detailing the context and the design expectations associated with specific loops. Each block represents an interaction or visual element encountered by the player, and these blocks are color-coded according to the palette used within each respective loop.

### 2.2 Olfactory feedback as the narrative

We posit that olfactory feedback extends beyond merely enhancing immersion; it also holds significant potential for storytelling, complementing other sensory cues within the game. Accordingly, we have designed the game such that olfactory elements are integral to both micro-narratives—individual moments or interactions—and the macro-narrative—the overarching story of losing a sense of smell. This strategic integration of scent into the narrative arc deepens the player's experience, making each interaction meaningful and cohesive with other sensory information.

*2.2.1 Memory Training and Olfactory Cues.* In *Scented Days*, we employ the potential of scents having a strong memory attachment [4] to authentically simulate the experience of olfactory sensory loss for players. The game's looping structure supports this simulation by familiarizing player interactions with visual cues—both from within the game environment and from the olfactory device in the real world—with the emission of specific scents. Once players have become accustomed to these associations, we introduce a significant twist: replacing all scent emissions with water. This deliberate substitution is designed to disorient players, effectively mirroring the confusion and sudden realization typical of actual olfactory loss. This moment of realization not only serves as one of the most emotionally impactful experiences in our game but also underscores the unique narrative potential unlocked through olfactory feedback.

## 3 SENSORY DESIGN

The sensory design of *Scented Days* engages with the following multi-sensory design principles, archived in Figure 2.


Fig. 2. Multi-sensory design criteria employed according to the narrative phase

*3.0.1 Olfactory feedback.* Players can understand the context of the game with various scents. The device exerts a corresponding scent as per the game element—including the **bacon, sandwich bread**, and **laundry detergent** scents—while during the "Smell Impairment" phase, players only engage with the water, simulating the loss of smell. A detailed discussion can be found in 3.1.

*3.0.2 Audio feedback.* In the 'No Smell Impairment' phase, audio plays at default pitch and speed. However, during the 'Smell Impairment' phase, the music becomes muffled and slowed, reflecting both altered auditory perception associated with sickness and the protagonist's depressed mood [7]. As players advance to the 'Recovered Smell' phase, the audio maintains the pace established in this final phase, symbolizing the restoration of normalcy.

*3.0.3 Visual feedback.* The color hue and saturation alter according to the color palettes set for each phase also seen from Figure 1. Due to the association of bright colors with positive mood and dark colors with negative [2], we choose specific color palettes from Figure 2. Finally, as demonstrated by learning design principles from [11], we acquire that warm and cool colors induce different affective arousal. We also employ the aforementioned 'friction' such as blinking screen, slowed-down interactions, and game options like giving up for visual challenges.

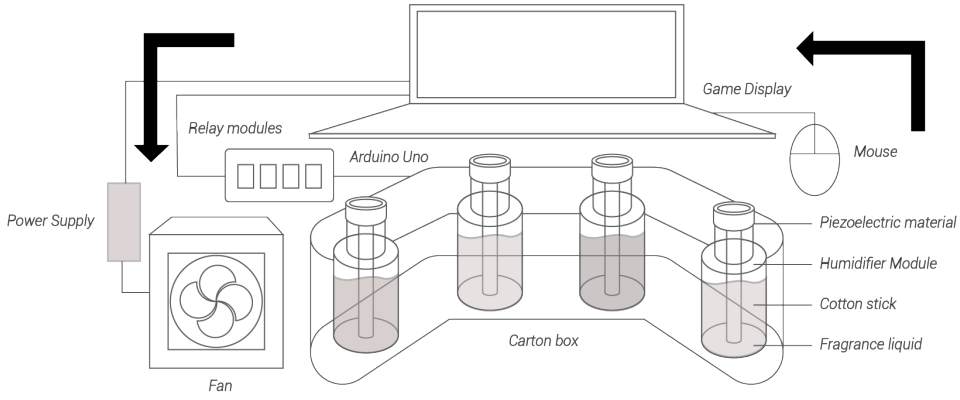



Fig. 3. Olfactory interaction mechanics

### 3.1 Olfactory Output 'Smellbox' Design

The olfactory system comprises an Arduino Uno and a 5V power supply, linked to four humidifier modules on a PCB board. A fan motor is positioned nearby to disperse the scents. Our game interfaces with the Ardity Unity asset [15], enabling communication to activate the relays controlling the humidifiers seen in Figure 3. Each humidifier module is housed in oval bottles containing distinct scents from the Candlemaker's Store [1] that are compliant with IFRA and EU Allergen standards. To avoid biasing players, the bottles and wiring are concealed with cardboard. To maintain player engagement and prevent surprises, the setup is labeled as a 'Smellbox' using color markers (refer to Figure 4).

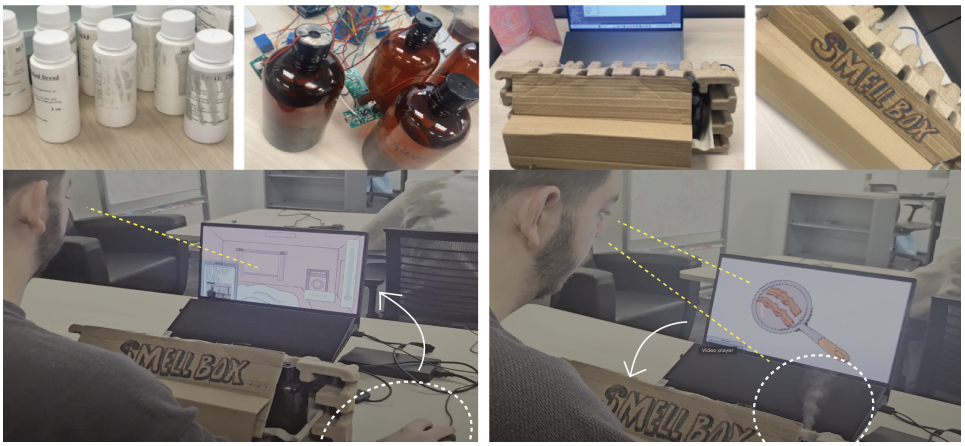



Fig. 4. Devising and using the Smellbox: On the top is the wiring and the use of fragrance oils, hardware supplies and cardboard to prototype the box, and on the bottom is the interaction sequence of a player

## 4 DESIGN INSIGHTS

Upon designing the game, we were able to derive valuable design insights for infusing scents into a narrative game.

Game designers can use scent-based memory [5] as a strategy for scent narratives. We anticipate that the scent triggers followed after player inputs can be perceived as "rewards" and achievements as proposed by [17]. There is also the apparent design challenge of familiarizing players with the concept of "smell-enabled" gameplay. Given the unconventional nature of olfactory feedback in gaming, it is vital to design the game for players their in- and ability to smell as natural. Quantifiable measures of players' mental models and scent perceptions during gameplay are essential for optimizing scent usage in games. Finally, using discernible scents is critical as they would eventually create an amalgamation. As design suggestions mention [9], it is beneficial to separate the scent outputs far from each other. Nonetheless, due to the distances that the scents can travel, it is hard to achieve even with a clearing fan. Design considerations on scent locations and mutual scent exclusivity can optimize the interpretation of scents. Further and importantly, stakeholders must be responsible for allergen control and scent exposure to those who are sensitive.

## 5 CONCLUSION

In this demo, we utilize multi-sensory feedback in a serious game to help appreciate the sense of smell in everyday life, particularly through the lens of a person battling post-COVID-19 side effects. By immersing players in routine scenes,

[1]www.thecandlemakersstore.com, 4951 Hamilton - Middletown Rd, hamilton, Ohio 45011, info@thecandlemakersstore.com, 513-868-9425

we showcase their health statuses through memory-based olfactory feedback, allowing for emotional engagement with their sense of smell as the core narrative. Olfactory memory, associated with emotionally significant situations, is episodic [1] and offers emotional depth in nostalgic contexts. This small-scale exploration of scent-based narrative presents an exciting venue to explore alternative, scent-based ways of engaging with and evoking such experiences. Although primitively, We aim to contribute to scent advancements in serious games, healthcare, education, and cultural heritage applications, hoping for empirical future research on their effectiveness.

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