The Anemoia Device: A Tangible AI System for the Co-creation of Synthetic Memories through Scent

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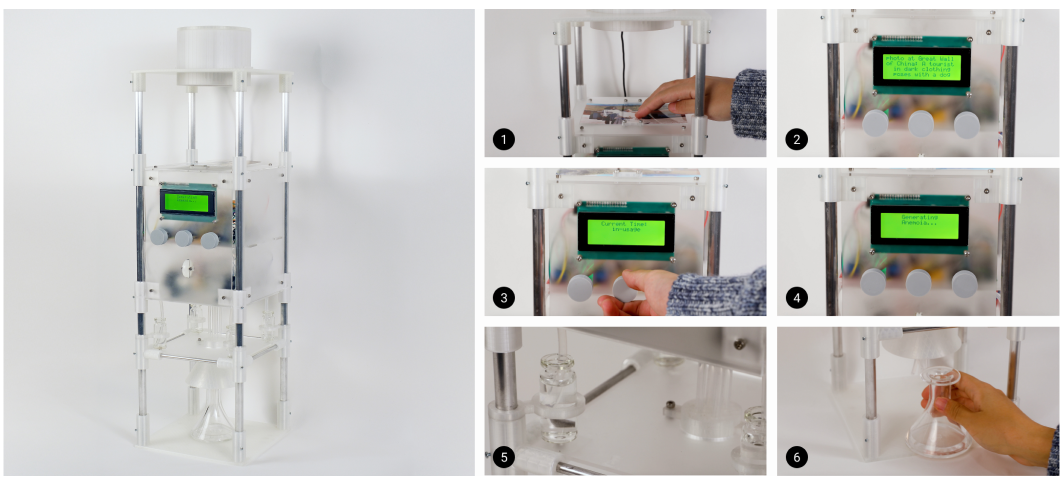

Figure 1: Left: The Anemoia Device. Right: User interaction steps: (1) insert photo, (2) generate caption, (3) prompt via dials, (4) generate story and scent, (5) dispense scent, (6) smell fragrance.

Abstract

We present the Anemoia Device, a synthetic memory generator that uses generative AI to provoke nostalgia for a time you have never experienced. The system transforms an archival photograph into a multi-sensory artifact through a novel synthesis of vision, language, and olfactory technologies. This multi-modal pipeline uses a tangible, dial-based interface to guide an LLM in performing a cross-modal, semantic-to-olfactory translation. The work is an inquiry into memory malleability in an age of AI, proposing an alternative to conventional screen-based interaction through an intentional, embodied ritual that positions the user as an active co-author, rather than a passive consumer.

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1 Introduction

Can you feel nostalgia for a past you never lived? What stories might AI be able to tell you about that past, and more uniquely, what might that story smell like? The Anemoia Device explores this possibility by co-authoring synthetic memories with generative AI models. It is built on the proposition that a tangible, multi-sensory experience, through the production of immersive narratives and corresponding scents, can help forge an emotional connection to an unlived past, incorporating an external memory into a user's embodied reality.

The term "anemoia" is a neologism, meaning 'nostalgia for a time you never experienced'[1]. This form of nostalgia aligns with contemporary theories of memory that argue our cognitive recall includes the external world, from Cloud infrastructure to the memory of others [14, 33]. This is especially evident in an era where we increasingly externalise our memories in vast digital archives where they are exposed to algorithmic influence [13].

Herein lies a critical issue. As we treat our digital archives not just as files or photographs, but as reliable proxies for our memories, the ever-growing capabilities of AI to author synthetic memories is a growing risk [32]. This technological capability forces us to confront the fact that human memory is not a static archive, but a malleable and reconstructive process susceptible to sensory suggestion[27]. The dominant trajectory of generative AI development often prioritises photorealism and persuasive power, a path that risks exploiting our cognitive vulnerabilities for persuasive ends [31], potentially eroding collective trust and devaluing authentic experience.

In response, we argue for an alternative direction, aligned with poetic exploration and generative empathy. The challenge is not simply to replicate or re-author the past, but to create new co-authored narratives that expand our imaginative and emotional worlds. This necessitates a shift in design values: from speed and scale to slowness and reflection. From black-box persuasion to tangible, user-guided collaboration. From purely visual output to multi-sensory, embodied experiences.

To provide this, we utilise two underexplored modalities in AI interaction: olfaction and tangible interfaces. Olfaction offers a unique and powerful ability to evoke vivid memories [11, 20], yet technical challenges have limited its application in computational systems [36]. However, recent research has demonstrated that Large Language Models (LLMs) can approximate human-scent perceptual judgments from text [24]. Our system builds on this approach to provide a semantic foundation for olfactory experiences, linking the associative space of language with the evocative world of odorants. Understanding that embodied interactions would enhance the subjectivity of the experience [38, 41], our approach grounds the system in physical acts from inserting analogue photographs to physically manipulating dials.

In this manner, the Anemoia Device transforms the open-ended and immaterial act of prompting into a structured, co-creative ritual. The system synthesizes and orchestrates generative models to transmute an impersonal, external memory into a more subjectively significant, co-authored experience. The result is a multi-sensory artifact, a generated story paired with a dedicated fragrance, dispersed through an integrated olfactory system, connecting people to pasts and memories they have never lived.

2 Related works

This work is situated at the intersection of four key domains: contemporary theories of memory; critical work on the role of AI in generating synthetic memories; foundational research on the link between olfaction and memory; and finally principles from tangible and embodied interaction.

2.1 Extended memory

While traditional models frame memory as a brain-bound process based on lived experience [7], our work builds on contemporary theories of extended memory that explain how memory is increasingly stored and accessed via external media such as digital archives [14, 38, 41]. This notion of extended memory is not limited to technological artifacts, demonstrated by the existence of vicarious memories, where second-hand accounts start to share phenomenological and functional properties with personal memories [33, 39]. Our work is situated in this conceptual space, exploring how anemoia can be understood as a technologically mediated vicarious memory, co-authored with AI.

2.2 Synthetic memory and malleability

Contrary to the idea of memory as a perfect recording of the past, research shows it is a reconstructive process [37], where misinformation and falsified content can lead people to form rich false memories [27]. As our cognitive processes actively rebuild memories rather than simply replaying them, our cognitive processes are malleable and susceptible to external influence [28]. It is this malleability that makes synthetic memories, recollections of events that either never occurred or are dramatically distorted, a psychological reality [22]. This vulnerability has been demonstrated to significantly increase with exposure to sensory media [30].

2.3 Olfaction: affective power and computational challenges

Olfaction is known to evoke vivid memories, this phenomenon famously known as the Proust Effect [35], stems from the direct pathways between the olfactory system and the neurological centres for emotion and memory [12, 21, 25]. Leveraging this power by integrating scent into computational and AI systems presents significant challenges due to difficulties with digitisation and high interpersonal variability in perception [36, 40]. Machine learning research in this domain has primarily focused on predicting odour properties from molecular structures [2–5, 17, 26] with notable work from Pyrfume to build a comprehensive foundational data infrastructure [19], while recent research has demonstrated that LLMs can represent human olfactory information from textual data alone [24]. Interactive systems meanwhile have largely been limited to pre-defined mappings, where a specific input triggers a single, pre-loaded scent [6, 10, 15]. Our project addresses this gap, exploring dynamic scent mappings that are conceptually linked to AI-generated narratives.

2.4 Tangible and embodied interaction

It is well established that tangible interfaces can enhance cognition and create more meaningful experiences compared with abstract, detached information processing [16, 23]. Contemporary theories around extended cognition help to explain this, proposing that external information requires a process of embodiment and incorporation into the body *(in corpore)* to become a meaningful part of our cognitive experience [14, 38, 41]. This suggests an interface designed for memory-making would benefit from a physical and sensory led approach. Our tangible interface is guided by these principles, with the olfactory output completing the process of bodily incorporation.

3 Anemoia Device

The Anemoia Device is a tangible system that implements a novel multi-modal pipeline for generating olfactory experiences. The architecture is designed to support generative world-building, where a user transforms an archival photograph into a multi-sensory artifact. This is achieved by integrating a Vision-Language Model (VLM), a tangible interface for user guidance, and LLMs for narrative generation and cross-modal translation from semantics to a scent-vector space.

3.1 System architecture

The full pipeline as illustrated in Figure 2, proceeds in six key stages: (1) VLM-based image captioning of a photographic input. (2) LLM-based subject classification based on the caption. (3) The user's low-dimensional inputs via three dials are processed. (4) A final narrative is synthesized by an LLM from the user inputs. (5) A scent formula is generated via a few-shot, cross-modal translation from the narrative. (6) Formula quantities are calculated into pump timings and the final scent output is rendered by the integrated olfactory display.

3.2 User interaction

The physical form of the device is based on the metaphor of distillation, organized vertically from top to bottom (See Figure 3) where a memory is gradually processed and concentrated into a scent through a multi-sensory ritual. User interaction is anchored in the physical world, beginning with the insertion of a physical photograph.

The core of the interaction is the user-guided narrative construction using three physical rotary dials. This tangible interface provides a constrained, structural and exploratory experience, compared with

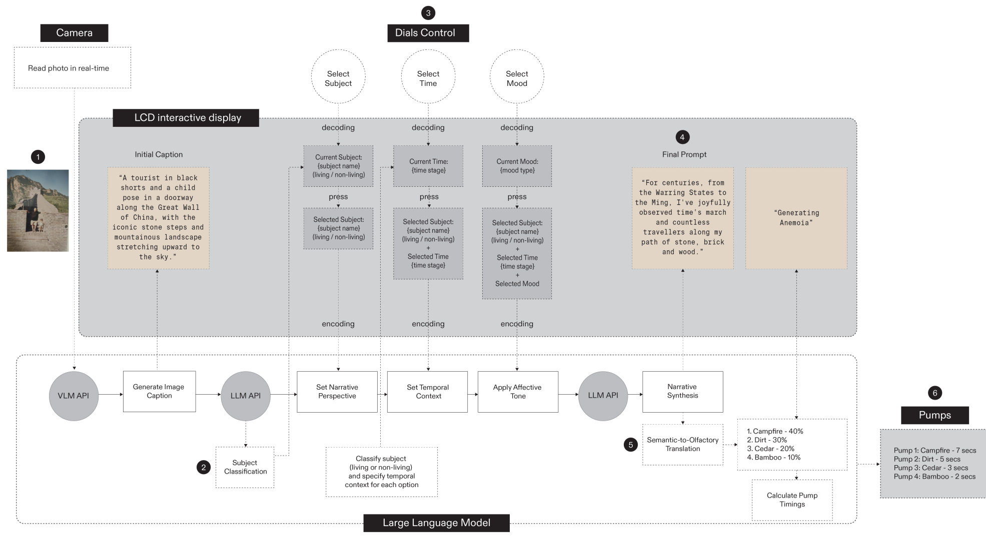

Figure 2: Overview of system architecture from image captioning to scent dispersal

a typical open-ended prompting process. The three dials are designed to align with the concept of anemoia by allowing the user to define the parameters of an imagined past:

- Dial 1 - Subject (perspective): enables the user to inhabit an unfamiliar perspective within the scene by selecting the point-of-view of a subject (e.g. "old man," "tree," "bicycle") based on the VLM-LLM subject classification from the photograph. As part of this initial classification, the LLM determines whether the subject is living or non-living, which directly informs the options available on the next dial.
- Dial 2 - Time (temporal context): situates the selected perspective within a timeline. Options are dynamically filtered. If a living subject is selected, the options are ["childhood", "youth", "adulthood", and "elderly"]. If a non-living subject is chosen the options are ["raw material", "manufacture", "in-use", and "decay"]. This ensures conceptual coherence.
- Dial 3 - Mood (affective tone): allows the user to infuse the synthetic memory with a specific emotional tone from a fixed set of options: “happy,” “sad”, “calm”, “angry”.

3.3 LLM semantic-to-olfactory translation

As outlined in Section 3.1, the VLM image caption and the user’s three conceptual parameters are synthesized into a structured prompt for an LLM (GPT-4o). The LLM’s first task is to generate a short, poetic narrative that integrates these multi-modal inputs. This step transforms the sparse user input into a rich, high-dimensional semantic context.

The LLM’s second, more novel task is to perform a few-shot, cross-modal translation from the generated narrative to an olfactory output. The foundation of this translation process is a scent library that defines the target olfactory space for the model. This library consists of our $(N = 39)$ available pre-blended fragrance oils. Rather than relying on simple one-word labels, each scent is annotated with a set of semantic descriptors. These descriptors add details such as primary olfactory notes, associated concepts, and emotions to help translate fragrances into a machine-readable semantic space (see Appendix A.4 for details).

To enhance this process, we constructed an Olfactory Knowledge Base containing example pairings of narratives, their ideal scent vectors based on scent profiles, and a textual rationale explaining the semantic mapping. For each generation, we use in-context learning: 2-3 of these examples are randomly selected and prepended to the prompt, effectively teaching the model the desired reasoning process in real-time. The model is then prompted to analyse its own newly generated narrative and following the provided examples, output a proportional recipe of up to four scents that best represents

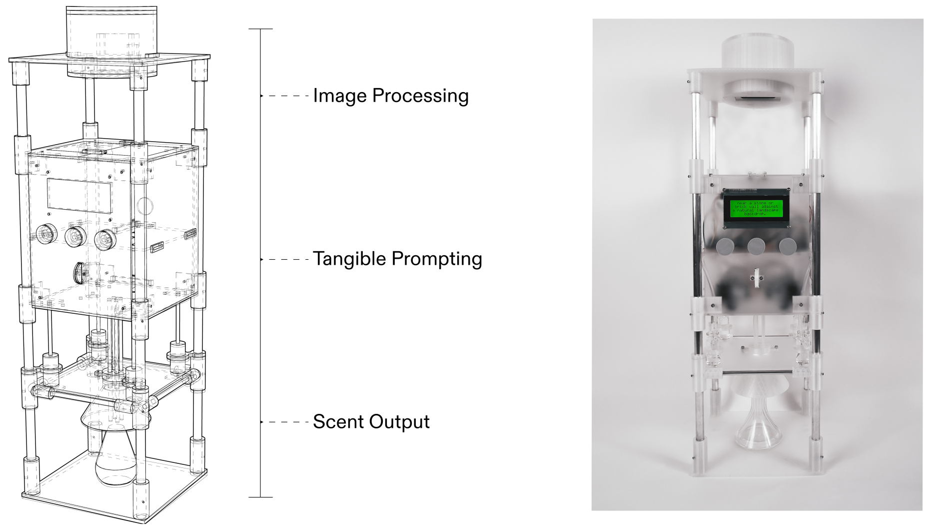

Figure 3: The Anemoia Device is vertically structured with three functional zones. The left schematic highlights the internal structure and modular segmentation, the right image shows the final prototype.

the story's emotional and thematic content. An example is provided in Appendix A.5. This output can be considered a sparse vector in the N-dimensional space of our available scents, and this few-shot approach yields more consistent and conceptually grounded results than a purely zero-shot method.

3.4 Olfactory interface

The digital scent vector is rendered into a physical fragrance by a custom olfactory display. This subsystem is controlled by a XIAO ESP32S3 microcontroller, which receives commands from the host system. Upon reception of a scent formula, the host application calculates the precise duration each pump must be activated to dispense the appropriate proportion of fragrance oil. These timing commands are sent to the microcontroller and relays to control four 12V DC peristaltic pumps, capable of dispensing fragrance oils with millilitre accuracy. The four pumps draw from separate glass vials and dispense their liquids through silicone tubing into a shared blending vessel. This vessel, containing the final composed scent, can then be removed by the user, completing the pipeline from abstract prompt to physical, olfactory experience.

Additional details of hardware and software implementation as well as notes on fabrication are provided in the Appendix.

4 Discussion

4.1 Co-authoring synthetic memories

By co-authoring synthetic memories through a tangible, olfactory driven process, the Anemoia Device moves beyond conventional screen-based interactions to explore a more embodied and poetic form of human-AI collaboration. This work proposes a fundamentally different archetype for our relationship with generative machines that prioritises intentionality, embodiment and co-creation.

This stands in contrast to the dominant trajectory of AI applications, which often centre on the creation of photorealistic fictions designed to persuade. This approach, reinforced by frictionless, screen-based interfaces conducive to passive consumption, places the user in a position where their cognitive vulnerabilities can be exploited. While the device leverages similar 'black box' language models to everyday consumer products, it wraps them in an overtly mechanical object designed for transparency and intentionality. The physical nature of interacting with the device takes the user from a passive consumer to an active co-author. The resulting scent and story are not a deception to be believed, but the poetic outcome of a co-creative act. This approach suggests a more humanistic path for synthetic media, where rather than attempt to blur the line with reality, AI models are used to create beautiful, honest fictions that we can hold, smell, and reflect upon.

4.2 Limitations and future directions

As a speculative research artifact, this work has several limitations that provide opportunities for future inquiry. This paper presents the system and its conceptual framework without a formal user study to validate its capacity to provoke anemoia. The olfactory display uses a curated array of 39 pre-blended fragrance oils with a four-scent output array. While designed to help reduce perceptual blending issues [8], this limits the breadth and precision of olfactory experiences the device can offer. Finally our current semantic-to-olfactory translation uses a one-directional semantic approach which has no model of underlying chemical structures or perceptual interactions between odorants. This model in turn cannot benefit from user-feedback. Future work will seek to address these limitations. Firstly, conducting empirical validation of the system to gather data on user experience. Recognising the highly subjective nature of scent perception, a key goal is to create a more dynamic user-adaptive system that incorporates feedback into a reinforcement learning model, helping to fine-tune the LLM's semantic mapping. This combined with a more comprehensive fragrance library would help to create a system that is a powerful, personalisable scent engine capable of evoking the emotional texture of any narrative.

5 Conclusion

By designing a system that co-authors synthetic, olfactory memories, this project demonstrates a novel pathway for human-AI interaction that is intentional, embodied, and poetic. We have presented a multi-modal pipeline that translates an external visual memory into a multi-sensory artifact, using a tangible interface for user guidance and LLMs for cross-modal generation from narrative semantics to a physical scent. A key contribution of this work lies in its novel synthesis of vision, language, and olfactory technologies to create a generative system. This demonstrates how AI tools can be orchestrated to produce rich, affective experiences that engage the challenging domain of olfaction and points towards a future where we design not just for individual AI modalities, but for the complex, multi-sensory systems of our embodied humanity.

Beyond a technical system, this work proposes an alternative archetype for our relationship with generative machines. In a landscape often focused on the speed, scale, and persuasive power of AI, our approach promotes a different set of values: transparency, co-creation, and reflection. This suggests a trajectory for creative AI where technology is used not to replicate or deceive, but to expand our capacity for imagination and empathy. Ultimately, the Anemoia Device is a provocation that asks what it means to remember when memory itself can be generated, what it means to feel when that feeling is co-authored with a machine, and what it means to be human when we can craft beautiful, fragrant fictions of pasts we have never lived.

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A Technical Appendices and Supplementary Material

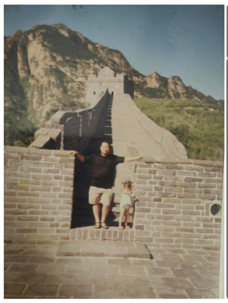
A.1 Software implementation

The software architecture includes firmware on the Arduino Uno and XIAO ESP32S3, the central Python host application, and external cloud AI services. A central host application (Python 3.10+) orchestrates the workflow, managing separate serial connections (`pyserial`) to the Uno (input/feedback) and XIAO (output commands), handles image encoding, makes API calls (`requests` to Anthropic/OpenAI), manages state, generates dynamic options, and performs deterministic pump timing calculations (ref. Algorithm 2).

Input controller firmware (Arduino C++ on Uno) reads encoders/buttons, updates the LCD (`LiquidCrystal_I2C` library), sends confirmed selections, and displays received dynamic options (ref. Algorithm 1). Output controller firmware (Arduino C++ on Xiao ESP32S3) is dedicated to receiving pump commands via serial and precisely controlling the relay modules using non-blocking timers (`millis()`), implementing the execution phase of Algorithm 2.

VLM/LLM interaction and prompting use a structured, multi-stage prompting strategy. First, for initial image captioning, Anthropic's API (Claude Sonnet 3.7) is invoked to generate a concise textual description (max. 145 characters) from the webcam's base64-encoded image. All subsequent generative tasks leverage OpenAI's GPT API (model GPT-4o). Firstly, the LLM synthesizes inputs based on the user's dial selections to generate the final narrative. This serves as the prompt for semantic-to-olfactory translation performed using a few-shot, in-context learning approach. This involves dynamically pre-pending the prompt with examples drawn from the curated olfactory knowledge base, which contains narrative-to-scent vector pairings and rationales. This method guides the LLM to map its own generated narrative to a proportional scent formula, utilizing format constraints and embedded knowledge.

Tangible prompting logic is described in Algorithm 1, detailing the user interaction flow for parameter configuration and the dynamic feedback loop between the user, input controller (Arduino) and host application. Narrative-to-scent logic, shown in Algorithm 2, outlines the end-to-end process from narrative input to scent output, combining the generation of the LLM formula, the calculation of the host time and the execution of the output controller (XIAO / relay). Example outputs are illustrated in Figure 4.



Objective Caption	Extracted Subjects	Selected Subject	Select Time	Select Mood	Final Prompt	Scent Formula
"A tourist in black shorts and a child pose in a doorway along the Great Wall of China, with the iconic stone steps and mountainous landscape stretching upward to the sky."	0: Tourist (living) 1: Dog (living) 2: Great Wall of China (non-living) 3: Mountains (non-living)	Great Wall of China (non-living)	Raw-material Manufacture In-use Decay	Happy Sad Angry Calm	For centuries, from the Warring States to the Ming, I've joyfully observed time's march and countless travellers along my path of stone, brick, and wood.	Campfire - 40% Dirt - 30% Cedar - 20% Bamboo - 10%
		Tourist (living)	Childhood Youth Adulthood Elderly	Happy Sad Angry Calm	Where ancient guardians once watched, I feel time stretch like the Wall itself. My childish wonder mirrors my past, our souls becoming part of this stone tapestry.	Moss - 35% Night Air - 30% Cedar - 25% Green Tea - 10%

Figure 4: Example outputs demonstrating narrative and scent generation for different user inputs (Subject, Time, Mood) based on a sample image caption.

Algorithm 1 Tangible prompting interaction logic

Initialize Phase
Host: Get VLM caption & LLM subject classifications.
Host → Arduino Uno (Serial): Send initial Subject options (`OPTS:SUBJ:...`).
Arduino Uno: Display Subject options on LCD.
`activeParam` ← `SUBJECT`.
Interaction Loop Phase
loop
    Arduino Uno: Monitor Encoders/Buttons.
    if Rotation detected for `activeParam` **then**
        Arduino Uno: Update internal selection focus & LCD display.
    else if Button Press detected for `activeParam` **then**
        `selectedValue` ← Focused option on Arduino Uno.
        Arduino Uno → Host (Serial): Send confirmation (`CONF:PARAM:Value`).
        Host Processing: Parse confirmation, store `selectedValue`.
        if `activeParam` = `SUBJECT` **then**
            Host: Determine dynamic *Period* options based on tag.
            Host → Arduino Uno (Serial): Send *Period* options (`OPTS:PERD:...`).
            `activeParam` ← `PERIOD`.
            Arduino Uno: Update internal list for Period dial.
        else if `activeParam` = `PERIOD` **then**
            Host: Determine fixed *Mood* options.
            Host → Arduino Uno (Serial): Send *Mood* options (`OPTS:MOOD:...`).
            `activeParam` ← `MOOD`.
            Arduino Uno: Update internal list for Mood dial.
        else if `activeParam` = `MOOD` **then**
            Exit Loop.
        Arduino Uno: Update LCD for new `activeParam`.
Post-Loop: Host proceeds to Narrative Synthesis.

Algorithm 2 Narrative-to-Scent generation logic

Require: Final `narrative_sentence`, `scent_library` with descriptors, `olfactory_knowledge_base`, `pump_assignments` dict, `MAX_PUMP_DURATION_S`.
Ensure: Physical scent emission.

```
Host Application - Few-Shot Formula Generation
k ← 3                                    ▷ Number of examples for in-context learning
selected_examples ← RandomlySelect(olfactory_knowledge_base, k)
formatted_examples ← FormatExamples(selected_examples)   ▷ Formats Narrative,
    Rationale, and Recipe
prompt ← ConstructPrompt(system_instruction, formatted_examples,
    scent_library, narrative_sentence)
formula_string ← LLM_API(prompt, model="GPT-4o")
formula_dict ← ValidateAndParse(formula_string)  ▷ Parse into {name: percentage}

Host Application - Timing Calculation                          ▷ Deterministic
commands ← []
if IsEmpty(formula_dict) then return
                                                               ▷ Handle error
proportions ← Values(formula_dict)
max_proportion ← Max(proportions)
if max_proportion ≤ 0 then return
scale_factor ← MAX_PUMP_DURATION_S / max_proportion
for all name, proportion in formula_dict do
    duration ← proportion * scale_factor
    pump_index ← Get(pump_assignments, name, default=-1)
    if pump_index ≠ -1 then
        cmd_string ← Format("pump{pump_index}:{duration:.2f}")
        Add(cmd_string, commands)

Host Application - Dispensing Trigger
Wait for User Trigger signal from tangible interface.
for all cmd in commands do
    Host → Xiao ESP32S3 (Serial): Send cmd + ’
n’.
    Delay(50ms)                          ▷ Short pause between commands

Output Controller (Xiao ESP32S3) - Execution
Loop:
    If Serial data ("pumpX:Y.YY") received Then
        pumpIndex, duration ← ParseCommand(command).
        Set target end time: pumpEndMillis[pumpIndex] ← millis() + duration*1000.
        Activate relay: digitalWrite(relayPins[pumpIndex], HIGH).
    End If
    CheckPumpTimers            ▷ Deactivates relays when millis() ≥ pumpEndMillis
End Loop
```

A.2 Hardware implementation

The hardware system comprises distinct input and output modules connected to a central host computer, alongside the necessary power and fluidic components. Key components and their interconnections are shown in Figure 5.

The input module uses a USB webcam to capture images. Three KY-040 rotary encoders and an I2C 20x4 LCD screen form the tangible interface, connected to the Arduino Uno (see Figure 6). The output module consists of four 12V DC peristaltic pumps used to dispense fragrance oils. Each pump is switched by a separate 12V relay module. The logic inputs of the relays are controlled by a Seeed Studio XIAO ESP32S3 (Output Controller), which is mounted on a custom PCB. Figure 7 shows a simplified representation. Power distribution is handled by powering the Arduino and XIAO via USB,

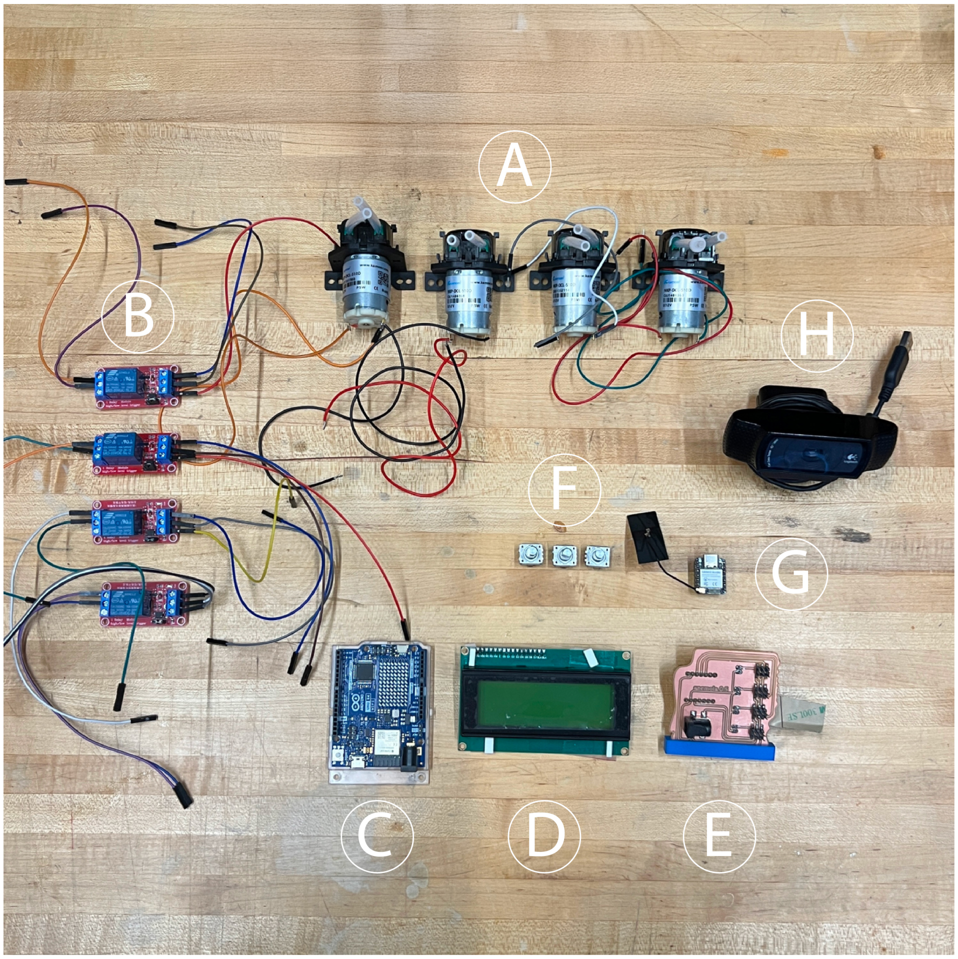


Figure 5: Core hardware components used in the Anemoia Device: (A) peristaltic pumps (x4), (B) 12V relay modules (x4), (C) arduino uno (input controller), (D) LCD screen module, (E) custom PCB with XIAO ESP32S3 (output controller), (F) KY-040 rotary encoder modules (x3), (H) USB webcam.

while an external 12V DC power supply powers the pumps, switched via the relay contacts. The relay modules' logic coils (`VCC`) are powered by the XIAO's 5V output. Fluidics are implemented using glass reservoirs, connected via silicone tubing through the pumps to a passive mixing point.

A.3 Fabrication

The device enclosure was constructed using a modular aluminium rod frame with laser-cut frosted acrylic panels. Key structural joints and component mounts were 3D printed (PLA), creating a layered internal layout. A custom PCB, designed in Fusion 360 Electronics, processed using `gerber2img`[9] and `mods` [18], and CNC-milled on a Carvera Desktop CNC machine, integrates the Seeed Studio XIAO ESP32S3 with connectors for four relay modules. This compact board simplifies wiring, improves reliability, and provides centralised control over the peristaltic pumps. To minimise cross-interference, the internal layout physically separates logical subsystems (e.g. microcontrollers, relays) from fluid-handling components (pumps, tubing, reservoirs), each mounted on distinct internal panels within the frame.

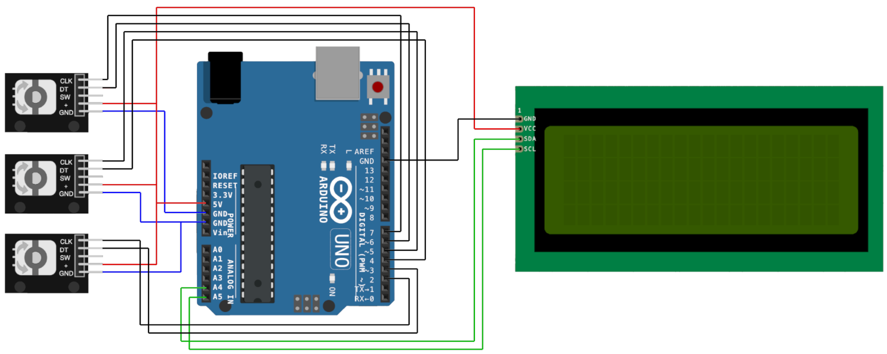


Figure 6: Input module schematic: shows connections between Arduino Uno microcontroller, three rotary encoders and LCD Screen

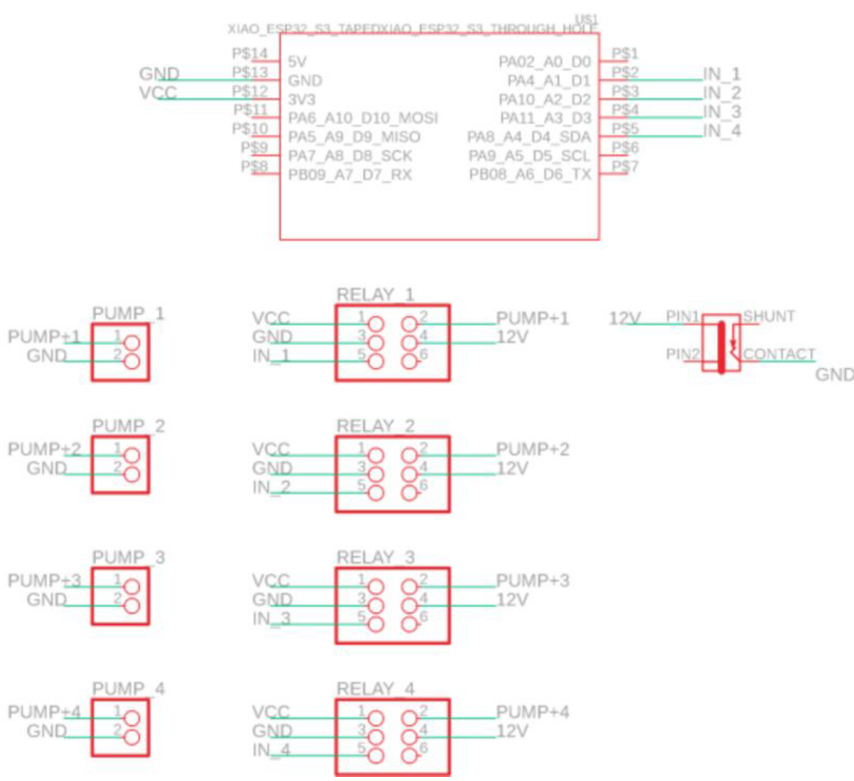


Figure 7: Output module: simplified schematic shows XIAO ESP32S3 controlling the logic inputs of four relay modules. Each relay switches the external 12V supply to its respective pump.

A.4 Curated fragrance library

This library was prepared via a combination of manufacturer descriptions [34], olfactory notes from Odeuropa - a large scale study of scent notes [29], and the authors' own sensory evaluation.

Table 1: Fragrance library with semantic descriptors

#	Fragrance name	Semantic descriptors / keywords
1	Night Air	cool, crisp, ozonic, dark, mysterious, midnight, dew, subtle, empty street
2	Dirt	earthy, grounding, rich, soil, garden, damp, mineral, fertile, forest floor
3	Ocean Breeze	salty, aquatic, marine, invigorating, fresh, coastal, wind, mineral, expansive
4	Rain	ozonic, petrichor, wet pavement, fresh, rejuvenating, melancholy, atmospheric
5	Fresh Cut Grass	green, sharp, vibrant, summer, lawn, childhood, outdoors, fresh, uplifting
6	Campfire	smoky, woody, warm, nostalgic, embers, resinous, comforting, autumn
7	Sandalwood	woody, creamy, sweet, warm, smooth, meditative, sacred, balsamic, rich
8	Bamboo	green, crisp, clean, watery, airy, light, spa, fresh, zen
9	Forest Pine	coniferous, fresh, invigorating, pine needles, mountain, crisp, woody
10	Peaches & Cream	fruity, sweet, gourmand, comfort, creamy, soft, innocent, summer, dessert
11	Vanilla Bean	gourmand, creamy, baking, warm, sweet, rich, comforting, familiar, edible
12	Baby Fresh	soft, clean, powdery, light, innocent, delicate, talc, comforting, gentle
13	Green Tea	fresh, herbal, calming, zen, bitter, clean, spa, meditative, light
14	Magnolia	floral, creamy, lemony, delicate, southern, elegant, fresh, romantic, rich
15	Honeydew	juicy, fresh, sweet, aquatic, mellow, ripe, summer, light, fruity
16	Amber	rich, resinous, warm, golden, ancient, comforting, oriental, nostalgic
17	Sweet Tobacco	warm, smoky, sweet, leathery, pipe, grandfather, study, rich, vanilla, spicy
18	Cedar	woody, crisp, dry, clean, aromatic, closet, sharp, pencil shavings, grounding
19	Old Books	paper, dusty, woody, library, quiet, intellectual, history, leather-bound
20	Coffee	rich, roasted, bitter, energizing, morning, warm, comforting, dark, cafe, gourmand
21	Leather	earthy, robust, animalic, warm, smoky, worn, library, comforting, masculine
22	Sand	dry, warm, mineral, subtle, beach, sun-baked, grainy, neutral
23	Salty Sea	bracing, marine, fresh, mineral, aquatic, sharp, invigorating, ozonic, seaweed
24	White Tea	clean, delicate, subtle, elegant, fresh, light, spa, herbal, refined
25	Verbena	citrusy, fresh, green, lemony, invigorating, bright, herbal, sharp, clean
26	Seashore	marine, salty, breezy, aquatic, sand, sun, coastal, open-air, driftwood
27	Moss	earthy, damp, green, forest floor, ancient, cool, loamy, natural, shaded
28	Lilac	floral, sweet, fresh, spring, powdery, romantic, nostalgic, delicate
29	Cucumber Melon	fresh, green, juicy, sweet, aquatic, clean, young, light, refreshing
30	Coconut	creamy, tropical, sweet, gourmand, beach, sun-tan lotion, exotic, warm
31	Cinnamon	spicy, warm, sweet, gourmand, exotic, baking, comforting, woody, aromatic
32	Fresh Cotton	clean, soft, airy, laundry, fresh, comforting, light, powdery, simple
33	Violet	powdery, floral, delicate, sweet, earthy, slightly woody, nostalgic, classic
34	Sugar Cookie	sweet, gourmand, comforting, buttery, baking, warm, childhood, school
35	Vanilla	perfumey, sweet, amber, musk, complex, elegant, sophisticated, oriental
36	Pomegranate	fruity, tart, vibrant, juicy, sweet, exotic, sharp, bright, refreshing
37	Lavender	floral, herbal, calming, clean, aromatic, relaxing, sleep, classic, medicinal
38	Pear	juicy, crisp, fruity, fresh, sweet, green, light, delicate, orchard
39	Peppermint	cool, invigorating, crisp, minty, sharp, refreshing, clean, energetic

A.5 Example from the olfactory knowledge base

Below is one of the few-shot examples used to steer the LLM's semantic-to-olfactory translation.

Input narrative

> "In the fading light of autumn, the leather chair sits quietly by the window, remembering the scent of rain on the dusty glass, a comfortable sadness for things long past."


```
{
  "Leather": 0.40,
  "Rain":    0.30,
  "Old Books": 0.20,
  "Amber":   0.10
}
```


Rationale The narrative's primary subject is the *leather chair*, making *Leather* the dominant note. The mention of "rain on the dusty glass" maps directly to the *Rain* scent. The overall mood of "comfortable sadness" evokes nostalgia, expressed with *Old Books* and the slightly somber resinous note of *Amber*.

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   Answer: [Yes]

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Question: Does the paper describe the usage of LLMs if it is an important, original, or non-standard component of the core methods in this research? Note that if the LLM is used only for writing, editing, or formatting purposes and does not impact the core methodology, scientific rigorousness, or originality of the research, declaration is not required.

Answer: [Yes]

Justification: The paper explicitly describes the multi-stage use of a VLM for image captioning and an LLM for both narrative synthesis and the novel task of few-shot, semantic-to-olfactory translation.

Guidelines:

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