Scent Interfaces Definition: Diffuser Devices Interaction and Control

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Abstract. Interface's definition, in its various perceptions, is explained as the relation between different systems interaction with or without human intervention. Scents are perceived with a direct link to the brain cortex that handles emotions, often triggering immediate emotions [1]. Aroma cannot be seen, heard or touched; it must be dispersed in the air to be perceived. To do so intentionally, a diffusing device built with the purpose of spreading smell into an environment is usually needed and it requires a controlled source. High-tech scent diffusers make use of new technologies reaching new usage and experiences. This includes smart control in various uses, frequently offering multisensorial interfaces. We can observe this in numerous appliances today. This paper discusses scent interfaces for controlling scent diffusion, investigating on the space between a scent diffuser device and its control source to define and categorize Scent Interfaces.

Keywords: Scent diffusion · Interfaces · Scent interfaces · Emotional design · Interaction and control

1 Introduction

The control of scent diffusion is often in a blur zone regarding existing interfaces between a device and a fragranced environment. This paper's intents to clarify and classify a definition for interfaces concerning the control of fragrance dispensers.

Operating contemporary scent diffuser's can be more than just plugging airfreshners to a wall, pressing on/off and basic intensity regulation. New generation airfreshners are often sophisticated devices requiring operational action accordingly: features like setting different fragrances, program working hours each weekday, control multiple devices remotely, choose aromas and diffusing times is possible.

Interacting with scent can give rewarding experiences to end users. UX design aimed solutions may enhance this by engaging users in comprehensive and new challenging products.

This paper will be divided in four parts. The 1st is this introduction, the 2nd will focus on scent interfaces, emotional design, multisensory approaches to design and interface definitions, the 3rd consists on reviewing and classifying two smart controlled diffusion systems, organizing its attributes and common grounds regarding its

functionalities and interfaces and the 4th part is the findings and conclusion regarding Smart control Scent Interfaces, leaving an open field for future developers.

2   Scent Interfaces

Mehta considers that "A good design is a treat for the senses" [2]. Design should have our senses in consideration, 35 of them, divided by physiologic and sensibility driven senses (the 5 senses most of us are aware off are included in the physiologic category), it is a fact that Mehta's paper does not refer to specific senses including olfactory stimulus linked to design processes, but we will show products developed exclusively for olfactory experiences later in this paper.

Turin claims "The relative neglect of smell compared to other senses may also have to do with the fact that it cannot be easily transmitted like images and sound. As a colleague of mine put it, 'You still can't fax a perfume.' Possibly also, it is wrongly held to be less reliable as a sensation than vision or sound." [3] however, it is well known that consumers have been gaining consciousness regarding olfactive experiences, fragrance dispensers have been developed to make olfactory experiences increasingly interactive and dynamic.

Latest technological developments make use of sophisticated electronics and built in sensors that improve efficiency and can gives its users information like for example fragrance identification, intensity, refill level, timers, functional programs. These features make fragrance dispenser interactive, this is especially helpful because, as Turin claims, scent is invisible and doesn't make noise. Feedback efficiency is important making possible for users to receive different status information, effective information can enhance user pleasant experiences.

Norman states "Appliances have increased in complexity, especially ones that used to be quite simple: for example, toasters, refrigerators, and coffeemakers, all of which have multiple control dials, multiple LCD displays, and numerous options" [4], scent diffusion devices are being developed accordingly with increasing complexity.

Martin Lindström explains multisensory approaches in marketing strategies that include the use of scent [5]. In 1990 the business magnate Steve Wynn pioneered the funneling of scent through the Mirage's hotel and casino vents [6]. The Hilton affiliate program offers aroma options for costumer preferences, having room ambiance with chosen fragrances upon checking-in in certain Hilton hotels, this last reference may be considered a static (not interactive) but it is a personalized experience.

Regarding home fragrance dispensers, high end products are in demand for quality sophisticated costumers along with a growing interest on health and wellbeing focused products, these are natural low tech luxury products, like reed diffusers, trigger sprays, candles, from brands such as Rituals, Diptyque, Joe Malone, Millefiori Milano, Nest and others offering sensory experiences in various moments of truth for its customers: it usually starts in the store environment, high quality designed packaging until a final experience, it can be argued that this market has its references in luxury perfumery where "(…) only 3 per cent or so of the price in the shop is the smell. The rest is packaging, advertising and margins." [3].

This investigation emerged due to new technologies and its user experience possibilities that opens a new generation of scent diffusers with increasing complexity "We interact with machines all the time, often without being aware of the interaction (which is what superior design should aim for)" [7]. As Mehta argues, "Products have evolved from being a bundle of attributes/benefits, to a bundle of images/benefits, to a bundle of sensory experiences and now to a bundle of comfort and delight – a bundle of sensibilities" [2]. Smart controlled scent diffusers have UX design solutions with user friendly interfaces that allow simple usage for a complete (complex) array of features and functions.

2.1 Scent Interfaces - Scope

According to *The Oxford English Dictionary*, the first known definition for the term interface refers to a surface between two portions of matter or space that have a common limit [8] to identify a separation surface between two liquids.

Parslov and Mortensen [9] illustrate different interface definitions clearly reviewed scoping structural and functional interfaces throughout many scientific disciplines. The study revealed many different perceptions regarding the manifestation of an interface divided in four key issues: 1 - Definitions reviewed in their study along time in different fields; 2 - Structural interface sub-systems exist to perform many physical actions in an object, Functional interfaces have interaction properties such as transfers of material, energy and information; 3 - Different system languages influence the way an interface is perceived, a mechanical engineering's language may vary from an electronics and/or an IT professional, however it is important to refer that interfaces happen on projects sharing multidisciplinary inputs; 4 - Perception differences: interfaces can be considered parts of the elements or an interface can be an object by itself.

This paper's scope will consider interfaces as objects developed for interaction with scent diffusing products. Mehta's claim that "products are becoming secondary, experience primary" [2] can fit the need for interfaces to make mass customization objects possible, this can be shown in different everyday objects such as a smart phone, a mass production object that can be loaded with many different personalized apps, some could suit in the functional interfaces definition – an object between 2 elements that exists to control a system. This exists in different levels of complexity and in most cases setting up personalized experiences.

2.2 Conclusion

New technology makes complex scent interfaces an open field for innumerous interaction possibilities for controlling scent devices. Remote smart controlling is possible using an independent network protocol such as Bluetooth or Wi-fi either directly or with multimodal platforms like Amazon Alexa, Google Assistant, Microsoft's Cortana, Siri or others. This allows to develop interfaces as objects or products independent from devices. This possibility opens investigation fields for re-thinking scent interfaces designed for user experiences, giving a greater freedom on controlling devices with users enjoying increased controlling abilities and designing their own experiences fully exploring each system capabilities.

Functional scent interfaces can be independent objects and allow programming options open. End users can co-design their experiences by programming device settings to their personal preferences.

3   Scent Interfaces Objects Evaluation

Scent diffusers using smart control make personalized olfactive experiences possible for end users. In this chapter we will review and compare interactive interfaces designed for 2 devices, both devices are multi-technological systems with multiple interfaces including functional interactive interfaces. Our scope will remain mostly in the interface as an independent object to program and control scent diffusion (structural interfaces such as refill fitting, push buttons and others are out of scope in this study). These diffusers have their main controls in an app available for Android or IOS, assuming the need for a second device to operate it to its full potential. On board control exists for basic functions, power plugging and (physical) refill exchanging, this allows its autonomous basic usage using its basic functions as a not smart controlled device, this does not limit the device functionality if a smart controlling device is not available.

3.1   Moodo Home Fragrance Diffuser and Rituals Perfume Genie

We will perform an analysis on Moodo (Fig. 1) and Rituals Genie (Fig. 2) regarding its interfaces. These fragrance dispensers are smart controlled devices – its interfaces are independent objects (apps) designed to control the system. Its programming is independent from the device allowing personalized control and remote system updating regarding its controlling functions. Both devices can be operated by the app itself or through leading smart home platforms.

Fig. 1. Moodo Home Fragrance Diffuser System. Devices (white and black color options), refills and smartphone showing app. Leading smart home platforms ready for operating Moodo device: Siri; Amazon Alexa; Google Assistant; IFTTT (If This Then That); Moodo API and Homebridge. Available at: https://moodo.co/smart-home/

Fig. 2. Rituals perfume Genie system. Genie device and refill (Fragrance: Ritual of Ayurveda). Leading smart home platforms ready for operating Rituals Genie Perfume: Amazon Alexa and Google Assistant. Available at: https://www.rituals.com

Its interfaces are designed for increasing its user possibilities of use: The experience starts by activating an account and connect with your device choosing a name, these interfaces allow the control for multiple devices in different locations or networks, the fact that you give each device a name is an example of personalization. Each genie device has a QR code in its bottom to be identified directly by the smart device's camera. Both devices allow scheduling different calendars through each weekday, Moodo allows individual working programs for each scheduled period, this is possible because it can be loaded with up to four different fragrances, Genie needs one device for each fragrance. These examples have information like fragrance identification and level, battery level, fragrance intensity settings and a direct link to buy refills in both products on-line store, Moodo has a monthly subscription program for refill purchasing.

Each Genie device can be loaded with a single fragrance, however multiple devices control is possible, using a device's network for different fragrances (hubs) could be controlled by managing them through its interface. Moodo goes a step further on this and it allows some perfume composition by mixing 4 different fragrances individually, there are composition suggestions from the manufacturer but a manual program can be used for the user's own mix, programming each fragrance individually for each scheduled working period, for example it can disperse different perfumes in different timings, for example: weekdays early morning it would disperse an energizing smell and in the evening a relaxing one, on weekends it could do the same but a couple of hours later. These interfaces are simple to use with accessible commands for interacting as in many different appliances within general public contemporaneous known languages in our day to day communication devices technology (Figs. 3 and 4).

Fig. 3. Rituals Genie visual interface: Connectivity (QR code); Basic commands menu; Scheduling menu; Preferences menu.

Fig. 4. Moodo perfume visual interface: Pre-set programmes; manual regulation commands menu (all fragrances in max. intensity); manual regulation commands menu (different settings for each fragrance); Scheduling menu.

4   Conclusion and Findings

Technological developments have evolved to multifunctional devices working with exchange information protocols, an increasing number of electronic objects exist depending on other objects to be controlled, this can be observed in portable loud-speakers and headphones, and innumerous domotic aimed products. Functional inter-faces for smart controlled scent diffusers can be independent objects and classified as autonomous modules within a system, it can be developed as a product and be updated through its life cycle. This approach to designing scent interfaces is the mean to make scent diffusing devices capable of delivering perfume designed for interactivity with increased participation on the desired experience for its user. The devices studied show

considerable evolution from most existing scent devices and they are examples regarding what can be done in future developments, this approach leaves an open space for future interface developers to explore interfaces as a viable module to design and develop future scent diffusion systems. Scent diffusion interfaces UX design gains a field of its own on developing new products related with the spreading of olfactive molecules into the air.

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