Unlocking The Power of The Underrated Digital Smell Technology

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***Abstract*—Digital Smell Technology is a rapidly developing field of technology that seeks to bring the sense of smell into the digital world. It is aimed at creating a platform for the digital transmission of smells through a computer, smartphone, or other device. The technology has the potential to revolutionize social and commercial interactions by allowing people to experience smells from around the world. It could also be used to enhance virtual reality experiences, providing an even more immersive experience. This paper outlines the potential applications of digital smell technology and the research that is being conducted to make these applications a reality.**

***Index Terms*—Scentography, iSmell, Digital Smell, Virtual Reality.**

I. INTRODUCTION

Digital smell technology is a relatively new field of research that seeks to create and replicate the sense of smell in a digital form. Until now, online communication relied on two of our senses: sight and hearing. Sooner the sense of smell will also be evolved. Digital smell technology also called olfactory technology is the main application of electronic-nose which is an engineering discipline dealing with olfactory representation. Through the use of this technology it can detect, send, transmit and receive scent via the internet. A novel technology is being developed to virtually detect odors. That is to bring alive the experience of sensing with more realistic effects along with visuals in digital media like movies, video games, motion pictures, virtual reality (VR) etc. Virtual reality concepts include digital smell, virtual theatre, electronics hand gloves, multipoint surround sound system, 3D goggles.

When used in communications, scent becomes a new information channel by taking multimedia to the next level. Imagine smelling perfume online before purchasing it, sending scented E-cards via scent-enabled websites, and experiencing the burning smell of rubber or plastic in your favorite TV show or game.

The sensing component of this technology employs olfactometers and electronic noses. The combination of hardware and software creates the technique of Digital smell. The smell will be produced by the hardware part and software will evaluate the smell and generate specific signals for each smell. And the hardware device like speaker is connected to the computer system. Scentography is the process of creating and storing odors by chemically and electronically recreating a smell.

In future, the smell or scents is becoming a communication mode for more realistic effects and this Digital smell technology is directing the way to smell things using a device that connects to your PC or mobile phones.

This paper studies the Digital revolution of smell technology. Furthermore, this article also brings the mechanisms inside the digitality of the fragrances. Potential applications of digital smell technology could include virtual reality gaming, scent-based advertising, and remote medical diagnosis.

II. HISTORY

The history of Digital smell technology dates back to the 1950s when the first electronic nose was developed. Hans Laube invented the Smell-O-Vision, a system releasing odor during the film projection to smell the real instance happening in the movie, which had a competition with AromaRama invented by Charles Weiss that emitted scents through air conditioner in theatres.

In the 1980s, researchers developed the first Digital Scent Synthesizers which could create smells from digital information. These early devices were limited in the types of smells that could be created. In the

1990s, Digital Scent Technology was used in the gaming industry to allow players to smell the environment in video games. This technology also became popular in the perfume industry, allowing customers to sample perfumes online. In the 2000s, Digital scent Technology was used to create smell-based advertising campaigns and to create personalized fragrances. In the 2010s, the technology was developed further to allow users to create their own personalized scent using a mobile app. In the 2020s, Digital Scent Technology is being used to help create virtual reality experiences their include smells. As digital scent technology continues to evolve, it will likely become even more prevalent in our everyday lives.

III. LITERATURE SURVEY

Digital Smell Technology- A Critical Overview [1] proposed by Sorna Mugi Viswanathan and Revanth Rajan in 2020. This study aims the digital smell technology. This paper presents the detailed analysis on the evolution and method of digital smell devices and also the hardware devices and discusses the various technologies used to create digital smells, including electronic nose, olfactory displays as well as their advantages and limitations. It also provides an overview of the potential applications of digital smell technology. Finally, the review also discusses the societal implications of digital smell technology and the need for further research in this field.

Digital smell technology [2] proposed by B.Jebina Priscill and M.Anandhavalli in 2018. This paper provides a comprehensive overview of the various technologies used to create digital scents, as well as their current applications and potential future directions. The authors provide a quick overview of various components of digital smell technology, including the hardware devices and platforms used to create and deliver digital scents also the limitations of the technology.

Smell-O-Vision-The future digital display device [3] proposed by CH.Aravinda and Dr.R.V.Krishnaiah in 2013. This paper presents and mainly focuses on the evolution of Smell-O-Vision the technology if digital smell. It introduces about the device implementing the digital smell in the hardware devices to emit scents. The history of digital smell is depicted in this paper. The scientists who worked behind this technology and their innovations over this technology is said in this paper.

IV. METHODOLOGY

Digital smell technology works with olfactometer and electronic nose. Olfactometer is an instrument used to detect and measure dilution of odor and used to gauge the odor detection threshold of substances. Electronic nose is a device used to recognize the specific components of an odor.

Scent is detected by the electronic nose which act as the receiver. Like the color spectrum, there is also scent spectrum and indexed smell is primary smell which produces smell in the scent spectrum. Following is the communication model of Digital Scent Technology.

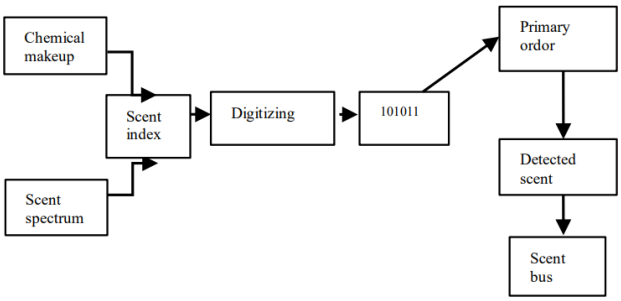

Figure 1. Communication Model of Digital Scent Technology

As in the above diagram of communication model of Digital Scent Technology, with the help of two parameters of smell, chemical makeup and its position in the scent spectrum, e-nose detects more smells. Depending upon chemical makeup bonding with scent spectrum, scent is indexed. These indexed is coded and digitized into small file by olfactory signal processing. This digitized scent is encoded with the email to recipient's computer. At the receiver's end, when the user activates the file by opening the mail, the personal scent synthesizer will identify the smell and recreate the small amount of aroma and directs the smell to user through air cannon. The transmitted digitally encoded file contains the data about the smell and sent by using scent bus. Then the smell is emitted in the form of vapors.

V. HARDWARE DEVICES

A. Smell synthesizer

A smell synthesizer is a device that is able to generate smells or fragrances. The iSmell is a device used to

produce gas using a computer. The DigiScents industry produces a variety of smell synthesizers. Some smell synthesizers are able to generate more than one smell at a time, allowing for a variety of combinations and mixtures.

B. iSmell

iSmell Personal Scent Synthesizer is developed by DigiScents Inc, a peripheral device like a speaker that connects to a PC via a serial or USB port and powered using any ordinary electrical outlet. The device looks similar to a shark's fin, with many holes on it to dispense scents. It can synthesize and even create new smells from certain combinations of other scents using a cartridge. Consumable cartridges are used and replaced similarly the way like ink jet printers use ink cartridges. The iSmell device reads a digital scent file, creates a scent from a "palette" of 128 chemicals stored in a cartridge, and then wafts the scent into the air with a small fan that can be blended to natural and man-made smells. This iSmell is able to produce 10,000 various smells and to activate this device for computer it requires a driver program called 'Scent Stream' which is also developed by DigiScents lnc.

Figure 2. DigiScent iSmell version 1

Figure 3. DigiScent iSmell version 2

C. Cartridge

The cartridge is a component which contain chemicals (natural oils or synthetic fragrances) and will be activated by either a heat or air pressure when you send a signal from your computer. These products are very similar to a printer where there are cartridges inside the actual product but rather than 4 basic colors there are 128 chemicals that are mixed to produce other odors. The dispenser dispenses the chemicals into the air whenever there is a trigger and the chemicals dissolved in there. This air is then directed towards the user. These oils form the core of a replaceable cartridge, that is inserted in the company's iSmell device.

For example: Web webpage highlights, PC recreations, advanced music, and motion pictures.

Figure 4. Cartridge

D. Scentography

Scentography is the process of creating and storing odors by chemically and electronically recreating a smell. It is a device that permits the coordination of scents with traditional digital multimedia which includes games, DVDs, and web sites. Scentography adds a new layer to webpages and virtually all other forms of electronic/digital advanced communication by allowing to communicating with fragrances. The ability to digitize and communicate aromas will allow merchants and buyers to send scented mail, construct notice 'n shop electronic stands, create and watch scented DVDs, and play scented amusement games.

Figure 5. Scentography analogue camera captures smell

E. ChatPerf

Japanese company created an accessory 'ChatPerf' an attachment for iPhone that allows and releases actual scents accompanied by messages or emails straight from the smartphones. This is an add-on for smartphones that can emit scents. It is only possible to share scent from one person to another where the people can only send each other scents that have already been programmed in that person's phone. These scents are stored in cartridges and allows phone to release it through these cartridges. This can be synced up with various apps and games to emit scents.

Suppose you want to send a message to a friend via a social network, maybe because you know your friend is tried. You can use this to send relaxing scent along with your message. Also, able to use it to add scent to the notification sound whenever getting a new e-mail.

Figure 6. ChatPerf attached in iPhone

VI. ADVANTAGES

- Increase Accuracy

Digital smell technologies are much more accurate than traditional scent detection methods, as it can digital odors much more precisely.

- Enhanced Sensitivity

It is more sensitive than traditional scent detection methods, able to detect scents at extremely low levels. This can be useful in applications such as food safety, it detects contamination at much lower levels than traditional methods.

- Cost Reduction

It can be used to reduce the cost of creating and distributing scents, since it eliminates the need for costly physical production and distribution of scent materials.

- Environmental Monitoring

Digital smell technology can be used to monitor air quality in areas such as factories, as it can detect pollutants before they reach dangerous levels. This can help to reduce the environmental impact of industrial processes.

- Improved Personalization

Digital smell technology can be used to customize products based on individual preferences, as it can detect and respond to particular scents. This can be useful in applications such as perfume and cosmetics, as it can create a personalized scent for each customer. Also, possible to quickly and easily create new scent experiences, allowing for greater and creativity.

- Increased Safety and Reach

Digital scent technology eliminates the potential for human error and the potential for accidental inhalation of hazardous substances when working with physical scent materials. This technology enables efficient and cost-effective distribution of scents over a wide area, allowing for greater reach and impact.

VII. LIMITATIONS AND DISADVANTAGES

- Cost

The main limitation technology is the price. Digital smell technology is very costly and is still in its infancy, so it is not yet widely available and it is unreliable, the people using PCs at home cannot afford this luxury of scratch-and-sniff websites. Since the technology is still not fully grown, the duplicates of the necessary equipment's cannot be produced. This technology needs dealer financers and dedicated partners to invest their money to get revolutionary.

- Accuracy

The difference between smell is not been fully differentiated since there is only slight variations in the scents and chemicals stored in the cartridges are not enough. That is, it is not as accurate and it cannot always detect subtle differences between smells. There are only limited varieties of scents available. It is limited to a few specific smells and aromas; it cannot replicate all the smells and aromas found in nature.

- Data Storage

Due to the large size of the data required to accurately reproduce smells, digital smell technology requires a lot of data storage.

VIII. APPLICATIONS

Digital smell technology is a new field of research and development that seeks to replicate the sense of smell using technology. The goal of this technology is to create a new form of communication that can be used

in a variety of applications, from virtual reality and gaming to medical diagnosis and industrial safety. This application seeks to develop a digital smell technology platform that can be used for a variety of purposes.

- Send perfumed emails
- To watch scented DVD's
- Play aromatic video games
- Smell emitting TV and smartphones

This technology plays an important role in certain fields:

1. Food and Beverage: To enhance the flavor and aroma of foods and beverages.
2. Healthcare: Used to diagnose diseases by detecting subtle changes in smell that could indicate the presence of certain diseases or health conditions. It can also be used to monitor a patient's health and alert medical professionals to any change in smell that could signify an issue. Aromatherapy helps in discriminating brain disorders.
3. E-commerce: This provides live shopping experiences for the customers, to detect and analyze the odors of products and help customers identify the products they are looking for. This enables to buy perfumes, flowers from exotic places.
4. Security and Surveillance: To detect the presence of hazardous substances and explosives, drugs, or other contraband in public places, to detect intruders in the home and alert about gas leaks, and other smokes to any potential threats.
5. Entertainment: Used in virtual reality systems to create immersive experiences for gamers and movie-goers, to create more lifelike experiences during the streaming of movies in theatres.
6. Environmental Monitoring: Used to detect and measure pollutants in air, water, and soil also to detect the presence of hazardous materials in the environment, to detect pollutants in the air and alert nearby residents, businesses and institutions to potential health risks.
7. Automotive: Implementing Digital smell technology in their cars to detect and monitor levels of pollutants and other hazardous materials present in the vehicle's interior, alerting passengers to danger and helping the vehicle to make decisions about route changes.
8. Education: To teach students in a more engaging and memorable way.
9. Military Operations: To detect hazardous chemicals or explosives, to help soldiers navigate unfamiliar terrain.

XI. CONCLUSION

Digital scent technology is an emerging field of technology that has the potential to revolutionize social and commercial interactions by allowing people to experience smells from around the world. It can be used to create immersive and interactive experiences in digital spaces, such as virtual reality or video games, or to create unique digital advertising experiences. This adds a new dimension of realism to virtual reality and gaming also to be integrated into a variety of different applications, from health monitoring to entertainment experiences. Digital scent or artificial scent can give the sensation of virtual reality and suspension of disbelief. It could improve virtual experiences for computer games and online films.

Digital scent technology is still in its infancy, more research and development is to make the technology more accessible and reliable. This technology could enhance advertisements and empower customer emotions towards a brand by capturing the attention of audiences more easily, which acts as a great tool for marketing. Despite the business, the technology also stepped into medical field for diagnosing many diseases and by enhancing the health the health and emotional happiness of its users. Aromatherapy, helps in justifying the management of dementia, insomnia, headaches, and stress, indigestion, and anxiety in patients. Smicons [7] also called smell icons, state of the art in scent emission technology. It could also bring information about activities of computer like; a smell of an orange is discharged while uploading a file, and if it is shifted to chocolate, it says that file has been uploaded successfully. This is useful for visually or hearing disabled peoples who can find out the process easily.

The future of digital smell technology is still uncertain. Additionally, the technology is still relatively new and there are still some kinks that need to be worked out before it can become

widespread. Despite these drawbacks, digital scent technology appears to be a promising technology that could revolutionize the way people experience scents and the way they interact with the world around.

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