

# Digital Scent Technology- A Critical Overview

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## ABSTRACT

The technology has targeted only on our sense of sight and sound so far. This is the reason why we have realistic looking games, and graphics card. What if we could send the smell of spice and flowers with pictures? Now with the digital scent technology we are able to sense, transmit and receive the smell-through internet in which a perfume can smelled online before buying them, freshness of a food which are ordered through online can be checked, can smell burning rubber in our favourite racing game or send scented e-cards from scent enable websites. As this technology gains extensive assert, there is nothing stopping it from entering into all areas of virtual world. Envisage being able to smell things using a device connected to our computer. Digital scent technologies are making this a reality. This paper presents a detailed analysis on broadcasting of smell, hardware devices and applications of digital smell technology.

**KEYWORDS:** digital scent technology, virtual world, broadcasting of smell

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## I. INTRODUCTION

Up to the present, only three of our senses - hearing, touch and sight are implicated in online communication. Transferring smell over an internet is still not very popular. New technology is being developed to root around our sense of smell. Digital smell is one of the concepts of virtual reality. The virtual reality has provided very good features to the computer systems. The digital smell is generally a hardware software combination. The role of hardware is to produce the smell and the software part will evaluate the smell equation and generate distinct signals for distinct smell and lastly the device will produce that smell. With the digital scent technology one can sense, transmit, reproduce and recapture smell, flavours and fragrances digitally through the internet and smell things using a USB powered device that is supposed to emit appropriate smell at exact time. California-based Digiscents Inc. has developed the iSmell personal scent synthesizer. This small device is connected through our PC via serial port and has its own driver. An interactive media company known as Digiscents is developing iSmell Digital Scent Technology, new software which will permit scent to be broadcast from the Web. Another developer of smell based computer interface device, Aroma-Jet is announced in 2001, had successfully imparted scent over the Internet. Later, they continued to market it as an entertainment technology as well as for medical use. Digital scent technology could appreciate advertisement and swing consumer emotions towards a brand. The olfactory nerve is close to the areas of the brain that make it very powerful target for advertise. The potential of marketing would be huge by using scent in advertising. Regardless of

the business, digital scent technology could help its users in an effective and intellectual way by intensifying the health and emotional happiness of its users. This technology aids to design characters and to give an emotional intelligence of existence. This amazing technology provides huge area of applications in communication which includes websites with scent, in scent-entertainment, games, movies and music. It is also relevant to E-commerce which makes online shopping fascinating and fun. In the new future, one cannot only just see but also can smell things on the internet.

## II. Evolution of digital smell

From last 5 to 6 years, scientists have bought the term virtual reality in many applications. One of the experiments with virtual reality has resulted in a concept called virtual theatre which includes an electronic hand gloves, digital smell, multipoint sound system, movement controllable seats and 3d goggles. Thereafter, to fill more realistic effects in movies and games, scientists proposed a very new utility of digital smell. This incredible technology is initiated by the experts in bioinformatics and genomics known as Dexter Smith and Joel Lloyd Bellenson. The fundamental idea for this was given by the perfume making companies for the advertisements of their perfumes. This is how digital scent technology came into existence.

Early in 1950's, Hans Laube invented the smell-o-vision. DigiScents introduced a device called iSmell in 1999. Due to some loss, DigiScents was shut down in 2001. So in 2003, TriSenx launched Scent Dome to recognize smell identifying

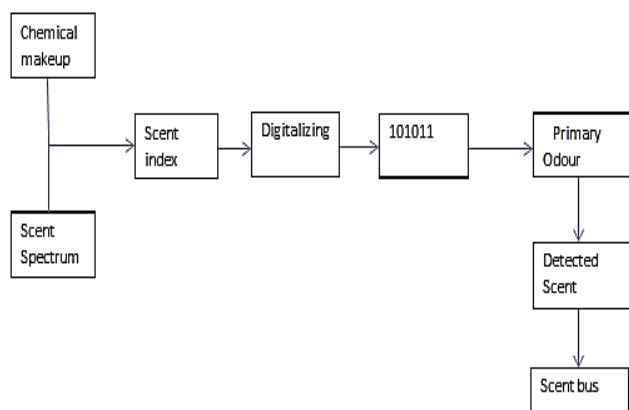
codes. In 2004, the Japanese firm “K-Opticom” placed a special units named Kaori web (consisting of 6 different cartridges for different smells) in their internet cafes for their experiment until march 20,2005. In the same year 2004, the Indian inventor Sandeep Gupta claimed to show scent-generating device prototype at CES 2005. In 2005, XML Smell was developed by the researchers from the University of Huelva and worked on reducing its size. Simultaneously, Thanko launched a P@D Aroma generator (a USB device) and the announcement of the work on a 3D television with touch and smell to be released by 2020 was given by the Japanese researchers. The demonstration of a smell generating device was done by an Israeli company Scentcom. In March 2013, the Japanese researchers came up with their invention, “the Smelling Screen”. There are so many advancements and researches happening in this domain.

### III. Physiological Aspects of Smell

The act of smelling is defined as Olfaction and the olfactory nerves are meant to receive the scent of something. Odorants are substances whose characteristics can be determined by chemical analysis. The olfactory system of a person operates in the vein of other sensing activities in the body. The smell organ, olfactory epithelium covers an area of 4-10 cm<sup>2</sup> and consists of 6-10 million olfactory hairs called cilia which detect different types of smell. Excited receptors direct pulses to the olfactory bulbs. Olfactory bulbs are the part of cortex with a pattern of receptors action denoting a particular scent.

### IV. Methodology

This technology works in combination with Olfactometer and Electronic nose. An olfactometer is an instrument that is used to detect and measure odour dilution. They are used to gauge the odour detection threshold of substances. Olfactometers introduce an odorous gas to measure intensity, as a baseline against which other odours are compared. An electronic nose (e-nose) is a device that recognizes the specific components of an odour and for this reorganization the device analyses the chemical makeup of tat components. It consists of two mechanisms which are chemical detection and pattern recognition.



**Fig: 1 Transmission Model of Digital Scent Technology**

Scent is detected by the electronic nose which acts as a receiver. Like the colour spectrum, there is also scent spectrum and any smell will be the indexed smell of primary smells in the scent spectrum. In favor of the chemical Makeup and its position in the scent spectrum, e-nose

detects thousand varieties of smell. The scent is indexed based on its chemical makeup and scent spectrum. Then by olfactory signal processing each indexed scent is coded and digitized into a small file. This digital file is enclosed with a World Wide Web content or email to the recipient’s computer. At the receiving end, when the user activates the file by opening it, the personal scent synthesizer will recreate the small of aroma and the air cannon will direct the smell into the user’s nose. The digitally encoded file which is transmitted contain the datas about the smell. The smell emitted will be in the form of vapor.

### V. Hardware devices

Both the software and hardware are created by synthesizers in which the game producers need to mix and incorporate scents into their latest offerings. Reminiscent is a database of standard smells. These odors will be licensed to developers for integrating it into games, websites, and advertisements and so on.



**Fig2. Digital smell recorder**

Below are the devices that are used in transferring smell over internet.

#### Smell Synthesizer:

Scent synthesizers are devices which are used to generate the smell in accordance with the file which is digitalized during the transmission of that smell through the web. They are interfaced with the personal computer through an USB port and then they are programmed to generate a small quantity of smell vapours into the surrounding. Smell synthesizers are available with wide varieties in the market but for personal computers they are made by Digiscents industry.

#### iSmell:

The iSmell Personal Scent Synthesizer is a small device and using an USB port it is connected to a computer. This device is powered using any ordinary electrical outlet. This device is developed by Digiscents Inc. The device appearance looks similar to that of a shark’s fin, with many holes lining up in the fin like structure to release the various scents. It is activated by a driver program called as Scent Stream. Using a cartridge which is similar to a printer, iSmell synthesize and even create new smells by mixing certain combinations of other scents. These newly created odours resemble common natural and manmade odours. The cartridge used has to be swapped once the scents inside are used up. When these scents are incorporated with websites and interactive media, they can be used automatically once a website is opened or can be activated manually.



**Fig3a. Digiscents iSmell version I Fig3b. Digiscents iSmell version II**

**Cartridge:**

Cartridge contains chemicals such as natural oils or synthetic fragrances and these chemicals are activated by either heat or air pressure, when the signals are sent from the computer. Presently, a cartridge is stored with 128 chemicals which are able to produce 10,000 different types of smell. These chemicals are activated electrically in different combinations to produce specific smell in response to software prompts and are programmed into applications such as Web site features, computer games, digital music and movies. Similar to an ink jet printer, these chemicals form the core of a replaceable cartridge, which is inserted into the iSmell device. The scientists are still investigating different scent combinations which are possible with the iSmell device. As the technology becomes more cultured in future, a large number of scent combinations will be possible.



**Fig4: Cartridge**

The idea is to have a box about the size of a small speaker that would be connected to personal computers and within that box is a cartridge of odours, having hundred different small chambers in it. Then by depending on the commands from the computer, various odours within that hundred is chosen, mixed up together and are gently puffed out of this port.

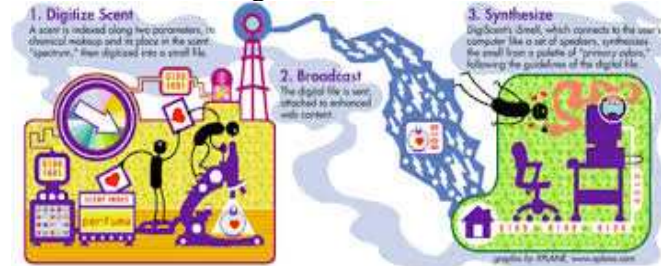
**Scentography:**

Scentography is a device that permits incorporation of scents with traditional digital multimedia such as games, DVDs and web sites. The capability to digitize and broadcast scents will enable the dealers and consumers to send scented mail, make and watch scented DVDs, and play scented games.



**Fig5: Scentography**

**VI. Broadcasting of smell**



**Fig6: Broadcasting of smell**

Smell broadcasting consist of three major units, they are

1. Digitized Scent
2. Broadcast
3. Synthesize

**1. Digitized Scent:**

With the help of chemical Makeup and its position in the scent spectrum a scent is indexed. Then by olfactory signal processing each indexed scent is coded and digitized into a small file.

**2. Broadcast:**

The digitized scent file is then attached to enhanced web contents.

**3. Synthesize:**

By activating the file automatically or manually, the personal scent synthesizer will recreate the smell of aroma and the air cannon will direct the smell into the user's nose.

iSmell device transforms the smell into digital codes which are stored as computer files and are mailed. This device then reads the digital file, creates a smell from a palette of 128 chemicals stored in a cartridge, which drifts into the air with a small fan.

**VII. Applications**

Digital scent technology has a wide variety of applications such as:

- To send scented email
- To watch scented DVD's
- To play scented video games
- To sample a perfume from a beauty product's website
- To smell the assortment of freshly brewed coffees for sale in their online store.

This technology plays its important role in the following fields.

- A. **Medical:** Aromatherapy is a kind of curing certain disease by using different types of smell. It helps in discriminating brain disorders.
- B. **Education:** Scent is an effective teaching tool for subjects such as Geography, History and Science.
- C. **E-Commerce:** This technology provides live shopping experiences. This enables to buy perfumes, flowers and food beverages from exotic places.

**VIII. Advantages**

1. Since one can send any type of smell, the iSmell is designed in a way that it will provide protection to the user against the smell.
2. The chemicals in cartridge mostly contain natural materials commonly found in the cosmetics, foods and beverages.

3. The iSmell device provides locking facility so that the user can lock a particular smell which he/she is allergic.

#### **IX. Limitations**

The considerable limitation of this technology is the price. This technology costs about \$250 and above, so the people using pc's at home cannot afford for this luxury of scratch – and-sniff websites. As the technology is still not fully grown, the exact duplicates cannot be produced. Till now, the difference in smell is not been fully differentiated as there are only slight variations in the smell and the chemicals which are stored in the cartridges are not enough for it. This technology requires committed partners and dealer financiers to invest their money so that this could be revolutionary.

#### **X. The Future of Digiscents**

In future, the scent technology can be introduced using 3 dimensional projections which enable people to view more realistic views. People can conduct meetings at different places during the same interval of time. The online classes can also be conducted by the schools and colleges during the rainy seasons.

Google Nose: New and existing technologies purportedly employed by Google Nose promised to provide smartphone and other users of handheld devices the ability to search for, and actually smell, a wide variety of fragrances.

#### **XI. Conclusion**

Smell has a strong power over human beings. The sense of smell is intimately linked to the memory and emotions making scent a powerful way to boost ideas. It wins the attention of audiences and affects learning, mood and memory. This technology could upgrade advertisements and is a great tool for marketing. It can stimulate emotions such as fear or love. This digital smell can be used in several streams such as over the television, theatre and the web. Multisensory experiences attract the attention of audience and olfactory stimulus perfectly accomplishes learning, mood and memory so this technology could help users to

maintain calm and superb mood in education. This technology also stepped its foot in the medical field for diagnosing many diseases. This will become our need in future.

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