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Model Representation and Study of Essence Effect Creation through Internet Technological Aspect

Zinkar Das* Nilotpol Manna Dr. Biswarup Neogi
JIS College of Engineering, Kalyani, Nadia, West Bengal, India
* E-mail of the corresponding author: mr.zinkar@gmail.com

Abstract

Smell adds much vital information to the experiences. The concept of the world without smell exists on the Internet but that is about to change .Digital scent technology is an equipment to sense, transmit and receive i.e. to communicate a scent-enabled digital media (such as web pages, video games, movies and music) which will create a more immersive and attractive environment for the audience . Downloaded images via internet technology are matched with the image-database and spray the essence of the image generating appropriate code is the key features of this proposed research. This piece of research work deals with the evolution of odour involving multimedia technology contributing a new path in the research and development of Digital scent technology.

Keywords: aroma sense, essence effect, internet technology, odour intensity

1. Introduction

An odour (Trygg *et al.* 1991) is generally caused by one or more volatilized chemical compounds at a very low concentration. The sense of smell is very important to the humans or other animals which they can perceive by the sense of olfaction. Development in modern technology has enriched human life with immense speed. Existing multimedia systems generate audio-visual effects, making it transferrable and readable with sampling, coding and processing techniques. But transfer of essence to a long distance via cable or other wired or wireless medium is not possible till today .The hardware instruments like chemical sensors, biosensors, electronic noses (E-noses), mass spectrometers (MS) and differential optical absorption spectrometers (DOAS) (Sichu Li *et al.* 2009) can detect and classify the odour. Recently for various developments mail service as an instant communication is playing a vital role. Through mail, not only the data also various images, videos, sounds can be transferred. But till today ultra-modern scientific technologies are yet to transfer smell effects of images as well as objects. Today odour effect creation is a growing topic of interest among researchers.

There is a technology of odour effect creation for an internet based e-image, named ‘e-image sprayer’. USB interfaced device is developed for emitting the odour of the object present in the image sent through mail via internet by someone. The mail receptor gets the images, matches automatically with coding techniques with its original smell and sprays the smell (which is already stored in various bottles of essence) to the receptor.

2. Relationship between Odour Intensity and Concentration

Odour intensity is the strength of the perceived odour sensation. Odour concentration is a sensory property which produces an olfactory response or sensation. Basically the odour intensity increases with the odorant concentration. The relationship between odour intensity and concentration can be represented as:

$$I=k(C)^n$$

$$\text{or, } \log I = \log k + n \log (C)$$

where, I = Odour intensity

C = Concentration

k = Constant

n = Exponent (Guidelines 2008)

This is well-known as Power law or Steven's law. The ranges of 'n' depends on the odorant and the odour intensity is expressed in parts per million of butanol. According to research it is shown that the ranges of 'n' is from 0.2 to 0.8. The rating of odour intensity is usually stated that,

1= Barely perceptible
2= Slight
3= Moderate
4= Strong
5= Very strong (Guidelines 2008)

3. Bio-Mechanisms to Sense the Aroma

Bio mechanisms of odour sensing are still being examined. The process which allows the brain to make proper perception about olfactory information is not completely understood till now even. Olfactory sensory neurons develop axons in the brain within the olfactory nerve (cranial nerve I). Due to lack of myelin sheaths, these nerve fibres pass to the olfactory bulb of the brain through perforations in the cribriform plate, which in turn speculates the olfactory information to the olfactory cortex and other areas (Morris *et al.* 1953). The axons from the olfactory receptors join in the outer layer of the olfactory bulb within small (~50micrometers in diameter) structures called glomeruli. Mitral cells are located in the inner layer of the olfactory bulb form synapses with the axons of the sensory neurons within glomeruli. They send the information of the odour to the other parts of the olfactory system, where multiple signals may be processed to arrange a synthesized olfactory perception (Dale Purves *et al.* 2001).

When an odorant is perceived by receptors, the receptors in a sense break the odorant down and then the brain locates the odorant back together for identification, perception and remark (Wilson DA 2001).The odorant binds to receptors which only recognize a specific functional group, or feature, of the odorant. After binding the odorant, the receptor is triggered and will send a signal to the glomeruli (Leon M *et al.* 2003). Each glomerulus accepts the signals from numerous receptors that detect similar odorant features. Various receptor types are activated due to the different chemical features of the odorant. Thus several glomeruli will be motivated as well. All of the signals will then be directed to the brain from the glomeruli, where the combination of glomeruli activation will encrypt the different chemical features of the odorant. The brain will then essentially put the pieces of the stimulation pattern back together in order to detect and distinguish the odorant (Johnson BA *et al.* 2000). Odorants that are analogous in structure trigger similar patterns of glomeruli, which lead to an analogous perception in the brain (Leon M *et al.* 2003; Johnson BA *et al.* 2000).

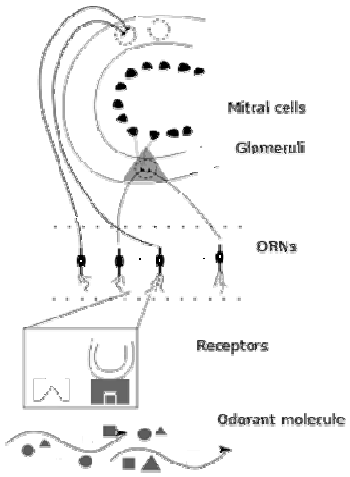


Figure 1. Olfactory System (Benjamin Auffarth *et al.* 2011)

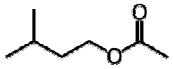
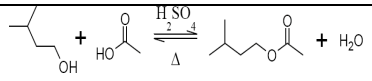
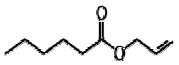
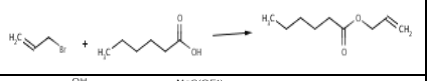
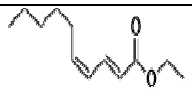
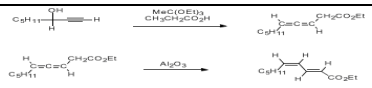
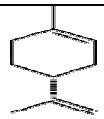
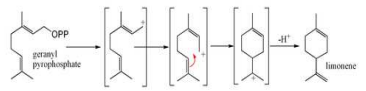
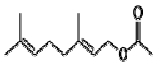
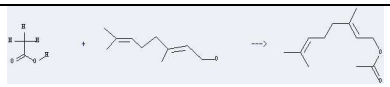
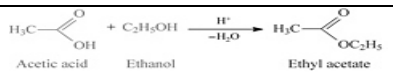
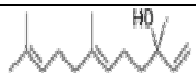
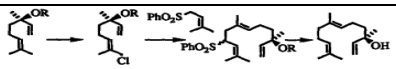
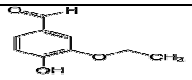
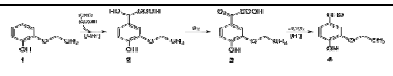
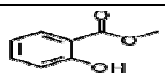
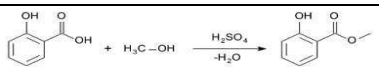
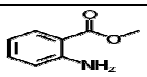
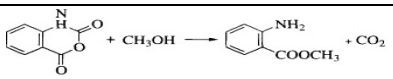
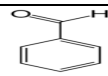
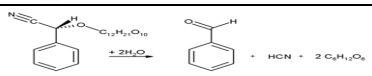
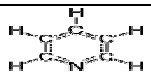
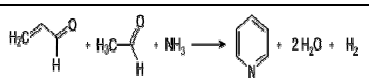
4. An Overview of Concept for Odour Sensing

Digital Scent Technology aims to modify the interactive entertainment experience creating a more immersive and attractive environment for the audience. The idea is to make movies, games, music, animation, or any digital media scent-enable. The power of scent makes content extremely immersive and attractive creating a mood, such as vision or feel intensifying the emotions, such as anxiety or affection establishing place and season that help to develop characters giving an intensified sense of realism (Digital Scent Technology 2003). The developed "iSmell Personal Scent Synthesizer" could create thousands of everyday scents with a small container that contains 128 primary odours. These principal odours were mixed together to generate other smells that closely duplicate common natural and artificial odours. It brought about new revolution in the digital media (P.A. Dawes 1996). Today few computer generated environments employ olfactory displays. Olfaction is a significant sense and can been shown to stimulate both responsive and recall (S. Chu & J.J. Downes, 2000) responses. J. Degel *et al.* (2000) suggested that occasional information is a crucial constituent of olfactory memory and that its function is comparable to that of form and structure in visual and auditory memory systems. On the other hand the study on electronic nose in various fields of odour is continued and in 1999 the concept of "iSmell" indicated the future application of a smell emitter system via Internet (Tadayosi Yosimura *et al.* 2006). A good summary of past and existing commercially accessible olfactory displays (iSmell) has been compiled by D.A. Washburn *et al.* 2004. It is noteworthy that numerous commercial initiatives proven to develop and advertise olfactory displays have not survived. In order to avoid the emission of unpleasant or offensive odours during management titanium dioxide maintained in silica gel a photo catalyst to prevent the anaerobic/aerobic digestion of household waste. By using the photo catalyst in combination with a decomposition tank, improves the technique for eliminating the salinity from the household waste (Yuichi Sakashita 2006). The concept of development of a Perfume Emission System via Internet is progressing along with time and the mail receiver system is hence become capable of emitting perfumes from the emission device (FBC Television 2006). By combining the elements of the perfume, NTT is marketing the perfume-generating device (NTT Communication 2005). The study of a bidirectional model, of smell as media and its applications in the physical world made the possibility that apart from video and audio, smell can also become a durable medium for exchanging information established on the planned model (Aman Raj *et al.* 2012). J Bellenson *et al.* (2001) proposed a system where scent depiction can be communicated over computer networks, such as the Internet, for re-creation at remote locations, and can be kept for re-creation of the scent at times different from the time of sampling of the scent and hence it found a profound application in the contemporary world. After a lot research work, the scent generating device "Scent dome" was manufactured by Trisenx , US based company tested it by UK internet service provider Telewest Broadband tried to allow to transmit aromas to the users through internet (Smelly device 2004).

5. Tabular Representations with Chemical Structure of Essence

Some odorant compounds are enlisted in following table with their chemical component's name, IUPAC name, basic structure and synthesis reaction. The odorant compounds are like some fruits, flowers or different materials. From this table it is shown that the various odour flavours are mainly the organic compounds of carbon, hydrogen, and oxygen molecules.

Table 1. Tabular representation of different odors and their chemical structure and synthesis techniques (Karl-Georg *et al.* 2003; Alphhus *et al.* 2009; Maryadele *et al.* 2013; Louis *et al.* 2007; S.Tsuboi *et al.* 1988; Bartling K *et al.* 2001; Hanumant *et al.* 2010, David E. *et al.* 1990; V.K.Ahluwalia *et al.* 2000;Kurt Bauer *et al.* 1997; S.Shimizu et al. 2005)

Odorant Source	Chemical Compound	IUPAC Name	Structure	Preparation Reaction
Banana	Isoamyl acetate	3-methylbut-1-yl ethanoate		
Pineapple	Allylhexanoate	prop-2-enyl hexanoate		
Pear	Ethyl decadienoate	Ethyl (2E,4Z)-2,4-decadienoate		
Orange	Limonene	1-methyl-4-(1-methylethenyl)-cyclohexene		
Rose	Geranyl acetate	3,7-Dimethyl-2,6-octadiene acetate		
Wine	Ethyl acetate	Ethyl acetate		
Jasmine	Nerolidol	3,7,11-Trimethyl-1,6,10-dodecatrien-3-ol		
Vanilla	Ethylvanillin	3-methoxy-4-hydroxy benzaldehyde		
Wintergreen	Methyl salicylate	Methyl2-hydroxy benzoate		
Grape	Methyl anthranilate	methyl 2-aminobenzoate		
Almond	Benzaldehyde	Benzaldehyde		
Belladonna	Pyridine	Pyridine		

6. Technology Behind

There is a technology of odour effect creation for an internet based e-image, named essence effect through internet technology (EETIT). The device is named ‘e-image sprayer’. USB interfaced device is developed for emitting the odour of the object present in the image sent through mail via internet by someone. Image will be downloaded from e-mail and there will be an option to get the essence of that image. An USB interface technique is used to justify the proper essence of that image which is to be later emitted from the device. The mail receptor gets the images, matches automatically with coding techniques with its original smell and sprays the smell (which is already stored in various bottles of essence) to the receptor. An image of an object is sent through mail to another user who is in different location. The user will download the image from his/her mail account. When the user will open the image of the object there will be an option to get the essence of that particular image. If the user chooses this option, the image of the object will be decoded and it will be matched with the pre-saved image of image-sensor. If the images match, it will give a signal to microcontroller. The microcontroller will take the proper signal and it will choose the correct pressure sensor which will be placed at odour container and it will automatically generate from the container. So, proper essence of the object of the image is received. The scent of rose, for example, was accurately identified more often when presented along

with the colour red – and subjects' ability to identify the scent significantly enhanced their rating of its pleasantness.

7. Prototype Model Representations of Essence Effect through Internet Technology (EETIT)

This is the prototype model representation of essence effect through internet technology (EETIT) in fig.2. Here the sender sends a multimedia data through the internet at transmitter side. The multimedia data comes at receiver side via wireless communication medium. The receiver downloads that data by internet technology. There is an activation button of smell effect. Background processes have been run to match the newly saved object with the pre saved objects. After matching an appropriate image, the program gives an instruction to control box to operate the microcontroller. The microcontroller takes the proper port address and it activated the corresponding pressure sensor. The essence gets out from container and the user at receiving section gets the proper odour of an object of that image.

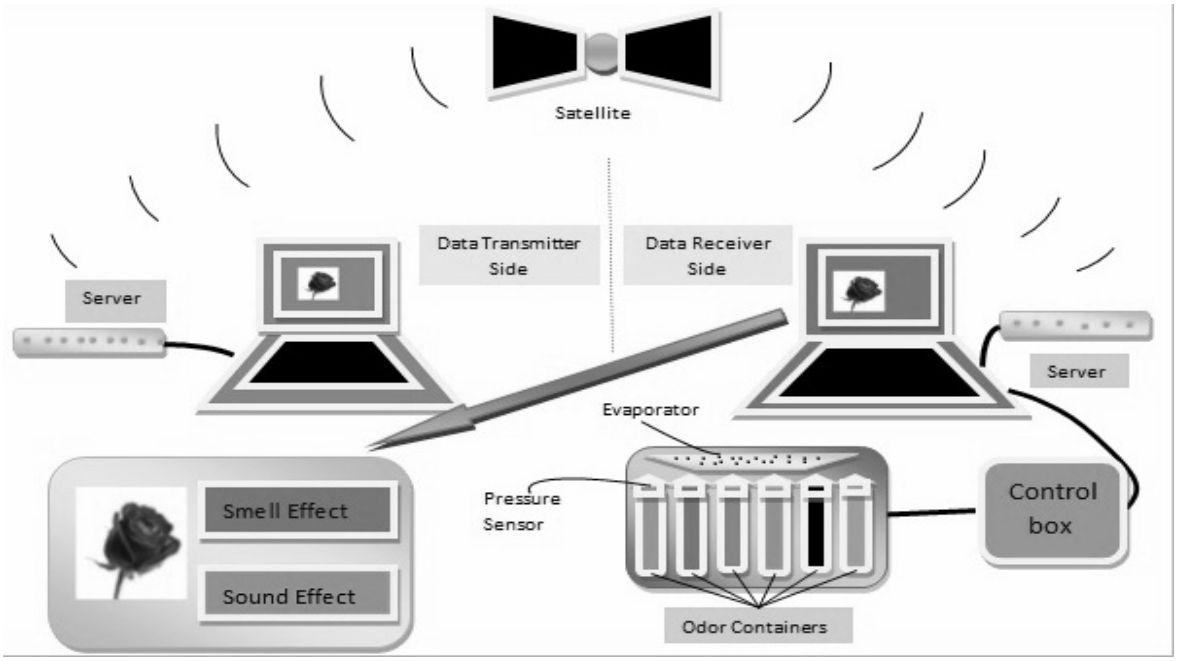


Figure 2. Prototype Model Representation of e-Image Sprayer

8. Process Flowchart of Proposed System

Flowchart has been described in fig.3, where the multimedia data is ready to send through internet from the sender. Enabling the smell effect option a suitable coding will be generated for this specific multimedia data. The generated coding will be encrypted and attached with that multimedia data and ready for sending operation. The multimedia data will be sent through internet server at the proper receiver by internet technology. The receiver receives the data through server and downloaded that through internet. Receiver activates the smell evaporation option of that image or multimedia data. Getting the information from user, the coding will be decrypted for the specific multimedia data precede to EETIT with proper format through USB. The controller device of EETIT accepts the data corresponding information and checks the upcoming information with the stored mapping data. If the information will be matched the controller checks the atomizer condition and precedes the operation. If any mismatch occurs, the system sends an acknowledgement signal at the computer for different steps will be taken. When the system precedes, it will check the sprayer condition of EETIT and gives a signal to the controller for activating the proper pressure sensor to evaporate the essence of the multimedia data sent by the sender to receiver.

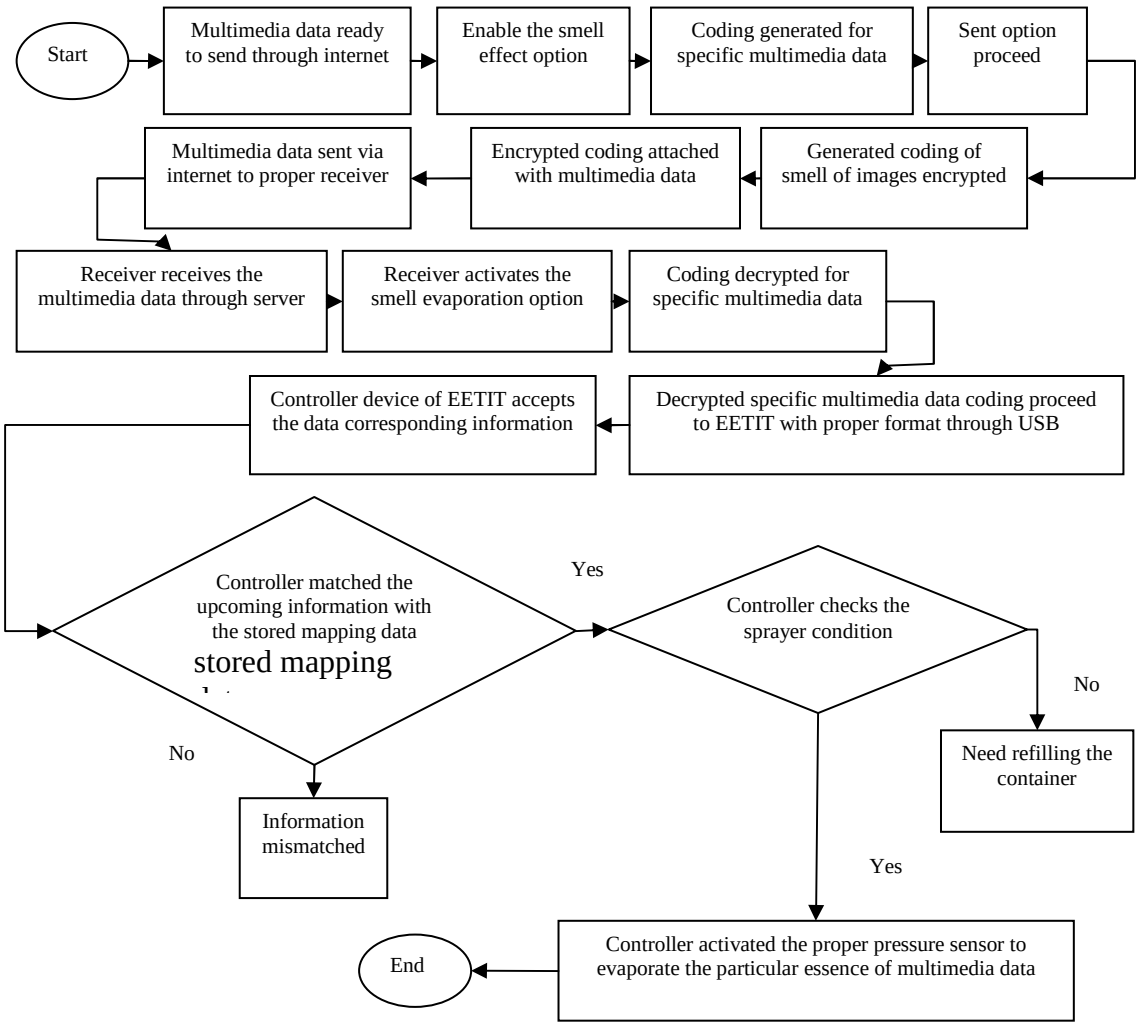


Figure 3. Flowchart of EETIT

8.1 Algorithm

Step 1: Initialize the multimedia data to be sent through internet as input.

Step 2: The smell effect option is enabled to receive the smell of the object as the output.

Step 3: Codes are generated for specific multimedia data to be sent.

Step 4: Sent option is preceded.

Step 5: Generated coding of smell of the images is encrypted

Step 6: Encrypted coding is attached to the multimedia data

Step 7: Multimedia data sent via internet technology is receiver by a proper receiver through server.

Step 8: Receiver activates the smell evaporation option for the smell emission.

Step 9: Coding is decrypted for specific multimedia data

Step 10: Decrypted specific multimedia data coding is proceeding to EETIT with proper format.

Step 11: Controller device of EETIT accepts the data corresponding information.

Step 12: Controller mismatched the upcoming information with the stored mapping data, then

information is mismatched else controller checks the sprayer condition

Step 13.The sprayer condition checked activates the proper pressure sensor to evaporate the particular essence of multimedia from the controller else needs refill.

9. Future Plans

In this era internet has a revolutionary impact on culture and commerce, including the rise of near-instant communication by electronic mail (e-mail), instant messaging (IM), Voice over Internet Protocol (VoIP), video conferencing and so on. Modern technologies perform at audio-visual domain in a full motion to the surroundings also transfer various data from one to other. Development of 3G and 4G enhance the procedure speed. But the scope of smell sensory domain is still limited. Enrichment of this domain signifies strong human-machine interaction research activities. Transmission of proper fragrances from one to other with existing images and sounds is the future plan which is completely a new achievement in techno -social environment like a serial corporates a kitchen event and easily get the smell of foods can be received.

10. Conclusion

The smell of an object helps in triggering more inherent emotional responses, increases reports of positive mood but the genuine smell can have dramatic effects in improving our frame of mind and sense of well-being. The positive emotional effects of pleasing fragrances also affect our perceptions. There really are serious efforts underway to make the digital capture and production of aromas a reality. This paper is an effective research work on digital odour technology which successfully deals with the evolution of smell (only of a few objects mentioned here) via internet technology to the outer world. It will pave a new path in the future commercialization of innovative gadgets making a positive social impact on humanity.

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Zinkar Das is an M.Tech Scholar and teaching assistant of Electronics and Instrumentation Department at JIS College of Engineering, Kalyani, W.B, India. He has completed his B.Tech degree from Greater Kolkata College of Engineering and Management, Baruipur, W.B., India at 2012. His area of interest belongs to Control theory, Artificial organ, Microprocessor, Microcontroller based on embedded system and Instrumentation domain. He has started his project work under the guidance of Dr. Biswarup Neogi. He has published two International Journals and one National Conference paper.

Email: mr.zinkar@gmail.com

Nilotpol Manna is an Assistant Professor and HOD (Electronics and Instrumentation Engineering) of JIS College of Engineering, Kalyani, W.B., India. He has wide industrial experience of twenty-two years from semi-government sectors like Instrumentation Ltd, Kota and several private sectors like Toshniwal Instruments Manufacturing Pvt Ltd and others. He was served in the R & D wings and was associated in development of various electronic and communication instruments meant for military application as well as development of analytical instruments.

E-mail: nmanna324@gmail.com

Dr. Biswarup Neogi is awarded PhD (Engineering) from Jadavpur University, India. He received M.Tech degree in ECE from Kalyani Govt. Engg. College in 2007. Before that He obtained B.E in ECE from UIT, The University of Burdwan in 2005.He has a experience on various project of All India Radio attach with the Webel Mediatronics Ltd, Kolkata. He was a lecturer in ECE Dept, Haldia Institute of Technology. WB, India. He was working as a faculty in ECE Dept, Durgapur Institute of Advanced Technology & Management. Currently he is engaged with JIS College of Engineering, Kalyani as a Faculty member and flourished R&D related activity. Recent now he is also engaged as a consultant executive engineer of YECOES Ltd, Hooghly, and attached as an advising body of different Engineering College under WBUT. His research interest includes Prosthetic Control, Biomedical Engineering, Digital Simulation, Microcontroller based Embedded System. He is guiding five Ph.D theses in this area. He has published about fifty several papers in International and National Journal and Conference conducted both in India and abroad. Additionally, he attached as a reviewer of several journals and yearly conference.

E-mail: biswarupneogi@gmail.com