

Welcome to SensoryX 2023

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ABSTRACT

We are excited to welcome you to the third edition of the SensoryX workshop on multisensory experiences. Building on the success of the previous two workshops (also co-located with IMX) in New York and Aveiro, the current workshop examines different aspects of multisensory design - from authoring tools to the evaluation of multisensory experiences - with the aim of identifying the current challenges and opportunities of mulsemmedia.

CCS CONCEPTS

• **Human-centered computing** → **Interaction paradigms**; • **Information systems** → **Multimedia information systems**.

KEYWORDS

Multisensory experiences, Mulsemmedia, Sensory effects, Immersive media

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1 BACKGROUND, SCOPE AND AIM

Multimedia applications have primarily engaged two of the human senses – auditory and visual. With recent advances in computational technology, however it is possible to develop multisensory applications across all senses. Important findings from psychological and neuroscience research, as well as technological advances responsible for increased diversity of devices with higher computational power and communication capabilities, augmented by various sensor and display technologies have enabled targeting other human senses. Moreover, the state of the art for multisensory systems has been pushed forward with the evolution of Mixed Reality-related technologies that allowed several senses to be stimulated at the same time, presenting users with ‘real experiences’ designed in virtual worlds [20]. This enables a more immersive, coherent, and credible experience, raising the level of presence

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[5, 9, 14, 19] as well as providing a strong enabler for sustainable and green computing [2, 6, 16, 17]. In this context, it becomes important to explore and understand how one can design effective multisensory experiences in a variety of domains (e.g., education, arts, entertainment, tourism, etc.) and how technology can be used to meaningfully stimulate these experiences [1, 3, 4, 15, 19, 24, 25]. The most appropriate metaphors to model multisensory interactions in a digital environment also need exploring [8, 13, 18]. Moreover, it is essential to identify the challenges, opportunities and limitations to be overcome in the quest to transcend the overwhelmingly bisensorial nature of digital multimedia into a multisensory one – the realm of mulsemmedia, multiple sensorial media [7, 11, 12, 26].

In Human-Computer Interaction communities, we are interested in the impact of sensory effects on the end user. Nowadays, knowledge is scattered and limited. We know that sensory effects can positively or negatively affect the user experience. Among the positive effects, research has shown that touch and olfaction can help with emotion regulation or that adding a sensory modality is enough to improve the user experience [6, 21]. Among the negative effects, research shows that in some cases noise can disturb the user, or that tickling sensory effects can prevent viewers from staying immersed in a movie [10, 22, 23].

The current research questions are:

- What can be the definition of multisensory interaction from the point of view of Human-Machine Interaction?
- Which measure methods do we have to use to study the impact of sensory effects on users?
- What do we already know about the impact of sensory effects on the user?
- What combination of sensory effects are efficient according to the context?
- What sensory substitution are efficient according to the context?

As *IMX 2023* takes place in France, we propose a third edition of SensoryX, co-organized with the global mulsemmedia communities and the French Multisensory Working Group supported by the French HCI association.

Thus, this workshop aims at collecting knowledge from related work on multisensory interaction from design to concrete implementation (from conception to use) and will identify future research directions for creating experiences at the intersection of various sensory dimensions with a transdisciplinary approach.

1.1 Aim

The aim of the workshop is to gather a transdisciplinary community (sound engineering, ergonomics, cognitive psychology, science of

education, design, teaching, art, music, IT, robotics, ...) in order to work on transversal issues about multisensory interaction and sensory effects in the idea to improve user experience.

An associated aim of this workshop is also to deepen the discussion on multisensory experience taking into account common questions from mulsemmedia communities and the French working group. This workshop will thus focus on enhancing the multisensory scope by exploring the six following topics: An associated aim of this workshop is also to deepen the discussion on multisensory experience taking into account common questions from mulsemmedia communities and the French working group. This workshop will thus focus on enhancing the multisensory scope by exploring the six following topics:

- Definitions of multisensory experiences
- Creation tools (Authoring tools) for multisensory experiences
- Use cases of multisensory interaction
- Evaluations of multisensory interaction
- Lessons learned from multisensory interaction

Thus, this workshop aims at collecting knowledge from related work on multisensory interaction from design to concrete implementation (from conception to use) and will identify future research directions for creating experiences at the intersection of various sensory dimensions with a transdisciplinary approach.

2 WORKSHOP ORGANISERS

2.1 Chairs

Celine Jost is an Associate Professor in Computer Science at Paris 8 University in France, working in the CHArt laboratory for her research, since 2015. She obtained her Ph.D. in Computer Science from South Brittany University (France) in 2013. She mostly conducts multidisciplinary research with different disciplines, for which she received the "RJS/KROS Distinguished Interdisciplinary Research Award" in RO-MAN 2014. She participated in several national projects (EmotiRob, Robadom, MoCa, and INGREDIBLE) and she created and led four projects (EMSHRI, StimSense, MemoRob, and PRIM). Her research interests include Human-Machine Interaction, multisensory interaction, evaluation methods, user experience, connected objects, social robots, natural interaction, individualized interaction, interaction paradigm, cognitive ergonomics, serious game, artificial companion, disabilities, education, and cognitive stimulation.

Débora Christina Muchaluat Saade is a full Professor at the Department of Computer Science of Fluminense Federal University (UFF) in Brazil. She holds a Computer Engineer bachelor's degree (1992), MsC (1996) and PhD in Computer Science (2003) from Pontifícia Universidade Católica do Rio de Janeiro (PUC-Rio). She founded the MídiaCom Research Lab (www.midiacom.uff.br) in 2003. She is a member of the technical committee of the Brazilian Digital TV Forum. She has contributed to the development of NCL (Nested Context Language) and Ginga-NCL, used in the Brazilian Digital TV Standard (ABNT NBR 15606-2) and IPTV services (ITU-T H.761). She is a member of the ACM IMX (Interactive Media Experiences) steering committee. She was one of the general chairs of ACM IMX 2022 that was held in Aveiro, Portugal. Her research interests are

multimedia, multisensory systems, computer networks, wireless networks, smart grids, IoT, interactive TV and digital healthcare.

Gheorghita Ghinea is a Professor of Mulsemmedia Computing in the Computer Science Department at Brunel University London, UK. His research activities lie at the confluence of Computer Science, Media and Psychology. In particular, his work focuses on the area of perceptual multimedia quality and how one builds end-to-end communication systems incorporating user perceptual requirements. Currently, his research pursuits are centred on extending the notion of multimedia with that of mulsemmedia a term which he has put forward to denote multiple sensorial media, ie. media applications that go beyond engaging the by now traditional auditory and visual senses, engaging three of our other human in a realistic manner akin to our experiences of everyday life.

2.2 Technical Program Committee

SensoryX'23 is organized with the help of the following Technical Program Committee:

- Alexandra Covaci, University of Kent at Canterbury (U.K.)
- Ines Di Loreto, Université de Technologie de Troyes (France)
- Joel Dos Santos, Cefet/RJ (Brazil)
- Brigitte Le Pévédic, ENIB (France)
- Sabrina Panëels, Paris-Saclay University (France)
- Celso Alberto Saibel Santos, Federal University of Espírito Santo (Brazil)
- Isis Truck, Paris 8 University (France)
- Gérard Uzan, Paris 8 University (France)
- Elisabetta Zibetti, Paris 8 University (France)

3 PROGRAMME

SensoryX 2023 will take place in Nantes, France, on June 12th, 2023, in conjunction with the ACM International Conference on Interactive Media Experiences (ACM IMX 2023). This workshop is co-organized with the French National Working Group on multisensoriality which aims at exploring the impact of sensory effects on people.

Table 1: SensoryX 2023 programme.

Time	Activity
9:00-9:30	Participants welcome – presentations (roundtables)
9:30-10:00	Workshop opening
10:00-11:00	Keynote Merle Fairhurst (online)
11:00-11:30	Break
11:30-12:30	Session – Sound design and AR (presentation and demonstration) – Frédérique Krupa
12:30-14:00	Lunch
14:00-14:30	Session – Olfactory (presentation) Cristian Pamparău (online)
14:30-15:00	Session – Mulsemmedia (presentation) Aleph Campos da Silveira
15:00-16:00	Session – Digital (presentation & demonstration) Charles Javerliat, Pierre Raimbaud
16:00-16:30	Break & Demonstration Cognitive stimulation – Justin Debloos
16:30-17:30	Session – Neurofeedback (presentation & demonstration) Gabriella Herrera Altamira, Stéphanie Fleck

The workshop will feature a world-class keynote by Prof. Dr. Merle Fairhurst, from the TU Dresden, Germany, on “A functional framework for multisensory and interactive mediated social touch experiences.” The accepted papers encompass discussions about sound design and augmented reality, cognitive stimulation, neuro-feedback, mulsemmedia based education, and olfactory-based mulsemmedia challenges. The full programme is detailed in Table 1.

SensoryX '23 will focus on enhancing the multisensory scope of both designers and developers of multimedia and Mixed Reality experiences who could thus harness the whole spectrum of sensory experiences. For this, the workshop will foster and challenge current practices in designing experiences, and will explore and identify future research directions for creating experiences at the intersection of various sensory dimensions.

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REFERENCES

- [1] Moein Abdolmohamad Sagha, Nader Seyyedamiri, Pantea Foroudi, and Morteza Akbari. 2022. The one thing you need to change is emotions: The effect of multi-sensory marketing on consumer behavior. *Sustainability* 14, 4 (2022), 2334.
- [2] Oluwakemi A Ademoye, Niall Murray, Gabriel-Miro Muntean, and Gheorghita Ghinea. 2016. Audio masking effect on inter-component skews in olfaction-enhanced multimedia presentations. *ACM Transactions on Multimedia Computing, Communications, and Applications (TOMM)* 12, 4 (2016), 1–14.
- [3] Judith Amores, Mae Dotan, and Pattie Maes. 2022. Development and study of ezzence: a modular scent wearable to improve wellbeing in home sleep environments. *Frontiers in psychology* 13 (2022), 791768.
- [4] Alexandra Covaci, Gheorghita Ghinea, Chang-Hsin Lin, Shu-Hsien Huang, and Ju-Ling Shih. 2018. Multisensory games-based learning-lessons learnt from olfactory enhancement of a digital board game. *Multimedia Tools and Applications* 77 (2018), 21245–21263.
- [5] Alexandra Covaci, Estevo B Saleme, Gebremariam Mesfin, Ioan-Sorin Comsa, Ramona Trestian, Celso AS Santos, and George Ghinea. 2022. Multisensory 360 videos under varying resolution levels enhance presence. *IEEE Transactions on Visualization and Computer Graphics* 29, 4 (2022), 2093–2101.
- [6] Alexandra Covaci, Ramona Trestian, Estêvão Bissoli Saleme, Ioan-Sorin Comsa, Gebremariam Assres, Celso AS Santos, and Gheorghita Ghinea. 2019. 360 Mulsemmedia: A way to improve subjective QoE in 360 videos. In *Proceedings of the 27th ACM International Conference on Multimedia*. 2378–2386.
- [7] Alexandra Covaci, Longhao Zou, Irina Tal, Gabriel-Miro Muntean, and Gheorghita Ghinea. 2018. Is multimedia multisensorial?-a review of mulsemmedia systems. *ACM Computing Surveys (CSUR)* 51, 5 (2018), 1–35.
- [8] Raphael Silva de Abreu, Douglas Mattos, Joel dos Santos, Gheorghita Ghinea, and Débora Christina Muchaluaat-Saade. 2020. Toward content-driven intelligent authoring of mulsemmedia applications. *IEEE MultiMedia* 28, 1 (2020), 7–16.
- [9] Alberto Gallace, Mary K Ngo, John Sulaitis, and Charles Spence. 2012. Multisensory presence in virtual reality: possibilities & limitations. In *Multiple sensorial media advances and applications: New developments in MulSeMedia*. IGI Global, 1–38.
- [10] Leonid R Gavrillov, Grigory V Gersuni, Oleg B Ilyinski, Efim M Tsurilnikov, and Eugenyi E Shchekanov. 1977. A study of reception with the use of focused ultrasound. I. Effects on the skin and deep receptor structures in man. *Brain research* 135, 2 (1977), 265–277.
- [11] George Ghinea, Frederic Andres, Stephen Gulliver, et al. 2011. *Multiple sensorial media advances and applications: new developments in MulSeMedia*. IGI Global.
- [12] Lana Jalal and Maurizio Murrioni. 2017. Enhancing TV broadcasting services: A survey on mulsemmedia quality of experience. In *2017 IEEE International Symposium on Broadband Multimedia Systems and Broadcasting (BMSB)*. IEEE, 1–7.
- [13] Céline Jost, Brigitte Le Pévédic, Justin Debloos, and Gérard Uzan. 2022. Interactions in Multisensory Experiences: Toward a New Timeline Metaphor. In *Proceedings of the 2nd Workshop on Multisensory Experiences-SensoryX'22*. SBC.
- [14] Juno Kim, Wilson Luu, and Stephen Palmisano. 2020. Multisensory integration and the experience of scene instability, presence and cybersickness in virtual environments. *Computers in Human Behavior* 113 (2020), 106484.
- [15] Abhishek Kumar, Bhavana Srinivasan, Abdul Khader Jilani Saudagar, Abdullah AlTameem, Mohammed Alkhathami, Badr Alsamani, Muhammad Badruddin Khan, Zakir Hussain Ahmed, Ankit Kumar, and Kamred Udham Singh. 2023. Next-Gen Mulsemmedia: Virtual Reality Haptic Simulator's Impact on Medical Practitioner for Higher Education Institutions. *Electronics* 12, 2 (2023), 356.
- [16] Prarthana Kumar. 2014. Multisensory marketing: creating sustainability perspective in various sectors. *Asia-Pacific Journal of Management Research and Innovation* 10, 1 (2014), 89–95.
- [17] Tommi Laukkanen, Nannan Xi, Heli Hallikainen, Nino Ruusunen, and Juho Hamari. 2022. Virtual technologies in supporting sustainable consumption: From a single-sensory stimulus to a multi-sensory experience. *International Journal of Information Management* 63 (2022), 102455.
- [18] Douglas P Mattos and Débora C Muchaluaat-Saade. 2018. MultiSEM: A mulsemmedia model for supporting the development of authoring tools. In *Proceedings of the 24th Brazilian Symposium on Multimedia and the Web*. 109–116.
- [19] Miguel Melo, Hugo Coelho, Guilherme Gonçalves, Nieves Losada, Filipa Jorge, Mário Sérgio Teixeira, and Maximino Bessa. 2022. Immersive multisensory virtual reality technologies for virtual tourism: A study of the user's sense of presence, satisfaction, emotions, and attitudes. *Multimedia Systems* 28, 3 (2022), 1027–1037.
- [20] Simon Niedenthal, William Fredborg, Peter Lundén, Marie Ehrndal, and Jonas K Olofsson. 2023. A graspable olfactory display for virtual reality. *International journal of human-computer studies* 169 (2023), 102928.
- [21] Marianna Obrist, Sue Ann Seah, and Sriram Subramanian. 2013. Talking about tactile experiences. In *Proceedings of the SIGCHI conference on human factors in computing systems*. 1659–1668.
- [22] Eunji Oh, Minkyoung Lee, and Sujin Lee. 2011. How 4D effects cause different types of presence experience?. In *Proceedings of the 10th International Conference on Virtual Reality Continuum and Its Applications in Industry*. 375–378.
- [23] Sara Price, Carey Jewitt, and Nikoleta Yiannoutsou. 2021. Conceptualising touch in VR. *Virtual Reality* 25, 3 (2021), 863–877.
- [24] Belma Ramic-Brkic and Alan Chalmers. 2014. Olfactory adaptation in virtual environments. *ACM Transactions on Applied Perception (TAP)* 11, 2 (2014), 1–16.
- [25] Filippo Sanfilippo, Tomas Blazauskas, Gionata Salvietti, Isabel Ramos, Silviu Vert, Jaziar Radianti, Tim A Majchrzak, and Daniel Oliveira. 2022. A perspective review on integrating VR/AR with haptics into STEM education for multi-sensory learning. *Robotics* 11, 2 (2022), 41.
- [26] Yevgeniya Sulema. 2016. Mulsemmedia vs. Multimedia: State of the art and future trends. In *2016 International conference on systems, signals and image processing (IWSSIP)*. IEEE, 1–5.