Guest Editors:

Lorenzo Desideri, Luc de Witte, Rabih Chattat and Evert-Jan Hoogerwerf

Organisers

AIAS DAL 1962 BOLOGNA ONLUS

aaate ASSOCIATION FOR THE ADVANCEMENT OF ASSISTIVE TECHNOLOGY IN EUROPE

ALMA MATER STUDIORUM UNIVERSITÀ DI BOLOGNA

TECHNOLOGY AND DISABILITY
Volume 31, Supplement 1, 2019

Special Issue: AAATE 2019 Conference – Global Challenges in Assistive Technology: Research, Policy & Practice, 27–30 August 2019, Bologna, Italy
Guest Editors: Lorenzo Desideri, Luc de Witte, Rabih Chattat and Evert-Jan Hoogerwerf

CONTENTS

Special Thematic Sessions:

1. Cognitive Accessibility of Digital Resources
2. User Participation in Software Development
3. Making STEM Accessible to Disabled People
4. Appropriate Wheelchairs a Global Challenge - Reflect, Review, Strategize/Revolutionize
5. Eye gaze technology: accessibility, usability and effect on participation and communication for persons with severe disabilities
6. Employing MOOCs and OERs in Teaching Digital Accessibility
7. AI and Inclusion – Exploring the issues as well as the successes
8. Creating a Match: Supporting student participation across the educational continuum with technology
9. Good Practices in AT Service Delivery
10. Play, Children with Disabilities, and Robotics. State of the Art and New Developments
11. Innovative Approaches in Building Inclusive Educational Environments with Technology
12. Developing Assistive Technology Together with End-users, Business, Healthcare and Knowledge Institutes - Challenges and Benefits
13. Challenges and Open Issues in Indoor and Outdoor Accessible Mobility
14. Pathological Speech Processing for Healthcare and Wellbeing
15. Robotics and Virtual Worlds for wheelchair users - from ideas to reality: Innovation, Training, and Roadmap to Market (The ADAPT project)
16. AT2030: A New Approach
17. Care Robotics in Europe and Asia; A Multicultural Perspective
18. Social Robotics for Assistive Technology

*Corresponding author. a.riccio@hsantalucia.it

Environment and People Perceptions: The Experience of NEVArt, Neuroestethics of the Art Vision

M. Coccagna[a,*], P. Avanzini[b], M. Fabbri Destro[b], G. Vecchiato[b], A. Banzi[c], R. Folgieri[c], V.A. Sironi[c] and S. Mazzacane[a]

[a]*CIAS (Research Centre for pollution control in high sterile rooms), Department of Architecture, University of Ferrara, cias@unife.it, via della Ghiara 36, 44121 Ferrara, Italy*

[b]*Institute of Neuroscience, National Research Council of Italy, Parma, Italy*

[c]*CESPEB (Research Institute on the History of Biomedical Thought), Milan, Italy*

Background: For several years, neuroscience has been involved in understanding the neurobiological bases of how people perceive their space and every common activity and to change organizational and architectural tools, to brake the existing barrier for a universal designed environment. Dues to the difficulties in using medical devices outside laboratories, scientists simulated their scenarios. The obtained results followed the classical view of cognitive science, which considers the brain as a machine that processes stimuli in a hierarchical way, at different stages of complexity. The chance of conducting real field studies is now easier through the increasing availability of low size sensors and wireless networks for EEG and EMG analysis. The same for other physical and physiological parameters, such as the tracking of eye movements and the electrical conductivity of the skin, closely related to the individual's most instinctive and unconscious reactions.

Method: The NEVArt project wants to investigate a typical emotional feature, as the evaluation of the artistic production and the wide aesthetic involvement generated by the vision of an art work, using a scientific approach and a statistically relevant amount of data. The research aims also to compare and evaluate both the medical and signal affordability of data generates by new Wi-Fi tools, often developed outside the health field (i.e. video games, meditation skills, mental-physical sport performance, etc). The first research step is to analyse how the brain perceive emotions in real scenarios, to further exploit this information improving the architectural environment, the way of exhibiting art and the approach to people that, dues to their specific background or physical-mental capacities, perceive some elements as a barrier or an improvement (to understand or to be understood). The NEVArt research group (including neurologists, engineers, architects, psychologists, ICT and art experts) will detect the aforementioned parameters by monitoring volunteer (at least 600 people) to analyse their explicit and implicit reactions using different kind of sensors, during their visit to the exhibition "*Painting affections: sacred painting in Ferrara between the '500 and the '600*"', set up at the Estense Castle in Ferrara from 26 January to 26 December 2019. The study database include: records collected by the investigator upstream (crowding, thermos-hygrometric context, lighting, noise, etc.), non-sensitive and anonymous data filled in by the voluntary visitors in the first section of a questionnaire (age, schooling, habit of attending exhibitions, interest in the subject, level of fatigue/initial fatigue, etc.); subjective evaluation by the volunteer of the works viewed (in the second section of the survey); the tracks of each analysis tool worn (including the video made in real time with the eye tracker). All data will be uploaded at the end of each working day by the investigator, within a protected database (created by CIAS and already used for other similar clinical surveys). All the recorded materials will be periodically analysed and statistically re-elaborated using T-test and ANOVA, by the research group, relating objective data (collected with sensors) and objective data (entered by the participant and the experimenter), so as to assess the incidence of elements of agreement and/or dissonance.

Key results: NEVArt may provide a framework of people's physiological, neurological and cognitive emotional reactions, on a broad statistical basis, during the vision of art (now painting but following sculpture, architecture, etc.). The main NEVArt aims are:

1. obtain a neurobiological validation of the experience of aesthetic perception, with particular reference to bodily and mental involvement (neurovegetative, motor, emotional), both implicit (from EEG, galvanic) and explicit (from survey), facing the artistic work and testing the possibility of calibrating some of these sensory levels (disgust, indifference, pleasantness, etc.);
2. quantify the intensity and type of instrumental signals recorded as a function of the level of aesthetic perception, comparing the obtained results through multisensory EEG, EMG and eyetracking tools in real museum conditions (Scenario A) and with high sensitivity EEG 64 channels sensors, EMG and eyetracking for a limited number of paintings and using a low environmental stimulation (Scenario B);

3. to identify the descriptive parameters of the cited experiences, in order to create a significant scale to represent the physical, emotional, cognitive responses on external strains, referable to the art vision.

Conclusion: Due to the CIAS experience on large clinical surveys, the collection of a huge amount of data it's extremely useful to consolidate the information collected through different sensory channels and diverse tools. Using this method, it will be possible to create a stable framework of information within study reactions, comparing these background data to similar stimuli by people with specific disabilities. Otherwise, the risk of lack of reliability of records, may confuse the perceptions based on experience and knowledge of people (which is expected to have common variations among all participants) with those one arising from cognitive or sensory deficits. The analysis of a feeling perceptions as the "aesthetic pleasure", it is well suited to identify a set of primordial elements that can be tested and stimulated even in subjects with different abilities. The research knowledge, both in term of technical skills and upgrade in neuroscientific awareness, will be fundamental to proceed with a set of new research topics. These expected improvement (partly implemented in parallel with the second stage of NEVArt) include the sense of smell (i.e. product and environmental odours), the didactic field (teaching methodologies aware of vision and perception features), medical purposes, in particular improving some past research of the CIAS about the Parkinson's disease and some new studies about the communication with people with specific cognitive disorders, as Autism, in order to relate their emotional/physiological/cognitive response to different external stresses (starting from basic stimuli as colour, forms, lights, smell, etc.). Expected results also on the exhibit field, to provide suggestions on how to achieve the best way to display art works, enhancing the elements with the greatest impact on visitors. The environmental field, improving new methods to measure the subjective response of users to setting parameters (light, heat, cold, etc.) in order to combine the analysis of objective standards and on the field perceptions. In the safety topics, studying the impact of sensory data to verify the users' perceptions in emergency situations and how to take into account people awareness in emergency preparedness, especially with reference to wayfinding and to use of signs, lights and colours.

Keywords: neuroestethics, art, beauty, perceptions

*Corresponding author. E-mail: cnm@unife.it