

# **Interdisciplinary Immersive Experiences within Artistic Research, Social and Cognitive Sciences**

***Adnan Hadzi***

## Abstract

*This paper analyses the use of Immersive Experiences (IX) within artistic research, as an interdisciplinary environment between artistic, practice based research, visual pedagogies, social and cognitive sciences. This paper examines IX in the context of social shared spaces. It presents the Immersive Lab University of Malta (ILUM) interdisciplinary research project. ILUM has a dedicated, specific room, located at the Department of Digital Arts, Faculty of Media & Knowledge Sciences, at University of Malta, appropriately set-up with life size surround projection and surround sound so as to provide a number of viewers (located within the set-up) with an IX virtual reality environment.*

## Interdisciplinary Immersive Experiences within Artistic Research, Social and Cognitive Sciences

This paper analyses the use of Immersive Experiences (IX) within artistic research [1], as an interdisciplinary environment between artistic, practice based research, visual pedagogies, social and cognitive sciences. This paper examines IX in the context of social shared spaces. It presents the Immersive Lab University of Malta (ILUM) interdisciplinary research project. ILUM has a dedicated, specific room, located at the Department of Digital Arts, Faculty of Media & Knowledge Sciences, at University of Malta, appropriately set-up with life size surround projection and surround sound so as to provide a number of viewers (located within the set-up) with an IX virtual reality environment. The set-up is scalable, portable and provide easy to use navigation and allow the user to move around within the virtual environment. The system is able to interact with the current geographic information outputs produced the researchers to project a 3D virtual environment [2], [3] allowing users to visualize and immerse themselves with the latter. Hardware and Software set-up allows for various applications in particular: ability of experiencing “as is” and “as proposed” virtual built environments; the idea is to utilize such 3D IX technology to enhance the decision making process, particularly in the realm of major projects, which would have a significant impact on their surroundings; predicative scenarios [4], [5]; change analysis [6]

ILUM also includes the necessary high-end hardware and software to be utilized primarily for the generation of the specific outputs required for use with the IX virtual reality environment system as well as any other visualization data [7] post-processing as necessary. In addition the system includes a number of end-user virtual reality headsets and relevant controller systems to complement and enhance the 3D IX virtual reality environment user experience. The headsets and related hardware supplied are of two types namely:

Type 1 – Headset accompanied by the required software and hardware setup geared towards a Complete and Surrounding Virtual Experience [8]

Type 2 - Headset accompanied by the required software and hardware setup geared towards an Augmented/Mixed Reality [9] and Holographic Experience [10]

The multimodal [11], [12] interactive installation ILUM was conceived and implemented as an experimental platform that permits the creation, testing and exhibition of diverse media

contents and interaction principles. Furthermore ILUM is being used for researching activities in the field of new media, computer music, and creative coding. ILUM places a particular focus on the establishment of social and collaborative interaction situations, the combined presence and perception of both physical and virtual aspects of the installation, and on educational settings that make complex algorithmic principles accessible for explorative forms of research and learning. The main activity carried out in this environment is the development of artistic contents by a growing number of artists and researchers. Their task is to develop pieces that combine panoramic image and surround sound with a focus on interaction. The curatorial guidelines will lead to a catalogue of artistic works that will present live-generated, multi-visitor, non-linear, audio-visual interactive pieces. This research addresses aspects of perception and communication that are relevant for the creation and experience of IX and Immersive Interactive Media [13]. Throughout the project, scientists collaborate to transfer scientific experimentation settings into the Immersive Lab that enable visitors to actively engage with and learn about these topics and methods of investigation.

The paper discusses how ILUM combines and integrates three research strands that are part of a major, sustained artistic or scientific focus of the partnering academic institutions, namely the Immersive Pipeline (IP) at Goldsmiths, University of London, UK [14], the ICST’s ‘Immersive Lab’ (IL) at the Zurich University of the Arts, Switzerland, and the Spatial Media Research Group (SMRG) at the National and Kapodistrian University of Athens, Greece. In those labs researchers, artists, film-makers investigate and create different kinds of IX. ILUM provides the opportunity to situate artistic research in the context of scientific. The thematic backgrounds of these research strands and the infrastructure of ILUM serve as starting points from which the partners collaboratively create new communication content, exhibition settings and teaching materials. Addressing the needs of the three target groups the paper will discuss:

1) The original development of the ILUM as being oriented towards practice-based research in Media Arts: Interdisciplinary Immersive Experiences within Media Arts. Through a multi-year development process with the Immersive Pipeline at Goldsmiths, University of London, the research group has acquired considerable expertise in IX Interactive Media, with a particular focus on surround sound (ambisonics/multichannel surround sound diffusion) and interactivity. This is applied to researching of generative, algorithmic, and media arts processes and the results will be shown to a general audience in public exhibitions.

2) The second scenario and field of expertise is established through collaborative work with ICST’s ‘Immersive Lab’ (IL) at the Zurich University of the Arts, Switzerland on Interdisciplinary Immersive Experiences within Cognitive Sciences. For the researchers, the key element is that the subjective experience [15] can be challenged using new technologies and IX media that induce perceptual bodily illusions. Such illusions are interesting to study for cognitive neuro-scientific research of self-consciousness and provide an excellent way for communicating and explaining our scientific questions. Work in ILUM implements the experimental conditions for visitors to experience these bodily illusions and provides the public with a better understanding of the fundamental mechanisms of self-consciousness [16]. The partner institutions have established contacts with cognitive scientists in their respective environment, so that this type of application provides an essential guide for further close collaboration across disciplines.

3) The third scenario is the application of techniques, tools, and processes of ILUM in Interdisciplinary Immersive Experiences within Social Sciences, such as Heritage Dissemination activities and finally an outlook on envisaged IX productions within migration studies. This enables immediate accessibility and provides direct experiences for general audiences that range from school-age children to adults. The ILUM researchers have the opportunity to retrace the process with a possible adaptation to the Maltese context [17]. Crucial is that by bringing together images, sounds, and movement through interaction, an embodied relationship arises from reconstructed shapes of palaeolithic art [18], [19] and their synthesised movements. Critical points of development are the translation of heritage content [20], [21] into digital interaction modules, providing uninhibited access via animated media scenarios.

## 1) Interdisciplinary Immersive Experiences within Media Arts

The advent of modernity [22], in the form of the Industrial Revolution, brought among many other consequences, an extraordinary capacity in transforming the physical and built environment. In this respect, the Age of the Machines [23] can be seen as a pivotal moment of discontinuity in a centuries long balanced relationship between humankind and its environment. The fast postwar economic growth [24], and the massive and crude application of building technologies soon started showing their controversial effects on space and society on many respects – environmental in first place – in terms of the increasing inability of the built environment to produce meaningful spatial experiences [25]. In *Genius Loci* [26], Towards a Phenomenology of Architecture, Norwegian architect and theorist Christian Norbert-Schultz re-interpreted the ancient notion of *Genius loci* advocating a more sensitive approach to architecture in the direction of the symbolic understanding of places. Going back to taking into consideration the value of the ‘character of place’, and understating it in terms of heritage, would – Norbert-Schultz suggested – offer insights to a more sensitive and dialectic relationship between society, the environment and the forms of human living.

In *Computers as Theatre* Laurel (1993) introduced a totally new perspective on the then rather new domain of human-computer interaction [28], by combining drama studies with videogame design at the Atari corporation. Laurel’s work brought a refreshing perspective to the emerging field of interface design, at the time mistakenly considered a mainly functional issue, a matter for electronic engineers. By introducing an alternative approach to the design of digital virtual environments, Laurel’s humanistic proposal highlighted the urge – beyond the mere technical and functional needs – of taking into account the user’s emotional and cognitive points of views. By underlying the value of orchestrating enjoyable and satisfactory interactions with the digital world, Laurel advocated to look for advice in formulas from the classic world noting how “Designers of human-computer activities can borrow concepts and techniques from drama in order to visualize and orchestrate the structural patterns of experience” [27]. One of the points discussed by Laurel is particularly relevant in our line of reasoning focuses on the relevance of orchestrating and designing environments (interfaces, as we call these today) where relationships and experiences can take place. Environments, or ‘places’ [29] – something obvious today, twenty-five years after

the book’s publication, but very radical at the time – where the users’ active participation plays a crucial role. Laurel explored the very issue of sense of oneself, identity and place in the pivotal virtual reality installation ‘Placeholder’ [30], developed in 1993 with Rachel Strickland at the Banff Centre for the Arts .

From a different perspective, interesting insights on this area can also be found in Char Davies’ early experiments in Virtual Reality [31], like in Davies’ *Osmose* [32] immersive VR installation. In a general context in which technology radically modifies the relationships between the visible boundaries – that we, at large, consider as a “screens” – and the moving image artifacts they are meant to display, the idea behind the traditional immersive VR setup is being questioned. A key area of investigation is, on the grounds of a long-established history of orchestration between spatial, visual components and storytelling, hence that of the possible contaminations between the diegetic space [33] of the audiovisual field and the narrative power of an expository medium. Despite an increasing presence of various audiovisual artifacts and multimedia interactive installations – having less and less auxiliary role, and instead increasingly playing an active part in the exhibits themselves – in exhibitions, the relevance of the extension of this relationship in the realm of the moving image appears largely underestimated.

Despite the great hope that accompanied its appearance in popular culture with the advent of high-quality, very fast graphic computing, such as in the early 90’s Silicon Graphics, Virtual Reality did not keep its promises to become a major future player in the visual arts, entertainment, apart from in gaming [34] and in our daily lives. Not only many years after the *Matrix* [35] or *Avatar* [36], to name two popular and Hollywood movies, we keep watching linear movies, and we cry, get scared, rejoice over the happy ending of a film in front of a flat, 2D screen. But the surface in which we ‘immerse’ ourselves during this narrative journeys becomes, with the advent of online streaming entertainment services, smaller and smaller, a tablet, a smartphone. One can today witness a migration process in which contents that were traditionally delivered in the most diverse formats tend to be re-packaged into audiovisual form. In this framework, the formulation of the audiovisual artifact as an individual, independent piece is increasingly being questioned in favour of the communication landscape described by Henry Jenkins as transmedial [37]: an online distributed space, populated by intertwined multi-media contents. This not only produces a massive proliferation in the available information in audiovisual (or ‘multimedia’) format, but greatly impacts the foundations of the moving image as a language [38]. The growing diffusion of portable smart devices and the increased ease of connectivity to multimedia network platforms are opening a new season for the audiovisual medium, that has in fact entered into our everyday experience with unprecedented pervasiveness.

Graphic or filmic contents, traditionally confined within well-defined boundaries, are gradually being replaced by new informative objects [39] and are increasingly being re-packaged in multimedia format. The result is a scenario – unimaginable only a few decades ago – in which visual communication is characterized by a constant and multiform presence of the moving image. The stream of audiovisual materials – narratives, information, images – in which we are today immersed, produces a totally new state of things in which the traditional boundaries between the author and the audience are blurring [40]. Furthermore, the very practice of

sharing and creating information on social media, so characteristic of our times, tends to introduce a new space in which the real and virtual dimension overlap, interacting in new and unexpected ways.

The original Immersive Pipeline research project [14] at Goldsmiths, University of London, was funded by the AHRC (Arts and Humanities Research Council UK), and looked at the production of pipelines and translators for the authoring, sharing, and touring of immersive audiovisual performative works. Partners of the Immersive Pipeline project included some of the most relevant and pioneer institutions in this field, Société des Arts Technologiques, Institute for Sound and Music, Recombinant Media Labs, Sonic Womb, GarageCube, publisher of MadMapper and Modul8, Derivative, publishers of TouchDesigner, NSC Creative, Rml CineChamber, Hexadome. The research project created content production pipelines allowing researchers and artists to concentrate on the creative aspects of their immersive works, and facilitate the conversion and translation of existing works from one format to another, asking the following questions:

Can we identify best practice in immersive production techniques to define an authoring workflow for new immersive audiovisual performance works?

Can we draw upon the wealth of existing practice for it to drive technology development, instead of technology determining creativity?

Can we create technologies for the translation of creative work from one immersive format to another in such a way to maintain original creative intent, and liberate works from being inadvertently site specific? (Regina, 2019)

## 2) Interdisciplinary Immersive Experiences within Cognitive Sciences

At the Zurich University of the Arts (ZHdK) the Immersive Lab was initiated by Dr. Jan Schacher and Dr. Daniel Bisig [41]. The Immersive Lab “is an interactive sound and video space; in a ring-shaped arrangement it presents digital media generated in real time in a panorama projection with surround sound. The entire surface of the installation is touch-sensitive and allows visitors to interact and influence the content” [42] Collaborations with researchers from cognitive sciences have led to experimental settings. The arts-based research at the Zurich University of the Arts addresses the following main topics:

Non-linear narrative: the use of real-time generated images, sounds and reactive simulation systems allows for the investigation of novel, on-linear forms of narration in the IX formats. Not all platforms afford the same manners of dynamic form generation, but all provide the basic freedom of on-the-fly decision making.

Interactivity-interaction design paradigms: The platform provided at ICST in Zurich allows for an almost immediate interaction with the bare hands by a large number of viewers. Taking this starting point the question of interactivity (re-activity, autonomous or semi-autonomous behaviour) within the different media-paradigms gets explored and applied.

Fundamental question of immersion and fluid media: The nature of immersivity of the different IX platforms is approached by examining the same contents transported (made interoperable) between the available techniques (e.g., from a VR-headset to a

dome-projection space). This perspective, in conjunction with an understanding of fluid media (non-linear, on-the-fly, generative, algorithmic, autonomous content processes) provides the foundation for a knowledge framework

The Immersive Lab has received international visibility as a platform for artistic research in residencies and public workshops. Currently, the Immersive Lab (IL) installation is a modular platform consisting of four free-standing frames with curved rear-projection screens as well as the multi-speaker audio system stacked in two circles of eight. The interaction is implemented by tracking the visitor's touch from behind the screens by means of a camera-based system. The tracking system surveys the entire screen surface of the installation, which spans more than ten meters in width and 1.5 meters in height. The circular creates an enclosed space that generates an IX field of image and audio. Stepping into the space immediately exposes the visitors to projected light and sound from all sides and envelops them in an image that exceeds the natural field of vision. Apart from a spatial envelopment by image and sound, additional levels of immersion are generated for the visitors: they enter into a dedicated physical space, the direct tactile interaction with the panoramic surface enhances their personal engagement, and finally group behaviours and social interactions emerge within the shared space. The researchers who engage with the challenges of making work for the IL face a considerable learning curve. To facilitate this process, IL provides a software simulation environment, where sketches can be visualised, and pre-recorded interaction patterns can be applied to the model for testing purposes. The main goal of the science communication project is to showcase exemplary research at the intersection of art and science. An example for such a field of expertise is established through collaborative work with Cognitive Sciences, that have up to now occurred on three distinct settings:

Collaboration with Auditory Neuroscience Group of the University of Zurich. Development of experimental methods for the investigation of neuro-feedback processes [43], using brain-computer interfaces [44] predicated on the use of the IX media environment. In this setting, closed loop phenomena emerge from measured motor imagery and through kinaesthetic and poly-modal explorations in the IX audio-visual environment. Collaboration with the Swiss Centre for Affective Sciences of the University of Geneva (UniGe SCAS) investigated synchronisation of multi-person actions [45] in order to understand prosociality [46] and social interaction in the context of music, action and emotions. Collaboration with the Laboratory of Cognitive Neuroscience of the Ecole Polytechnique Fédérale de Lausanne (EPFL-LNCO) addressed their research about cognitive and computational mechanisms [47] useful to investigate underlying human self-consciousness [48].

The design of the User Experience [49], through cognitive analysis, is the first fundamental step to create an immersive experience. Defining the key messages we want to translate, delineating the shapes researchers and artists want to use to communicate them, calibrating the combination of light-colours-sound-immersion level and selecting the technological human-machine interfaces [50], capable to bring the desired experience (e.g., headsets or large, projection-based screens, controllers or hand/body gestures, artificial or physical locomotion means like omni-directional treadmills, etc.) are primary steps to bring to light an IX.

The second fundamental step is the Art and Graphics: every concept, object and action researchers plan to represent has to be properly associated to a specific graphics style capable to support the intended cognitive, visual perception [51]. To this purpose, real world acquisition, 2D and 3D modelling and animation, graphic textures creation and mapping, lighting as well as optimization techniques like, e.g., mesh decimation [52], are to be mastered in order to guarantee the immersive simulation the best real-time performance and quality. Moreover, the integration with physics and other simulations, together with the use of specific visual effects play a relevant role to increase the level of realism and cognitive emotion transfer capability of IX.

The third step is the Logics Development [53], that is the creation of the mechanics regulating the simulation. This is the core, the “engine” of the whole process, and comprises all the software development processes leading to the implementation of the software logic, including virtual objects’ abilities/functionalities, simulation triggers, effects sequencing, playing and non-playing characters animation, etc. Most of these elements are often referred to as AI and, in fact, are ever more frequently developed by resorting to machine learning and other automatic techniques.

The fourth step is the Audio Development and Synchronization. This step embraces the creation, refinement and synchronization of all sound effects including background noise, environment sounds, characters’ dialogues, and music.

The cognitive science potential for researchers of the ILUM project are in researching and implementing content production pipelines at ILUM, concentrating on the creative aspects of IX research through (serious) game-like experiences using ILUM, disrupting dominant narratives, often unwittingly, promoting – by embedding stories, perspectives and artefacts representing cultures and communities that were previously hidden, or indeed (due to past prejudice in what might constitute legitimate historical narratives) altogether missing. Those stories, perspectives and artefacts will be positioned in juxtaposition to the most popular narratives. The new connections, meanings and nuances that will emerge from those juxtapositions will help demonstrate novel uses of IX technologies. ILUM develops a method in prototyping an experience for the inclusion of cultural perspectives and artefacts, which represent communities and groups that are currently missing or under-represented in the collections of cultural institutions. ILUM researches how to use IX technologies in order to embed hidden or missing histories and voices. Those curatorial disruptions or insertions allows the research fellow to understand how to create rich, diverse, and layered narratives, which can reach out to a wider audience demographic. Through ILUM researchers learn how to create a serious IX that invites audiences, in groups or pairs, on a journey of exploration and discovery throughout those narratives, in an immersive room. This will allow for cognitive scientists to understand in an interdisciplinary manner how to entice audiences, through IX technologies, to engage more deeply with the topics and themes on display, directing their attention towards artefacts and creating surprise encounters with the heritage and memories of cultures and communities that are currently hidden or obscured by the collections’ dominant narratives. The use of ILUM as a technological substrate for this participatory ‘journey’ offers solutions to the curatorial dilemma of how to guide audiences to less spectacular or well-known exhibits, which are

more cost-effective than physically redesigning the institutional spaces, and more adaptable to the different fabrics and needs of a range of diverse institutions.

### 3) Interdisciplinary Immersive Experiences within Social Sciences

At the National and Kapodistrian University of Athens the Spatial Media Research Group (SMRG) [54] operates within the Department of Communication and Media Studies, School of Economics and Political Sciences. The group serves research and educational needs of the Faculty of Communication and Mass Media Studies in the domain of new technologies and their applications in communication. SMRG is active in research and development in the fields of interaction design, multimedia, virtual environments, mobile communication and locative media [55], new media art, visual communication and visual design, computer-mediated communication and game studies. SMRG researches into solutions for other researchers, scientists and institutions engaging with IX technologies to extend the quantity and range of artefacts and objects they can display at any one time, through using IX to recreate objects hidden in the institution’s storage rooms and archives, and make them virtually accessible as part of the collection on display. This relates to the above discussed practice based artistic research IX approach, as the objects hidden from direct view often are linked to under-represented communities and cultures. Those objects do not constitute popular narratives as they speak to more obscure, not as widely rehearsed, narratives and cultural memories.

One major aspect for ILUM is the engagement with Maltese cultural and historical sites. Museums are sites of knowledge and memory, heritage and culture. Museums and historical sites in the Malta also are publicly funded institutions that have a social responsibility to reach out to a wide range of demographics. However, participation in culture is often significantly lower among those from a lower socio-economic background [56]. There is strong evidence (ibid) of arts and culture’s intrinsic, social and economic value. The government expects that all publicly-funded arts organisations must increase access for people from disadvantaged backgrounds and open up arts and culture for all. Furthermore, even when visiting museums and sites of cultural heritage, many visitors only engage with the ‘star’ exhibits, missing out on other, equally important if less celebrated or spectacular elements of the exhibition, either because they do not have an incentive to visit certain parts of the exhibition or because items are hidden in the storage. This can lead to educationally limited visits of cultural and heritage sites.

In this respect ILUM collaborates with MUŻA museum of art [57], housed in the former residency of the Order of St John [58]. “MUŻA is a community project in which people can participate while the museum provides the tools for interaction” [59]. Therefore ILUM focuses on learning to set up IX solutions to counter key challenges faced by Maltese cultural institutions today:

1. Diversity of audiences and narratives displayed: The diversity of audiences does not currently reflect the demographics of Malta as a whole. A contributing factor to this challenge is a widely-held perception that the story of the past, as the dominant narrative currently presented by mainstream cultural institutions, is

primarily that of wealthy, heterosexual, white males. As a result, audiences from different ethnic and religious communities, or with particular protected characteristics, can feel disconnected from this cultural narrative. Maltese heritage sites, museums and galleries are urgently seeking to address this through examining how cultural sites can better contribute to cultural and social developments by encouraging and facilitating diverse communities to contribute to culture within Malta. It responds to demands for more inclusive representation of Maltese history, and the recognition of its dependence on other countries and cultures. The case for diversity aims to both increase and widen cultural participation in Malta, including all citizens.

2. Visitors only engage with ‘star’ exhibits, resulting to educationally limited experiences: According to Waltl “the process of establishing museums for the many goes hand in hand with transformation of museums which (...) ‘change from being product-led to audience-centred’” [60]. Cultural institutions today seek to offer more engaging, enriching and relevant experiences to visitors, encouraging them to extend and diversify their visits. They want visitors to engage with the wider collection beyond the star exhibits, which would enrich the visitors’ experience, offering a broader contextual understanding and instigating ‘surprise encounters’ with objects or ideas they might have not previously encountered, thus audiences would learn more and deepen their enjoyment of visits.

3. Physical space and resources limit the range of collections and archives that can be displayed: Cultural institutions tend to only display a proportion of their collection to visitors at any time. A great deal of it remains ‘hidden’ either because of a lack of space or because of the fragility of the artefacts. However, the ‘hidden’ artefacts [61] are often those which are most pertinent to the under-represented communities [62].

Another Social Sciences research project which benefits from the ILUM project is the Platform for Migration [63] at the University of Malta. Besides the Immersive Pipeline [14], the University of London also hosts the Forensic Architecture [64] agency and the Forensic Oceanography [65] project, which recently published a report on the central Mediterranean migration crisis entitled *Mare Clausum* [66], which offers an awareness raising method for the unfolding migration crisis at the borders to Malta. In an increasingly integrated world, migration presents opportunities and challenges to communities, institutions and individuals alike. The mission of the University of Malta Platform for Migration is to offer a dialogical space in which researchers from different academic disciplines can work towards understanding all the evolving aspects of international migration, including that of belonging across generations. The long-term goal is to thereby contribute to an equitable, more sustainable and more inclusive society that brings benefits to migrants and their families, communities of origin, destination and transit, as well as their sending and receiving countries. Today the migration crisis renders the Mediterranean an opaque space, removed from the public eye, where the key founding values of the European Union (as per Art 2 TEU) are put under strain, making the Platform for Migration initiative all the more necessary. The Platform for Migration can help to shed light and raise awareness among stakeholders, policy makers, and the general public about the unfolding crisis at the common maritime borders of the Member States. ILUM supports

the Platform for Migration in data visualisation within immersive space for awareness raising purposes.

As long as there is no option of safe passage to Europe, ‘boat migrants’ will continue risking their lives, forced to take what is now the world’s deadliest migration route: the Mediterranean [67], [68], where loss of life is a constant risk and the violation of human rights a common occurrence. Despite the practical need for, and legal obligation of proactive Search and Rescue (SAR) operations, the EU and its Member States withdrew from proactive SAR at sea at the end of 2014 [69]. The termination of the last proactive SAR operation, *Mare Nostrum* [70], left a gap in SAR capabilities meant to deter crossings, which also led to a staggering increase in death rates [71]. Even the then President of the European Commission, Jean-Claude Juncker, admitted that “it was a serious mistake to bring the *Mare Nostrum* operation to an end [since] [i]t costs human lives” [72]. As a result, from 2015, non-governmental organisations (NGOs) felt compelled to step in and deploy their own rescue missions to fill this gap and reduce fatalities. However, SAR NGOs are currently operating in an increasingly hostile environment, facing smear campaigns and legal suits in several EU Member States [73] and parts of the media [74], [75]. Moreover, governments have tended to adopt a secretive approach regarding incidents at sea. There is a scarcity of data and monitoring facilities, which reduces opportunities for accountability and democratic oversight of the actions taken (or not taken) to uphold SAR and human rights obligations [66]. Yet, rather than stepping up their humanitarian response to the unfolding ‘boat migration’ crisis, EU coastal States have instead invested in deterrence and containment policies in cooperation with neighboring countries of origin and transit. On 2 February 2017, Italy signed a Memorandum of Understanding with the Government of National Accord (GNA) of Libya with the explicit objective to ‘stem irregular migration flows’ across the Central Mediterranean [76]. Similarly, Spain has developed over the years a strong cooperation with its Northern and Western African partners to control irregular migration, including through the militarization of border controls [77]. These transnational-transversal agreements have been replicated in other parts of the Schengen area, along the Balkan route [78], [79], and through the EU-Turkey ‘deal’ to seal the Eastern Mediterranean [80]. The implementation of these policies has sought to address migration flows by erecting physical barriers to impede irregular entry. Although these measures have dramatically reduced total arrivals, they fail to address the root causes of forced displacement, while increasing the risk of violations. In parallel, since 2015, a truly ‘digital revolution’ has allowed all parties concerned to communicate in real time, broadcast themselves, and gather information regarding crossings via social media.

The way we collectively discuss about migration, in general, and forced displacement by sea, or ‘boat migration’ [81], in particular, has an impact on our responses to address the phenomenon. Narratives on ‘boat migration’, be it in the media or in public discourse, affect political processes across Europe, influencing our perception of ‘boat migrants’, ultimately having an effect on the ways they are received in (or repelled from) our societies [82]. The challenge is to unpack and explain the causes and consequences of such narratives, examining their construction and assessing their effects on prevailing attitudes. Researchers in ILUM rise to this challenge by addressing the drivers and developments of ‘boat migration’ narratives at national and EU

level through a ‘fact meets feeling’ approach that intends to break through stereotypes, misconceptions, tropes, and prejudices producing research-led, creative spaces of dialogue, mediated through art, that include ‘boat migrants’ voices, emotions, stories, and experiences. On this basis, the ultimate aim is the promotion of more factually accurate and ethically sound public discourses and policy responses to ‘boat migration’ that contribute to real changes in position and perspectives towards forcibly displaced populations generally, in line with the UN’s Sustainable Development Goals (SDGs), the Global Compacts on Refugees and Migrants, and the founding values of the EU regarding borders, migration, and asylum.

ILUM stimulates discussion through direct exposure to new information in a format that marries data with sensations, combating falsehoods with a ‘more than facts’ approach, i.e. with scientific research that produces an emotional response and undoes unconscious biases and fears of the ‘Other’ [83], de-constructing narratives in a way that reaches the public and stakeholder communities beyond the ‘expert’ world. ILUM merges law, linguistics, and social sciences techniques with experimental art, IT, and cultural innovation methods, rooted in the critical analysis of current policy dynamics and dominant discourses and practices, generating alternative evidence-based, multi-media explanatory frameworks giving rise to counter-narratives regarding ‘boat migration’ across the Mediterranean. Results will be conveyed making use of novel immersive experience (IX) technologies that provide a complete sensory experience for participants, re-telling ‘boat migration’ stories from the individual and collective perspective of ‘boat migrants’ in four selected, paradigmatic settings [84], [85] These will be used as a basis for the development of the relevant sensory experiences, around four ‘anchor themes’: solidarity [86], containment [87], criminalisation [88]–[90], and militarization [91], [92], encapsulating key observable overarching trends in public policies and public debates around ‘boat migration’ across the Mediterranean.

ILUM will unite ‘fact’ and ‘emotion’ in a series of IX productions that will build on insights from art, technology, law, humanities, and the social sciences combined, to provide a comprehensive re-construction of the phenomenon of ‘boat migration’ in the Mediterranean, opening up new spaces for encounter, reflection, dialogue, and debate to practitioner communities, policy makers, and the public at large. The main impact of IX within migration studies pursues, through the technique of art and technology for social transformation, is to open up pathways to tangibly advance counter-narratives, inform discussion, and generate policy change.

ILUM, considering the above discussed case studies, serves as a vehicle for the exploration of new narratives for spatial media-arts work, combining the modalities of musical and visual surround presentation with a full-scale interaction surface. A core idea is to provide a platform for a wide variety of researchers and artists to experiment in and develop artistic works specific to this multi-modal configuration. The installation system intended for a variety of research scenarios that include researching in the domains of social and cognitive sciences, and media arts, such as creative coding, interactive media, as well as computer music and algorithmic composition. Furthermore ILUM allows for experimentation in the artistic research domain, as well for generating experiences to be investigated from the point of view of

composition, systems theory, and above all interaction and social behaviour within media environments.

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## Author Biography

*Adnan Hadzi is currently working as resident academic in the Department of Digital Arts, at the Faculty of Media and Knowledge Sciences, University of Malta. Hadzi has been a regular at Deckspace Media Lab, for the last decade, a period over which he has developed his research at Goldsmiths, University of London, based on his work with Deptford.TV. It is a collaborative video editing service hosted in Deckspace's racks, based on free and open source software, compiled into a unique suite of blog, cvs, film database and compositing tools. Through Deptford TV and Deckspace TV he maintains a strong profile as practice-led researcher.*

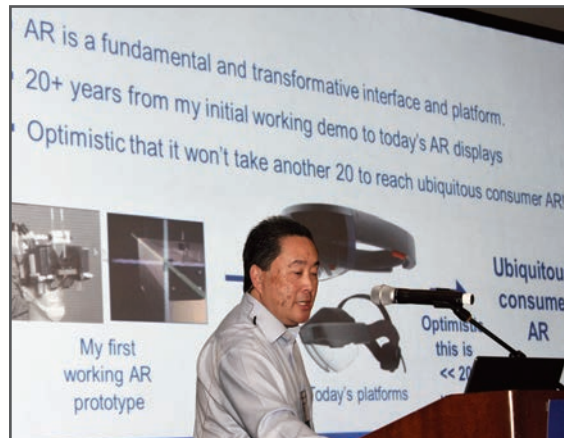
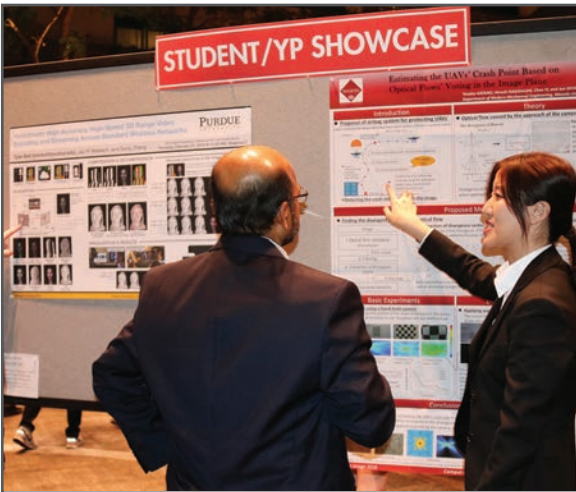
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