MEDIA FAÇADES: AUGMENTING URBAN LOCATIONS THROUGH INTERACTION

Caitilin de Bérigny, Design Lab, The University of Sydney, Australia; Majdi Faleh, The University of Western Australia, Perth, Australia; Freya Zinovieff, Design Lab, The University of Sydney, Australia

ABSTRACT

Media façades incorporate new technologies to augment urban space, inspiring people to renew their relationship with place, connection to location, cultural identity and sense of belonging. With emerging new technological applications, artists and designers are being called to transfigure public space, making it interactive by transforming the urban fabric into a dynamic tool. In this paper, we analyse how people reinvent their location by examining two contemporary international interactive media façades; the *Digital Wall* in Central Park in Sydney and *Islamic Design* on Metro stations in Dubai.

Central Park's *Digital Wall* is Australia's largest interactive wall in a public shopping center. Inspired by K11 Art Malls, a Chinese shopping mall franchise that features artworks by international artists such as Damien Hirst. We discuss artworks using mind computing technologies from the *Digital Wall's* 7mm curatorial pitch, to analyse how the public can alter their inner-city location through interaction. In this urban shopping space the artworks invite users to wear a biosensor headset which captures their individual brainwaves, subsequently transforming the imagery displayed and creating an interrelationship between the wearer, the environment and the artwork. The *Digital Wall* is a new way of thinking about urban space by integrating local artists to promote community engagement to inspire and enable community interaction within the urban location. The *Digital Wall* rethinks public space, taking into consideration the citizens as main actors, empowering them to become instruments of transformation of the location they inhabit.

Dubai is hosting the 2020 World Exposition under the theme; *Connecting Minds, Creating the Future*. In our proposal, interactive media façades will feature Islamic patterns on Dubai's metro stations. The artworks will provide the estimated 25 million visitors an opportunity to learn about Islamic heritage whilst being an integral part of the visual changes caused by spectator involvement. Moreover, the observed exploration of geometric patterns will reinstate the concept of 'dynamic and fluid' Islamic art, both calligraphic and geometric, as an integral part of Dubai's modern and traditional identities. The façades will contain integrated devices with monitors, in proximity to the metro stations, allowing people to interact with and transform the fluid Islamic patterns. The key characteristic of this design relies on smart technology to create a dynamic metro station shell using sensors to capture solar energy throughout the day.

Media façades as a medium for human interactivity within urban space has philosophical, spatial and social ramifications. As

philosopher Timothy Morton argues in *Realist Magic: Objects, Ontology, Causality*, our sense of proximity to the elements that make up a 'location' have now changed; we can no longer imagine ourselves as visitors to a location outside of ourselves or separate from the macro and microcosms of which we are part. Thus we endeavour to contribute to a global conversation with this paper; how media façades create public experiences through which a sense of intimacy with location can be explored, felt and understood. Identity is at the heart of these immersive experiences, bringing unique experiential experiences from East (Dubai) to West (Sydney).

نبذة عن المشروع

تتضمــن الواجهــات الديناميكيــة تكنولوجيــات عصريــة لزيــادة الحيّــز الحضــري، إلهــام النــاس لتجديــد علاقتهــا مــع المــكان، تقويــة العلاقــة مــع الموقــع و تعزيــز الهويــة الثقافيــة و الشّــعور بالانتمــاء. مــع ظهــور تطبيقــات تكنولوجيــة ناشــئة و جديــدة يســعى الفنانــون والمصممــون لإحيــاء مظهــر الفضــاء العــام، ممــا يجعلهــا متفاعلــة مــع المحيــط عــن طريــق تحويــل النســيج الحضــري إلى أداة ديناميكيــة. مــن خــلال هــذا البحــث، نقــوم بتحليــل كيفيــة احيــاء النــاس لمواقعهــم الحضريــة و مدنهــم مــن خــلال دراســتين معاصرتيــن لواجهــات وســائل الإعــلام التفاعليــة الدوليــة؛ و تتضمــن الدراســة التحليليــة للجــدار الرقمــي في ‹ســنترال بارك› في مدينــة ســيدني، والتصميــم الإســلامي الدينامــيكي و المعــاصر في محطــات المــترو في دبي.

واجهــة ســنترال بــارك الرقميــة هــي أكــبر جــدار تفاعــلي في مركــز للتســوق العــام في اســتراليا. الواجهــة 11 المتواجــد تحديــدا بمركــز صينــي للتســوق و الــذي يضــم أعــمال فنيــةK مســتوحاة مــن المشــروع الفنــي لفنانيــن عالميــين مثــل داميــان هيرســت. نناقــش هنــا الأعــمال الفنيــة باســتخدام تقنيــات الحوســبة العقليــة والتــي لعبــت دورا هامــا في تنظيــم الجــدار الرقمــي ذو الســمك الموافــق لســبعة مليمــترات، لتحليــل كيــف للجمهــور أن يغــير الموقــع داخــل المدينــة مــن خــلال ديناميكيــة التفاعــل. في هــذا الفضــاء الحضــري للتســوق تعتــبر الأعــمال الفنيــة دعــوة مفتوحــة للمســتخدمين لارتــداء ســماعة جهــاز الاستشــعار البيولوجــي الــذي يلتقــط الموجــات الدماغيــة الفرديــة، ثــم يحولهــا في وقــت لاحــق إلى صــور معروضــة تخلــق الترابــط بيــن الشــخص المشــارك والبيئــة والعمــل الفنــي. الجــدار الرقمــي هــو وســيلة جديــدة للتفكــير في الحيــز الحضــري مــن خــلال دمــج الفنانيــن المحليــين لتعزيــز المشــاركة المجتمعيــة واســتخدام التقنيــات التفاعليــة لإلهــام وتمكيــن المجتمــع مــن التفاعــل داخــل الموقــع الحضــري.هــو وســيلة لإعــادة التفكــير في الفضــاء العــام مــن خــلال أخــذ الفنانيــن المحليــين بعيــن الاعتبــار، وتمكينهــم مــن المســاهمة لــكي يصبحــوا عنــاصر مشــاركة.وفاعلــة لتغيــير المواقــع الحضريــة التي يعيشــون فيها

ستســتضيف مدينــة دبي المعــرض العالمــي 2020 تحــت شــعار؛ ربــط العقــول، وخلــق المســتقبل. يقــترح الفنــان التشــكيلي و المعــماري مجــدي الفالح واجهــات تفاعليــة تســتخدم أنمــاط مختلفــة مــن الزخــارف الإســلامية في محطــات مــترو دبي. إن هــذه الأعــمال الفنيــة توفــر فرصــة لنحــو 25 مليــون زائــر للتعــرف عــن كثــب عــلى الــتراث الإســلامي في حيــن أنهــا جــزء لا يتجــزأ مــن التغيــيرات المرئيــة الناجمــة عــن مشــاركة المتفــرج في عمليــة تفعيــل الزخــارف الديناميكيــة. عــلاوة عــلى ذلــك يتيــح هــذا المشــروع فرصــة للمتفــرج او للــمار لاكتشــاف مجموعــة مــن الأنمــاط الهندســية التي تبــث مفهــوم «الديناميكيــة» في الفــن الإســلامي، ســواء كتابيــة كانــت أو هندســية، كجــزء لا يتجــزأ مــن تدعيــم هويــة دبي الحديثــة والتقليديــة. ســوف يحتــوي المشــروع عــلى أجهــزة تحكــم متكاملــة للــزوار بالقــرب مــن محطــات المــترو، ممــا يتيــح للنــاس فرصــة للتفاعــل مــع الهندســة وتحويــل الزخــارف الإســلامية الى اشــكال مختلفــة و اكــثر حيويــة. الخصائــص الرئيســية لهــذا التصميــم يعتمــد أيضــا عــلى تقنيــة ذكيــة لخلــق ديناميكيــة عــلى واجهــات الاســقف الخارجيــة لمحطــات مــترو دبي باســتخدام.أجهــزة استشــعار عــبر التقــاط الطاقــة الشمســية عــلى مــدار اليوم

الواجهــات الديناميكيــة تعــدّ وســيلة للتفاعــل البــشري داخــل الحيــز الحضــري و لهــا ابعادهــا الفلســفية، المكانيــة، و تأثراتهــا الاجتماعيــة. يقــول الفيلســوف تيمــوثي مورتــون أن مشــاعرنا تجــاه العنــاصر التي تحــدد

المحيـط في تغـيّر متواصـل. لم يعـد بوسـعنا أن نتخيـل أنفسـنا كـزوار في موقـع خـارج أنفسـنا أو موقـع منفصـل عـن العـوالم المكـبرة و العـوالم المصغـرة التـي نحـن جـزء منهـا. وبالتـالي فنحـن نسـعى مـن خـلال هـذا البحـث إلى المسـاهمة في الحـوار العالمـي. هدفنـا التعريـف بالواجهـات الديناميكيـة في المعـمار المعـاصر مـن خـلال وصـف التجـارب الشـعورية التـي تخلقهـا هاتـه العنـاصر. الهويـة هـي جـزء لا يتجـزأ مـن هـذه التجـارب حيـث انهـا تجلـب الخبـرات التجريبيـة الفريـدة مـن الـشرق (دبي) إلى الغـرب (سـيدني).

INTRODUCTION:

Interactive environments are spaces where architecture and digital technologies collide. These spaces respond to visitors who interact with the technological devices contained therein, creating an immersive experience between the user and their environment. This participation creates a durable impression at the intersection of experience and expression.

In this paper, the authors discuss inventive new methods for augmenting urban space through the use of interactive technologies. We analyse two media façades, in Sydney and in Dubai and show how both examples inspire visitors to explore their locations through playful and imaginative means. Using these works as conduit, citizens become creative directors of their cities, altering, shaping, reforming and reimagining their urban space. The first façade we discuss is the *Mind Painting* project, which uses new technologies to directly translate the brainwaves of visitors into abstract digital paintings. The images are then displayed on Sydney's largest media façade, The *Digital Wall*. Levels of stress or relaxation outputted by visitors' brainwaves transform the images on the wall, creating an interactive environment where citizens can mould and reconstruct the space around them. The second façade we analyse is *IDENTITecture,* a curvilinear media façade that stretches across metro shells in Dubai, encouraging visitors to interact and engage with incandescent Islamic patterns and geometry. Media façades are the medium of connection between visitors and their location, allowing engaging interactive experiences, inspiring visitors to become artists using digital tools to transform their urban environment.

Media Façades

Historically, the term 'media façade' is associated with the cutting edge of digital advertising and the animated screens of commercial districts such as The Strip in Las Vegas, Times Square and London's West End. However, the last decade has seen a triumph of architects, designers and artists utilising the increasing availability of cutting edge technology, to create a new urban phenomenon: Media Architecture or Mediatecture. Within this genre of urban design, the interactive media façade functions as both a physical and a conceptual form. It acts as an interface between the physical and the virtual, representing both the integration of architecture with new technology and the blurring of boundaries between the digital and the corporeal. Media façades superimpose the virtual space of electronic media onto urban space. This facilitates a framework within which citizens become woven into the urban fabric of the city, acting as part of an infinite loop of data, becoming both a receiver and a transmitter of information. Interactive media façades challenge the concept of what constitutes public space. [8]

The presence of the media façade changes the urban landscape so that citizens are inspired to reimagine their sense of belonging as they interact with their physical surroundings in new ways. [13] Media facades bring creativity into the public sphere and facilitate the communication of art to a cross section of society by directly involving the audience with interactive artworks. [6] Relationships to place become reinvigorated and renewed, the urban landscape becomes a playground for interactivity and those within it subsequently feel an increased ownership and responsibility towards their environment.

Interactive media façades exist at the intersection of architecture, art, design and human-computer interaction. It is within this sphere of trans disciplinary communication that notions of location and how we find beauty within it can be explored. The city might be evidenced on a map but what are the elements that make up our experience of place? How might our ideas about an urban location change were we to consider the parts of its sum as other types of whole? An urban location is composed of individual elements, such as bricks, glass and concrete, yet these do not compose the totality of its character. For instance, the concrete, asphalt and glass, of which the structure is invariably formed, contain sand, the composition of which reaches back millions of years and transcends many life forms; does this fact contribute to how we experience location?

Fig. 1. Central Park, 2014, Artist Interpretation, Central Park, Sydney, Australia, Digital Drawing © Frasers Property.

Research indicates that the design of urban space affects the psychological outlook of citizens. [2] Within the world of urban design and planning, there is an increasing importance, on the notion of an experience of 'beauty.' [7] While city planners argue the importance of aesthetic beauty, our expectations of what this means are evolving and we are currently seeing a shift in focus, towards the urban landscape being used as a tool for community experience, ecological sustainability and community interaction. Media facades facilitate blurring boundaries between physical and virtual space. Much as the geography of urban space provides

a foundation for the interweaving of connections between different disciplines and modes of inquiry, virtual space provides a perpetual canvas on which the human mind can project unbounded imagination. Within this rift, of consciousness, of perception of self amongst physical surroundings, the thoughts and dreams an individual experiences can be cultivated and subsequently projected. Philosopher Timothy Morton reminds us of the potential of this dialogue between the real and the corporeal when he writes: "*What is uncanny and slightly frightening at times about beauty is that it can't be located, yet it appears to emerge in interactions between things. Beauty then is a kind of lie that is told of an object when it interacts with another object: a beautiful lie.*" [3] Thus, it can be suggested that interactive media facades create an infinitely faceted experience of location, an open space within the city, on which individual and collective ideas about beauty can be projected.

MEDIA FAÇADE, CENTRAL PARK, DIGITAL WALL

A global collaboration of architects and artists created Central Park, a new urban village, based on the concept of a 'Living Mall.' Sustainable features include a vertical garden (Fig.1) and the complex is situated among a plethora of art studio's and galleries. The galleries feature works by local and international artists, aiming to develop appreciation and audiences for artists in a public space. Visitor's witness art being made and can create their own transforming their urban location.

There is a 15 meter long façade in Central Park designed by internationally renowned light artist Bruce Ramus (Fig. 2) as a permanent installation, fusing art, technology and design. Showcasing curated creative content, it is curious, playful and rewards interaction with live sound and imagery.

Fig. 2. *Digital Wall* with Bruce Ramus and Caitilin de Bérigny, 2014, Central Park, Sydney, Australia, Digital Photography, Image © Nathaniel Fay.

Mind Painting Project

Mind Painting is an innovative, interactive project, which engages users to paint with their minds via live input from their brainwaves. New technologies are incorporated into the project, which enhances the urban space, by inviting people to transform, renew and alter their relationship with their location. Caitilin de Berigny and Bruce Ramus collaborated with Designer Renee Lance and

technical innovation specialists James Cook and Jai Honeybrook-Carter from Sydney University, to facilitate the *Mind Painting* project*,* for the 7mm Pitch. The 7mm pitch is a curated program, referring to the distance between each pixel that forms the façades. In her studio and along with her students from the Interaction Design and Electronic Arts program (Fig.3), de Berigny directed the creation of programming sketches, which allow users to input their brainwaves into individual NeuroSky MindWave headsets.

The NeuroSky MindWave measures and outputs the electroencephalogram (EEG). An EEG measures the electrical activity of the brain. Brain cells communicate with each other by producing tiny electrical signals, called impulses. An EEG measures this activity. The Mindwave measures alpha waves and beta waves, recording the attention and meditation levels of the user. The subsequent data, shaped by an individual's state of mind, is then translated into visual images and used to create abstract digital paintings which are displayed live on *The Digital Wall*.

Fig. 3. *Digital Wall*, Caitilin de Bérigny with students in the Interaction Design and Electronic Arts program, Sydney University, 2014, Central Park, Image © Jai Honeybrook-Carter.

As users states of mind transform the imagery for all to see, a genuine interaction and collaboration between the public and their location takes place. Moreover, the end result offers a unique opportunity to explore notions of what mind can mean, both in a visual and a philosophical sense.

Plants, creating a four-sided vertical garden, surround the outside of the architectural façades. Once inside, visitors are enclosed in large three-storey space, lit by a glass ceiling with running water. Swathes of plants line the surrounding architecture, climbing up the elevators, creating a lavish, green living landscape. It is within these lush surrounds and in view of the three storey high ceiling, rests the 15-metre long media façade. In front of the façade is an interactive kiosk, inviting users to sit and wear a headset entering into a relaxed meditative state. The *Mind Painting* project facilitates the transformation of the urban location, enabling users to become a part of the space. The space is transformed as users (re) present their unique mind states, creating digital paintings.

The *Mind Painting* project transgresses the boundaries between the physical and the virtual. Thought becomes visual, mood becomes art, inside becomes outside. The project rearranges public space by playfully engaging the visitors to become actors, empowering them to become instruments of transformation of the location they inhabit. As philosopher Theodore Adorno wrote so succinctly: "*Beauty is an event in being, a sort of gap, a gentle slit. Beauty allows for a cognitive state that is noncoercive and profoundly nonviolent.*" [1] We propose that it is within this blurring of virtual and physical space that individuals can experience a type of profound beauty.

DUBAI METRO STATIONS: IDENTITECTURE
Interactive Technologies and Islamic Geometry

Interactive architecture explores the fusion of technologies and virtual spaces, with tangible spatial experiences. Instead of defining an architectural finished product, this site becomes fluid. This flexible nature is illustrated in *IDENTITecture*. The experimental media façades *IDENTITecture*, developed by artist and architect Majdi Faleh, from the University of Western Australia, embeds new interactive and green technologies within Dubai's metro stations. *IDENTITecture* combines identity and architecture, challenging traditional, confined architecture as well as 'modern' and corporate. The video of the interaction can be found at: http://vimeo.com/105527654

The cladding for *IDENTITecture* designed in Dubai, has highly insulated properties that reduce energy consumption. [10] *IDENTITecture* uses micro-sensors embedded into the cladding. The sensors use solar power. The patterns use different calligraphic and floral styles, when temperatures rise; the patterns change, becoming fluid (Fig. 7). When temperatures cool down, the patterns and composition become less fluid (Fig. 5). When trains approach the sensors detect movement, sending signals to the patterns, which change opacity from transparent to dark and start to become more fluid as the train is moving either towards the station or away from it (Fig. 6). Thus, different interactions occur depending on temperature and movement.

In *IDENTITecture,* users can modify patterns through a screen and a control system installed near the station. Through a computer that is installed on site, the users manage to modify the patterns and learn about their historical value. In the meanwhile, the patterns continue to flow in different directions depending on the movement of the train and the weather conditions. This device creates a highly rewarding interactive experience that offers a new way of exploring the intricacy of Islamic art. While many might imagine Islamic art to be an exclusive language, the complex geometries of which these patterns are formed, transcend traditional formal notions as they metamorphose. All citizens and visitors of Dubai become directly part of the perpetual renewal of *IDENTITecture'*s façades. The evolving and unfolding of its Islamic art becomes a symbol for all people; of the spiritual transcendence incited by experiences of beauty.

Fig. 4. Dubai JLT Metro Station, 2014, Majdi Faleh, Digital Photography, © Majdi Faleh.

Fig. 5. Historic Islamic Pattern Applied on Dubai Metro Shells, 2014, Majdi Faleh, Digital Photography and Graphic Design, © Pattern: Hassan II Mosque, Morocco and Photo: Majdi Faleh.

Fig. 6. Islamic Interactive Patterns: The pattern's fluidity is influenced by the metro movement, 2014, Majdi Faleh, Digital Photography and Graphic Design, © Majdi Faleh.

Fig. 7. Islamic Interactive Patterns: Dubai Jumeirah Lakes Towers Metro Station, 2014, Majdi Faleh, Digital Photography and Graphic Design, © Majdi Faleh.

Reinvesting Identities:
National, Islamic and Global - Case of Dubai

Throughout the world, cities are changing due to their diverse character and dynamics of their morphology and urban form. Diversity and urban expansion are buzzwords that planners, artists and architects emphasize in their debates. The expansion of urban spaces requires wide-ranging experiences for the inhabitants. Cities are not only places to occupy, use or sojourn, but are new platforms of interaction, information and creative thinking.

Writer Dominique Kalifa states in his thought provoking book *Crime and Culture in the XIX Century* that mass culture is a culture of the image. [4] The age of information and technology and the age of accelerated globalization require experiences that engage users. Postmodern societies are pushing immersive experiences through a new culture of 'screens,' whether mobile, television, computer or computer game' interfaces. These technologies are comprised of 'Meta Design': coding languages; communication pattern; cognitive sciences; spatial concepts and architecture. [11] Architecture must use new communication tools, creativity and technologies. Globalization brings programming, new technologies, performance and interaction into play. Multimedia technology specialist and curator Marco Mancuso states that: "*The changes I mean are those little multimedia sparks which have started to become part of the urban landscape surrounding us: digital screens set in frequently visited places (such as stations, squares and airports), interactive shopping windows, public projections and multimedia advertising billboards. Those elements are more and more discussed and arouse curiosity as much as the latest discoveries in the ever-present demotic.*" [12]

The progress of modern societies has created a new environment charged with objects, signs and interactions based on commercial or material exchanges. Neuro-marketing is invading our personal and public space. This concept is the use of neuro imagery techniques to identify cerebral mechanisms involved in the consumer's habits. The idea of stimulating the brain can be used to inspire people's connection with identity in urban spaces. Companies around the world have used this technique to study consumer product responses. [9]

The 'new' technological civilizations tend to overshadow the spiritual. Spirituality is part of the identity, identity transforms and builds history and thus history is needed for building an intrinsically sustainable and well-founded base for a future. Spirituality is needed in this context to revive geometric and intricate patterns of the past and to enhance the meaning of Islamic design identity. Interactive technologies, in general, have impacted our social spheres and changed them into more individual and distant environments. Through public art and installations, interactive spaces can potentially offer a different experience, where an interaction takes place between the viewer and what is viewed. The object can respond to the presence of a body or to an electronic device. At every level, it encourages us to leave our small spheres and interact with the social group. Interaction also provides tenable and remarkable solutions for the workplace and the urban space. [5] The spiritual connection with the other enhances the interactive experience through technologies and establishes an equal environment for all users.

CONCLUSION AND FUTURE WORK

A crucial aspect of interactive architecture is the use of urban interactive media facades. The surface of buildings become a site to communicate audiovisual content, adding character to the building and urban location. Interactive surfaces are an indication of the transformation of the meaning and identity of place in the digital age. The evolution of interactive media façade technologies transcends limits of design, gathering architecture, design and interaction together. Multiple flows of technologies facilitate new ways of interacting with urban locations. To meet global markets identities in architecture and design are constantly shifting. The emergence of new systems of media facades, codification and motion sensors promotes new identities connecting the public to location, place and sense of belonging like never before.

REFERENCES

1. Theodor W. Adorno, *Aesthetic Theory* (Minneapolis: University of Minnesota Press, 1998), 245-246.

2. Elizabeth Ellsworth, *Places of Learning. Media Architecture Pedagogy* (London: Routledge, 2005).

3. Timothy Morton, *Realist Magic: Objects, Ontology, Causality* (Ann Arbor: MPublishing, University of Michigan Library, Open Humanities Press, 2013), 11.

4. Dominique Kalifa, *Crime et culture au XIXe siècle*, (Paris: Perrin, 2005), 10-12.

5. Lucy Bullivant and Helen Castle, *4D Space: Interactive Architecture* (Chichester: Wiley-Academy, 2005), 4.

6. Christa Sommerer, Laurent Mignonneau and Lakhmi C.Jain, *The Art and Science of Interface and Interaction Design* (Springer-Verlag Berlin Heidelberg, 2008), 1-14.

7. Elizabeth K. Meyer, "Sustaining beauty. The performance of appearance," *Journal of Landscape Architecture,* Vol.03, No. 1, accessed September 20, 2014, http://www.tandfonline.com/doi/abs/10.1080/18626033.2008.9723392#.VCpjYvmSySo.

8. Christiane Paul, Digital Art/Public Art: "Governance and Agency in the Networked Commons," *The Art and Science of Interface and Interaction Design,* Vol.01, accessed on September 20, 2014 http://firstmonday.org/ojs/index.php/fm/article/view/1616/1531.

9. Natasha Singer, "Making Ads That Whisper to the Brain," *New York Times*, November 13, 2010, accessed September 20, 2014, http://www.nytimes.com/2010/11/14/business/14stream.html?_r=0

10. Go green website, "Dubai Metro: Sustainable Design," accessed September 16, 2014, http://www.go-green.ae/greenstory_view.php?storyid=793.

11. Lab [au] "Laboratory for Architecture and Urbanism (2011)," accessed August 27, 2014, http://lab-au.com/.

12. Marco Mancuso, "DIGICULT: Digital Art, Design and Culture,"

accessed September 20, 2014, http://www.digicult.it/digimag/issue-029/meta-design-liquid-spaces-and-the-cities-of-tomorrow/.

13. Alexander Wiethoff and Sven Gehring, "Designing Interaction with Media Façades: a Case Study." Proceedings of the *Designing Interactive Systems Conference,* 2012.

BIBLIOGRAPHY

Books

Adorno, Theodor W. Aesthetic Theory. Minneapolis: University of Minnesota Press, 1998.

Ellsworth, Elizabeth. Places of Learning. Media Architecture Pedagogy. London: Routledge, 2005.

Kalifa, Dominique. Crime et culture au XIXe siècle. Perrin: Paris, 2005.

Morton, Timothy. Realist Magic: Objects, Ontology, Causality. USA: MPublishing, University of Michigan Library: Open Humanities Press, 2013.

Books with multiple authors

Bullivant, Lucy and Helen Castle. 4D Space: Interactive architecture. Chichester: Wiley-Academy, 2005.

Edited Books

Sommerer, Christa, Laurent Mignonneau and Lakhmi C.Jain, The Art and Science of Interface and Interaction Design (Springer-Verlag Berlin Heidelberg, 2008), 1-14.

Journal article (Online)

Meyer, Elizabeth K. "Sustaining beauty. The performance of appearance." Journal of Landscape Architecture, Vol. 3, 6-23, 2012. No. 1, accessed September 20, 2014.

http://www.tandfonline.com/doi/abs/10.1080/18626033.2008.9723392#.VCpjYvmSySo

Paul, Christiane. "Digital Art/Public Art: Governance and Agency in the Networked Commons." The Art and Science of Interface and Interaction Design, Vol. 01. Springer Verlag Berlin Heidelberg, 2008. , accessed on September 20, 2014.

http://firstmonday.org/ojs/index.php/fm/article/view/1616/1531

Magazines and Newspapers (online)

Singer, Natasha, "Making Ads That Whisper to the Brain," the New York Times, November 13, 2010, accessed September 20, 2014.

http://www.nytimes.com/2010/11/14/business/14stream.html?_r=0

Websites

Go green website, "Dubai Metro: Sustainable Design." Accessed September16, 2014.

http://www.go-green.ae/greenstory_view.php?storyid=793

Lab [au] laboratory for Architecture and Urbanism. 2011. Accessed August 27, 2014.

http://lab-au.com/

Mancuso, Marco "DIGICULT: Digital Art, Design and Culture." Accessed September 20, 2014. http://www.digicult.it/digimag/issue-029/meta-design-liquid-spaces-and-the-cities-of-tomorrow/

Proceeding Papers Published

Wiethoff, Alexander and Sven Gehring. Designing interaction with media façades: a case study, Proceedings of the Designing Interactive Systems Conference. 2012.