

Computational Regionalism: Re-articulating Middle Eastern Material Culture

Like smoke blown to heaven on the wings of the wind, our country, our conquered country, perishes. Its palaces are overrun by the fierce flames of the murderous spear.

FAYSAL TABBARAH

American University of Sharjah

INTRODUCTION: HOMOGENEITY IS PLAGUING THE MIDDLE EAST

The Middle East has long filled the coffers and exhibition halls of museums around the world with articulate objects of all functions and scales, most of which exhibit undeniable aesthetic and political gravity. In the best of cases, it might be considered frivolous for one to look at the political and social affects of material culture at a time of unending turmoil. However, material culture has resiliently proved throughout centuries of human civilization that it holds the latent potential as a political tool for the dissemination of information to the public. More specifically, material culture has long been considered a strong tool in the shaping of identity. Within the specific context of architecture, this is often translated as the shaping of identity through the production and dissemination of ornament, or lack thereof.

While issues of identity are not a novel struggle in the Middle East, the lack of strong contemporary Middle Eastern material culture practice has largely failed in the shaping of a contemporary post-post-colonial identity in this complex era of open and infinitely networked globalization. It is of no wonder that issues of identity continue to fuel some of the turmoil that besets the greater Middle East. This endeavor is an attempt at outlining reasons for the diminished state of Middle Eastern material culture and moves on to introduce an ongoing design framework that aims at producing contemporary regionally specific material cultures through integration with emerging computational design methodologies. This framework is being developed as a research project as well as an educational and pedagogical framework at a college of architecture in the Middle East.

DEFINING GEOGRAPHIES

As this endeavor is concerned with Middle Eastern material culture, it is important to clearly denote what that means in the context of this research methodology as it is otherwise a largely nebulous term. Here, the Middle East is

understood as the Arabic speaking region from the edge of the Atlantic in the west to the southern Arabian Peninsula in the east, including parts of historic Persia, known today as modern day Iran. The research methodology deliberately shies away from using the term Islamic due to its reductive connotations towards the complex ethnic, cultural and religious condition that has long existed and continues to exist within the region. The research methodology also shies away from referring to the historical work in question as one that comes from the Arab world. This is deliberately done to avoid references to Pan-Arab unity through that largely affected the production of art and material culture between the 1950's and 1970's.

The use of the term Middle East is largely preferred for three key reasons. First, it denotes a clear geopolitical condition and highlights the differences between this region and its adjacencies with Europe in the north and northwest and Asia in the east. Secondly, what binds the collection of diverse national identities under the banner of the Middle East is that this region shares a shared political and cultural destiny. This inevitable shared destiny is something that this region does not share with the larger Islamic world. For example, complex geopolitical events happening in modern day Iraq have little to do with the internal affairs in Indonesia, one of the largest Muslim countries in the world. However, these self-same events have significant and visible effects both in Iraq and Libya. This attitude can be said to be implicitly adopted by respected scholars on Islamic Architecture. As Nasser Rabbat lucidly notes that "despite its acceptance of the designation 'Islamic Architecture,' this all inclusive definition was decidedly not religious. It actually shunned religion as an ontological category."²

The third reason also comes from Rabbat's paper "What is Islamic Architecture Anyway?"³ The term Islamic Architecture is a Eurocentric construct that emerged in the 1800s following the Napoleonic campaigns into Egypt and beyond. Because this body of work attempts at crafting a disciplined methodology from within the region, all references that hint at past colonial formulations are avoided.

FROM CRITICAL REGIONALISM TO NEO-ORIENTALISM

The shift from the Islamic label towards the Middle Eastern one has historical precedent on the ground. The events between the First and Second World Wars brought about an accelerated rise of various interpretations of secular Middle Eastern nationalisms. Out went the subtle colonial Ottoman powers that proclaimed rule over an Islamic empire, and in came more obvious colonial western powers such as the British, French and Italian.

In retrospect, it seems that these emerging nationalisms had developed a form of Stockholm syndrome that took shape between the end of the First World War and the end of the second. In the recently departing Western colonial powers, Middle Eastern leaders found intellectual, social and political refuge from their previous Ottoman Islamic leaders. Shortly before that, the emerging secular Turkish Republic, born from the ashes of the Ottoman Empire, was undergoing a violent form of westernization spearheaded by Mustafa Kemal Atatürk who rallied the masses to shun 500 years of Islamic Ottoman rule. Consequently, the development of material culture from the 1940s onward could not escape the geopolitical and social context within which it was operating.

To understand what Western-styled secularism meant to the development of a post-colonial Middle Eastern material culture one has to critically draw

parallels with how the regional art practices were being transformed in the early stages of the post-colonial era. Modern Middle Eastern artists adopted emerging Western models and representational techniques. However, these artists worked hard at appropriating the thematic content of their work towards regionally specific issues, such as the struggle of rural peasants to socially mobilize towards and urbanized life. In the early 1930s, we can find paintings that carry on Degas' Impressionism mantle, such as Omar Onsi's painting *Young Women at an Exhibition* or Shafic Abboud's numerous abstract expressionist endeavors. Due to its slower pace, it took architects sometime for Modernism to make its mark in the Middle East. Beginning in the 1950s, The Middle-East began to develop its own brand of Modernism, and just as in art practices, this was not a practice of simply importing attitudes from the west. Works by architects such as Rifat Chadirji and Mohammed Makiya in Iraq, and Joseph Philippe Karam in Lebanon and Hasan Fathy in Egypt were not unlike Modernist practices in Central America in that they practiced under the banner what Kenneth Frampton coined as Critical Regionalism.

This practice of Critical Regionalism continued well into the 1970's, however, the declining belief in Pan-Arabism after a series of devastating wars that ravaged the Middle East up until the mid-1970s, and the global shift towards post-modernism pushed regional practices towards a severe form of pastiche that still continues today. Alternatively, if designers do not produce objects of pastiche, they turn to importing Western models of living and production.

However, it must be noted that despite the terminology, it must be acknowledged that the emergence of Islam in the 7th century and its rapid expansion throughout the Arabian Peninsula and beyond radically affected the development of the region's art and material culture. This was caused by the radical shift from iconographic practices towards geometric ones. Ironically, specific pattern formations in themselves have become world renowned icons of Islamic Architecture and Culture. Returning critically to the underpinnings of the shift from icon to geometry, and juxtaposing it with contemporary computational design methodologies and tools is at the crux of this endeavor. We are no longer constrained by chinks and strings to create geometric patterns based on circle formations as was the case in the 7th century and beyond.

COMPUTATIONAL ORIENTALISM

Orientalism, a term coined by the Arab scholar Edward Said in 1978, refers to a historical and arguably ongoing Western-centered attitude towards the Middle East. In the opening of his pioneering and controversial book, *Orientalism*, Said writes that "the Orient was almost a European invention, and had been since antiquity a place of romance, exotic beings, haunting memories and landscapes, remarkable experiences"⁴. Sibel Bozdogan, a leading architectural historian that continues to work on the development of Orientalism as it relates to architecture, explains that the implications of Orientalism to material culture in general, and architecture in specific lie in that it directs "how a culture is perceived, described and ultimately reconstructed by another, often gravely reducing, schematizing and distorting the image according to the predilections of the beholder"⁵.

Technology has always been a tool in the deployment of Orientalist attitudes, and current advancements have not shied away from this tradition. Computational Orientalism refers to the ongoing practice of legitimizing the superficial

deployment of historical patterns at various scales, ranging from interior screens, landscapes, and master-plans. This is directly driven by the proliferation of computational design methodologies. The ease of which architects and designers can generate digital surface patterns and deploy them in construction has revived the interest in pattern-based and geometry-driven practices. While this has created an unprecedented productive explosion within the global design community, it seems to have only legitimized the superficial use of historical patterns in Middle-Eastern design practices. Hexagonal patterns reign supreme, and because they are generated by the newest computational tools, they are deemed good and beyond reproach ⁶.



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COMPUTATIONAL REGIONALISM

As argued in the introduction, this body of work places the production of material culture in general, and ornamentation in specific, as a main tool utilized in the shaping of identity. It is with that attitude that the historical wealth of material culture developed in the Middle East becomes the basis onto which a new language can be built. This is made stronger when the parallels between the historical body of work and contemporary computational design endeavors are made.

The emergence of Islam in the 7th century ushered a revolutionary shift in the production of art and material culture. This is marked by a shift away from figural and iconographic practices towards geometric ones. In his influential “What is Islamic Architecture Anyway?” Nasser Rabbat outlines three distinct ways in which Islamic Architecture emerged as a legitimate discipline of study. First, he notes scholars like Georges Marcais’ stipulation that Islamic Architecture should be recognizable through its visual aspects. Second, he describes Ernest Grube’s attitude that highlights spatial organization stemming from cultural practices as an identifier of Islamic Architecture. Third on the list is a more practical approach, championed by the likes of Oleg Grabar, where “he argued in more than one place that Islamic architecture is the architecture built by Muslims, for Muslims, or in an Islamic country, or in places where Muslims have an opportunity to express their cultural independence in architecture.”⁷ This body of work straddles a delicate intertwining line between these three pseudo-truths. All

Figure 1: Student Work - Hafez Koohestani. Spline geometries are deployed to create a highly articulate assembly to structure column-grid space-types. Articulate spline assemblies operate on multiple-scales, as they form both the primary structure but secondary shading devices, *Vectorial Tectonics*.

three identifiers are equally important and inseparable. Given that the aim of this research and educational pedagogy is to explicitly produce work for the Middle East, therefore, the biggest challenge that faces the work introduced below is the attempts at integrating visual and spatial conditions into a coherent regionally specific whole under the umbrella of Computational Regionalism. Simply defined, Computational Regionalism encompasses material culture and architecture produced conceptually and practically through computational design methodologies with a strong emphasis on visual and spatial regional specificity.

A COMPUTATIONAL VISUAL AND MATERIAL CULTURE

Three computational visual and material practices emerged due to the shift from the iconographic to the geometric. These practices can be described as (a) calligraphy, the art writing, (b) geometric patterning, the generative practice of symmetrical subdivisions to create high resolution geometric patterns, and (c) Arabesques, which are foliage-like spline geometries⁸. Visually, these practices all exhibit an overarching use of systemically organized line geometries to generate adaptive multi-scalar patterns. On a foundational level, these practices and contemporary computational models have three shared values in common; they are (1) generative, (2) systemic, and (3) adaptive.

Here, generative design is conceived as the deployment of algorithms to generate an output. In the past, this was an analog and laborious process, while today we have the luxury to automate these processes. Within the educational platform that runs in parallel with this research, students are told to think generatively through the three circular questions: (1) What are you trying to achieve? (2) What is the algorithm or logic, analog or automated, that can help you find solutions, and finally, (3) what evaluation criteria do you use to evaluate the generated output?

Geometric patterning techniques, sometimes colloquially referred to as Islamic patterns are very good spring boards for students to begin thinking through these issues. Students are asked to pick an existing pattern and attempt to construct it generatively through off-the-shelf computational tools. This serves two functions simultaneously. First, they are introduced to technical capabilities of computational design methodologies, and secondly, they are immediately confronted with the computational relevance of their past heritage as they quickly learn that geometric patterning techniques have historically relied on the deployment and organization of fixed-radii circles to create intricate near infinite Cartesian patterns.

Systemic design, clear in both contemporary computational design endeavors and historical practices alludes to complex part-to-whole relationships. In the three material practices mentioned above, line geometries of various degrees of curvature form simple parts that aggregate to create complex, highly articulate and highly textural field conditions.

Adaptive design in this context refers to the ability to deploy visual patterns and spatial strategies at various scales. The three Middle-Eastern practices mentioned above are adaptive in that they were appropriated for calligraphy, textile design, jewelry, pottery, architecture and other material practices. This is not unlike contemporary computational design tools where off-the-shelf software or custom built ones allow for the production of near infinite variations and their deployment on a similarly near infinite number of scenarios and applications.

Operating generatively, systemically, and adaptively echo a 2014 seminal article published in Artforum by digital theorist Mario Carpo titled “Breaking the Curve: Big Data and Design.”⁹ Carpo calls for the obsolescence of spline based geometries that were heavily used in the early digital revolution and describes what he sees as a shift towards big data structures. Of big data, Carpo write that it is “a disorderly offspring of postmodern digitality, is a tool for coping with, managing, and some would even say extolling complexity” (Carpo, 2014). The problematic created in echoing Carpo’s work is that Middle-Eastern material culture is both, relevant to big data in that its digitality, to use Carpo’s term, produces high resolution field conditions whose underlying structures that cannot be immediately discernable by the naked eye, but heavily reliant on line geometries, and in some specific instances, spline geometries.



2

The problematic is further echoed because the research methodology specifically adopts the practice of producing Arabesques as its starting point. After a series of teaching exercises, it was deemed dangerous to extend working on the geometric patterning techniques much further. While producing these drawings had been a fruitful conceptual and technical exercise, it seems its ubiquity has the potential to lead the research towards an undesirable form of neo-orientalism.

A COMPUTATIONAL SPATIAL CULTURE

Spatially, Middle Eastern architecture can also be viewed through a computational lens as being generative, systemic and also adaptive. Much of the historical work in question happens on multiple scales. Mosques, palaces, bazars educational forums and administrative buildings represent the urban scale, while houses and khans (hotels) represent the domestic scale. As with other complexities within the region, there are no clear definitions of public and private, urban and domestic can be made. Palaces are both public and private conditions intertwined into an organic and continuously evolving architectural construct. However, what binds these typologies together are the way in which spatial typologies are deployed at different scales.

Three main spatial typologies exist historically in the region. First is the all too

Figure 2: . Student Work - Nada Abu Shaqra.

Spline geometries are deployed to create a highly articulate formation to structure a dome space-type. Articulate spline formations operate on multiple-scales, as they form both the primary structural members but also secondary members that can be used to support different functions, *Articulate Dome*.

familiar radially driven dome space. This space-type and the resultant geometric embodiment is one of the most ubiquitous images of Middle Eastern architecture. Used mainly to roof mosques and larger assembly halls such as rulers' courts, the freedom and openness that the dome space delivers is all too relevant today given the large market demand for flexible spaces that can house multiple different functions separately or at times simultaneously. In the past, the dome-space received ornamental articulation, be it calligraphy, geometric patterning or arabesques, through a surface treatment, given the nature of masonry construction techniques prevalent in the region.

The second space-type is the typically highly structured, yet highly adaptable column-grid space. The column-grid space affords designers the same flexibility as the dome space. However, here, articulation has the potential to leap beyond surface treatment into a more materially textural and tactile condition.



3

COMPUTATIONAL SPLINE ARABESQUES

As mentioned above, after a series of teaching exercises, it was deemed more fruitful to focus collective energies on the development of novel ways to deploy the spline-based arabesques beyond surface articulation into fully structural spatial conditions. The biggest difference between initial geometric patterning exercises and the foray into arabesque geometries is their intrinsic geometric differences. Geometric patterns are inherently Cartesian and are characterized by their precision, while arabesques are inherently non-uniform due to their algorithmic structure which leans towards interpolation as opposed to uniformly defined precision. Splines are not novel conditions in architecture. Greg Lynn led the drive towards spline geometries in 1990s. What is highly relevant to the juxtaposition of Middle Eastern historical practices and contemporary tools is that Lynn viewed spline geometries through the lens of Baroque topologies that are in many ways indifferent to Middle-Eastern topologies.

On a poetic level, the foliage-like nature of arabesques has historical roots in the Middle East that go far beyond the emergence of Islam in the 7th century. The Tree of Life dates back to the Assyrians and Babylonians, cultures that have lived in the Middle East from 2500 BC. The motif of the Tree of Life had been present since then, as evidenced by a number of archeological findings. The political implications of this in the process of identity shaping cannot be ignored, especially when those same ancient lands face turmoil today.

Figure 3: Image by author. (a) Dome space-type. (b) Hybrid space-type. (c) Column-grid space-type.



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As the goal of this research is to find novel spatial conditions, as opposed to reproducing superficial two-dimensional patterns, much of the computational work done also takes cues from the foliage-like geometries. This directly led to the adoption of various types of branching logics aiming at generating self-structural spatial prototypes, since most of the work done up to this point cannot pretend to be full architectural solutions (Figure 3). However, as spatial prototypes, they begin to exhibit the splendor and textural articulation that the Middle East has always exhibited in its material culture.

Figure 1 and Figure 2 present two separate attempts at creating highly articulate spatial prototypes that were developed in an architectural design studio with a focus on structural expression at the third-year undergraduate level. While both adopt one of the two archetypal space-types described above, and both use the deployment and subsequent branching of spline geometries, they are different in the expression of articulation. Figure 1 shows an example of the expression of spline geometries as articulate assemblies of fixed-radii tubular elements. On the other hand, Figure 2, attempting to define a dome space, is expressed as a highly articulate formation that hints at a radically different materiality and construction method.

ARTICULATE FORMATIONS

Outside of the teaching environment, the work purposely shies away from speculating explicit architectural applications through the production of a large number of highly articulate variations. This methodology helps make robust both the technical and conceptual underpinnings of the research.

As evident in Figure 3, two distinct algorithms were developed, each focusing on the generation of one of the two described above space-types. A big component of the computational work done here is the branching logic that allows each formation to become a singular holistic highly articulate formation.

The way this work attempts to bring together much of the research above is through generating highly articulate architectural prototypes that are both

Figure 4: Image by author. Dome space-type 3D print (32cm x 25cm x 25cm), *Domeness*.

ENDNOTES

1. Mclean, John, and Moses Hadas. *Ten Plays by Euripides*. Toronto: Bantam Books, 1981.
2. Rabbat, Nasser. "What Is Islamic Architecture Anyway?" *Journal of Art Historiography* 6 (2012): 1-15.
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4. Said, Edward. *Orientalism*. London: Penguin, 2003.
5. Bozdogan, Sibel. "Orientalism and Architecture Culture." *The Social Scientist* 14, no. 7 (1986): 46-58.
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3. Khalili, Nasser D. *The Timeline History of Islamic Art and Architecture*. United Kingdom: Worth Press Ltd. United Kingdom. 2005.

Parts of this paper feature and build on work from a previous paper: Tabbarah, Faysal. 2014. "Teaching Computational Regionalism." *In Proceedings for ACSA Open Cities*, Seoul, 2014. Seoul: Ewha Womans University.

The first instance of Computational Regionalism appeared in: Tabbarah, Faysal. 2014. "Searching for a Computational Regionalism: A New Middle Eastern Material Culture." *In Rethinking Comprehensive Design: Speculative Counterculture, Proceedings of the 19th International Conference of the Association of Computer-Aided Architectural Design Research in Asia CAADRIA 2014*, Kyoto, 2014, 3-12. Kyoto: Kyoto Institute of Technology.

Figure 5: Image by author. Column-grid space-type rendering and fabrication process (60cm x 60cm x 60cm). At this scale, this can also be considered a highly articulate furniture.

visually identifiable through their relationship to historical arabesques, as well as spatially identifiable through their adoption of various forms of Middle Eastern space-types. Moreover, in a nod to the highly articulate ornamental historic material culture, these prototypes attempt to express the importance of ornament in the shaping of identity is through integrating ornament and structure. For example, when dealing with the dome type, which has been historically conceived as highly ornamental surface-field condition, where surface represents enclosure and fields is the domain of ornamentation, here, arabesque like lines create a highly articulate and textured field of splines that are both ornament and structure. Similar strategies occur when dealing with the column-grid type. Here, columns are both, structure and spatial ornament.

The advantages of working through computation is that the adaptability of code allows for an adaptability and emergence of novel forms. Figure 3.b shows an attempt at hybridizing the dome and column-grid space types into a novel space type that exhibits both Middle Eastern characteristics of domeness and columnness.



5

FUTURE DEVELOPMENTS

As it stands, the work has largely existed in the computational realm. For the work to truly deliver on the promise of instigating some form of identity awakening through the reintroduction of ornamental articulation to architecture and everyday life material culture, it has to leap beyond the computer screen into the physical and material world. Early explorations in material have remained at the articulate object scale. While the research aims at achieving an architectural scale where the whole human body can experience these novel regionally specific spatial conditions, these early material tests have ironically opened a door towards focusing on designing highly articulate everyday life objects that have always been highly ornamental in the Middle East such as furniture, home ware accessories such as lamps, and even jewelry. Everyday objects have as much power in the shaping of identity as does architecture.

What this project, through both its successes and misgivings, also offers opportunities for other post-post-colonial territories to attempt to begin a process of developing their own versions of computational regionalism.