Digitally Disruptive Critical Regionalism: Climate, Place and Facade

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Abstract
The history of the built environment is quite extensive as building typologies have typically evolved slowly over time. However, the International Style inflicted a ubiquitous architecture indiscriminately across the globe, forever changing the urban skyline. Separating the occupant from the outdoors while also deploying uniform, anonymous styles around the globe, modernism cast on the dweller a certain sense of placelessness. Growing environmental concern and the impact that architecture may have as negative side effects was not part of the modernist agenda, at least not in the way we understand it now.

In the last three decades, the advent of digital tools in architectural design has produced a profound impact on architectural language. It is not a mere change in the way architects think or design architecture, it entails a significant transformation of the discipline in various groundbreaking aspects which affect the whole creative and materialization processes. Digital culture in architecture entails a shift of paradigm that goes beyond the tool to modify the conception, the design process together with the project’s own materialization. The question is then, in relation to this research, how can digitally disruptive architecture contribute to rethink the idea of critical regionalism in response to façade design and climatic conditions?

Background
The International Style emerged early in the 20th century as an embrace of industry and globalization (Frampton 1992). The movement welcomed a revolution of ‘new’ materials including laminated steel, plate glass and reinforced concrete as an architectural response to its time (Eldemery 2009). After the 1932 exhibition at the Museum of Modern Art, a new ‘modern style’ was coined, its syntax most notably disassociated the façade from the function of structure (Hitchcock 1951).

Transparency soon became an icon of modernity (Oeschlin 1997) made possible by the invention of the curtain wall. This system proliferated as the predominant building enclosure method in Europe and America and quickly became the symbol of economic growth and prosperity in the West (Oldfield, Trabucco, Wood 2009). This modern syntax resulted in a considerable uniformity; its most conspicuous image was based on regularity and gridded glazed facades that would become widely disseminated (Mies’ Seagram building could well illustrate this modern high-rise2 canon, Figure 1).

Regionalist Response to Modernism
Despite the extensive worldwide sprawl of modernism by the mid 1950’s, it became evident that the imaginary and the universalization of this syntax was not ubiquitous. A new concept, Critical Regionalism3, emerged, partly in response to the implicit critique of the international style’s eurocentrism. The idea of placelessness of such a uniform style was patent in the critical discourse enriched in time due to its weak (or nonexistent) relation to local culture and tradition of place itself (Norberg Schulz 1979). Critical Regionalism was a response rooted in place not mimetically vernacular. It was a critical local reading of the modern legacy which ought to be reinterpreted and enriched,
while rejecting historicist postmodernism (Frampton 1983).

Defining ‘Place’ – Climate and Culture
Climate control was associated with social status and was symbolically man’s victory over nature (Brager and de Dear 2008). Early office towers\(^4\), such as the Home Insurance Building in Chicago (1885), used operable windows for ventilation, lighting and the control of passive solar gains (Figure 1). Less than 50 years later, the first air-conditioned office building, the Milam Building (1928), was completed in San Antonio, Texas. Air conditioning soon became an expectation of the modern workplace necessarily reliant entirely on mechanical solutions. Despite the energy implications for which modernists were initially unaware, the move from open, naturally ventilated spaces to completely sealed environments narrowed the range of acceptable thermal conditions alienating interior from exterior. Something which further contributed to modern placelessness.

The sealed-glass archetype decoupled inside from out, disrupting energy flows through the building\(^5\). Developed largely for cold and temperate climates, the significant increase in the glazing increased solar gains too. Although Le Corbusier once favored “a single house for all countries, all climates” under the functionalist ideal of the *machine d’habiter* (cit. Torres Cueco, 2004, p.133), he became increasingly concerned with climatic control. His original proposal for the curtain wall in the Centrosoyuz Building in Moscow (1928), featured the ‘mure neutralisant’ and the ‘air exacte’, his early air conditioning and mechanical ventilation systems\(^6\).

The *brise-soleil* was made famous by Le Corbusier and further developed by the Brazilian modernists. The most celebrated building of this sort was the Ministry of Education and Health of 1945 (Figure 1) by Costa, Reidy, Niemeyer\(^7\). Le Corbusier, became aware about the need to adapt the modern syntax in relation to climatic needs. His collaboration with Missenard and Xenakis\(^8\) helped him to achieve some of the finest designs in India.
Nouvel’s kinetic façade for the World Arab Institute in Paris (Figure 2), is a technological update of the brise-soleil. The abstract reference to Arab geometric ornamentation can be considered a cultural reinterpretation of vernacular Islamic architecture too.

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In most cases, if not all, façades need not be completely glazed. Overhangs and louvres can be introduced to cast shadows depending on the orientation. In addition to the seasonal control of heat, external shading had other compelling attractions such as “the strong spatial character that reinforced the depth associated with mass walls to thin curtain wall construction” as well
as “regional specificity to location and climate” (Braham 2000), adding “new elements to the architectural vocabulary, and phrase a truly regional consciousness” (Olgyay 1976).

If architects want to maintain the curtain wall effect with the transparency and maximization of light, while avoiding many of the problems generated by the solar exposure and the flaws to this regard of modern language (Kelley and Johnson 2013), they may consistently improve the energy consumption in climates where the solar radiation is more significant.

Architectural disruption involves a radical innovative transformation of architectural syntax, a shift that succeeds in embodying the zeitgeist of its age, contributing to set a new aesthetic framework displacing the existing. In fact, this paper holds that digitally conceived architecture can work on the idea of superimposed diffractive skins and latticed façades to achieve a more effective approach to this problem. This can be considered digitally disruptive in relation to façade design and the modernist precedent of the plain curtain wall.

Climate is a well-studied science and its indicators are quantifiable. Though day-to-day weather conditions may vary from average conditions, climate is relatively predictable. Culture, on the other hand, is more nuanced. However, culture is partly informed by a region’s climate, as evident in clothing and vernacular architecture.

Figure 5. Thorn Faulders Architecture. *Airspace Tokio*. 2007.
The Jaipur Palace of the Winds (Hawa Mahal, 1799), for example, shows a historical approach to this kind of design strategy. Here, the latticework façade was used to conceal the royal ladies within while allowing their gaze towards the street and, additionally, allowing cooling breezes to pass through the façade. In the same way that Le Corbusier and the Brazilian modernists embraced the thickness of the *brise-soleil*, latticed transparency (Marcos 2012) allows to step over the limitations of literal transparency characteristic of some of the modernist designs (Rowe, Slutzky, 1963). Lattices allow transparency to different degrees, depending on the balance between the openings on built geometry. Seemingly opaque patterns still allow for transparency, especially from the interior towards the exterior.

Digital tools in architecture still require the thoughtful hand of the architect to identify parameters and priorities\(^1\). Parametric designs in combination with digital fabrication have generated different examples of latticed façades that benefit from this kind of design strategies.

The revolving-bricks façade designed by Farhad Mirzaei in Arak (Figure 3) is an excellent example of how digital tools may help to define new ways in which to address materiality while addressing the idea of latticed façades. Developing the ideas that Gramazio and Kohler popularized with their celebrated façade for the Swiss winery in 2006, Mirzaei reinterprets parametrization with a conventional material - brick - that is conceived as a veil over the glazing of the building, protecting it from strong solar radiation while showcasing a contemporary design\(^2\). Moreover, the latticed façade design can be enriched with diffractive effects. What is most remarkable about the effect of light diffraction is to achieve transparency despite apparent opacity. Thanks to the possibility to build perforated skins warping the building the effect will invariably remain because of the physical diffraction effect - light peeping in through tiny perforations on the surface and yet allowing it to go through them and see the exterior from the inside. Varied and changing day and night effects may be achieved as the transparency flows from outside to the interior in the daytime while it reverses at night. Depending on the light intensity, this diffractive transparency effect may serve in one direction or the other (the most intense will prevail).

Recently, such an effect has been wonderfully accomplished in the latticed diffractive façade designed by Architectkidd for the Street Ratchada in Bangkok commercial center (Figure 4). A complex triangulated paneling alternating diverse density perforations and opaque elements achieve a stunning façade superimposed to the glazing to reduce solar gain in the daytime while producing sharp night lighting effects enhanced by led illumination. Thus, what could have been an anodyne glazed façade has become, in fact, a very characteristic image in Bangkok’s urban busy area.

Another approach to latticed façades and the idea of a superimposed skin warping up the glazing has been addressed by many digitally conscious architects keen on parametricism. Schumacher (2009) has claimed this should be considered a global style, and although this position is probably excessive, parametric designed skins has been one of the hallmarks of computationally designed architecture in the last decade and a half. Thom Faulders’s Airspace Tokio project (Figure 5) is a good example of this kind of façade which, in as much as it reduces the amount of exposed glazed façade it is an improvement with regard to solar gain. It addressed this kind of latticed transparency that was built on a site “previously wrapped by a layer of dense vegetation” (Iwamoto 2009, p. 54).

Conclusions

As other syntactic clichés of modernist architecture, the curtain glazed façade became a stylistic feature associated with modernity and prosperity, despite its flaws. The universal adoption of air conditioning, high-rise buildings, and curtain wall technology all within the span of a single generation, not only did generate a significant impact on the urban skyline but also a lacking sense of self and place.

Many regions sacrificed their local identity and age-old construction techniques for the sake of Western building styles as symbols of power and prosperity, giving way to a ubiquitous placelessness among modern buildings, an overall detachment from nature and ecological degradation.

In response, this paper explored how to reference the past with current digital tools, analyzing different ways in which to design glazed façades, especially in latitudes alien to
most of the western countries’ climatic conditions where mid-century technological innovation occurred. Digitally designed latticed and diffractive skins are a critical reading of the modern curtain wall which, in addition, may find ways in which to reinterpret local traditions avoiding mimetic and superficial approaches and following a computational logic.

Using the defined parameters of climate, one can begin to use digitally disruptive means to achieve a regionalist approach to contemporary architecture, preserving both energy and the sense of identity.

New materiality characteristic to CAD-CAM convergence and customized mass production allow to think of these proposals as a new critical reading to architectural modern legacy in the context of digital disruption.

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Endnotes
1. Ian McCallum, the executive editor of Architectural Review, described the curtain wall as “the new vernacular” in 1957 (Yeomans 1998), probably spurred by its ubiquitous sprawl.
2. High-rise towers emerged quickly and universally, triggered by the adoption of steel structures, the invention of the elevator (Koolhaas 1995, p. 500), and the increasing accessibility of mechanical conditioning technologies. The international style set a uniform enclosure for high-rise buildings. This typology was simple: a curtain glazed façade with set-back columns and an internal core comprised of vertical communications and services - the rest a flexible space.
3. Lewis Mumford was one of the first to address these issues in the 1940’s in what some have referred to as the ‘Regionalist Rebellion’ (Lefaivre, 2003).
4. This generation of buildings was bulky and compact with load-bearing masonry walls and only 20-40% glazing, as compared to the 50-75% glazed facades of modern buildings (Oldfield, Trabucco, and Wood 2009).
5. The premanufactured nature of the curtain wall demanded caulking and sealants that in turn suppressed the potential for natural ventilation strategies.
6. In his Cité de Refuge for the Salvation Army in Paris (1929) he had been sued and forced to place windows at his cost as the system didn’t work as expected. He was able to replace all the enclosure of the façade due to war bombardments and took the opportunity to add a brise-soleil in 1942 (Dimitris Papanikolaou and myself shortly after my arrival).

References


