

## BOOK REVIEW

# Digital Fabrication, Architectural and Material Techniques Iwamoto, Lisa

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Digital Fabrications is one of many progressive Architectural books that encourage young architect to explore the world of digital design. Lisa Iwamoto is explain the collaboration of digital design and geometry-findings process. There are five cluster of explanations in this books that explains the types of geometrics organization, such as tessellating, sectioning, folding, contouring and forming. This category allowed readers to understand the process of complex form and geometry from the presented examples. Iwamoto is categorizing projects from emerging practices of Architects that pioneered fabrications techniques. Each category was explained by five to seven unconventional projects.

Digital drawing has been known for more than thirty years. CAD program are known as the most efficient drawings application. Yet for many years, the technology of drawing shifted from traditional, CAD (Computer Aided Drawing), BIM (Building Information Modeling) and lastly Generative Design. CAD enables to replace traditional tools but the buildings still looks the same. One form and two dimension representation can be solved but it takes three dimension simulation and fabrication technologies to expand the ideas of architecture's form and construction process. Digital Fabrication is the answer to the changing times that occur in the world of Architecture and design.

Nowadays, Architecture or building technologies are heavily informed by its representation and construction because of the development of digital media and emerging technologies. Particularly, digital fabrication was believed as a trigger for design revolution. The invention and innovation that has been done by progressive Architects are shifted into another level. Material Techniques and digital knowledge bridge the simulation model that can only be seen in computer into physical artifact. This theme is the main subjects of his books. Robin Evans explains that the separation between drawing, drawing as medium and building as the end result are become less. Drawing is an informative medium of design, digital production narrows the gap between representation ideas and building. However there's still a invariably gap among the modes of making. Facing this

situation, there are still some technical tools that can be used but every tools has their own constraint.

Digital fabrication has a capability to document the architecture process through digital design and innovative constructive projects. Some examples explains why digital fabrication sparks the new generation of designers. The examples was beautifully curated by Iwamoto, it is focusing on work that designed and built by emerging digital practices and supported by fabrication process. By means, this projects was done by many practitioners and architecture students. The case shows that digital fabrication is a form of applied design. Architects that involved in projects are mostly seeks leverage of digital design and manufacturing process for perceptual, spatial and formal effect. Iwamoto realizes that buildings consist of series of parts, the assembly process are strongly depend on techniques of aggregating and manipulating.

### **The Five Cluster type of Geometric Organization**

Digital fabrication brings Architects to experience the perception of their creations. In this books there 5 category that mentioned by Iwamoto, there are Sectioning, Tessellating, Folding Contouring and Forming with five to eight examples each.

#### **1. Sectioning**

Sectioning is a session there was a comprehensive explanation about the history of sectioning method. Sectioning is a part of constructions history. This method was a usually being used to construct the surface of airplane and shipbuilding industry. The shape of airplane and ship building were firstly defined sectionally as a series of construction elements. This method was adopted by Le Corbusier to study the construction of Ronchamps Roof. It can be seen on a paper model of Ronchamp during its internal construction studies. Frederick Kiesler works was also related to digital fabrication context, especially for endless form. Greg Lynn uses the digitally generated sectioning method as his legendary influential design methodology. From this explanation, Iwamoto clearly explains that there is a history relevance between digital fabrication and the evolution of form during early modern era. SHoP Architects presenting the sectioning method in a good combination form and perceptual elevation. This projects won P.S.1's young Architects program. This installation was built and designed by architects self. Dune scape is an architectural landscape element, constructed by a series parallel and stack of lumber. The methodology was completely digital driven, the manual workers needed to cut, assemble and fasten the joinery during actual construction process. The works of Mafoombey also a good example of sectioning method that related to function. Mafoombey build an installation out of corrugated cardboard. The build form is free curvy space that was constructed by a stacked of cardboard. All of 360 layers of seven millimeter cardboard are cut by controlled cutter machine that operated under computer.

LOOKING FROM TOP LEFT:  
 SHoP Architects, *Dunescape*, 2001.  
 Final installation at MoMA/RSJ, Queens,  
 New York, Photo: SHoP Architects.  
 Preston Scott Cohen, *House on a  
 Terminal Line*, 1997. Laser-cut model.  
 Photo: courtesy Scott Cohen/Cameron Wu  
 Jakob + MacFarlane, *Loewy Bookshop*,  
 Paris, 2001, Photo: courtesy Jakob +  
 MacFarlane  
 Alvaro Siza and Eduardo Souto de Moura,  
*Serpentine Pavillion Gallery*, London,  
 2005. Grid-shell lamella structure.  
 Photo: Pietro Russo

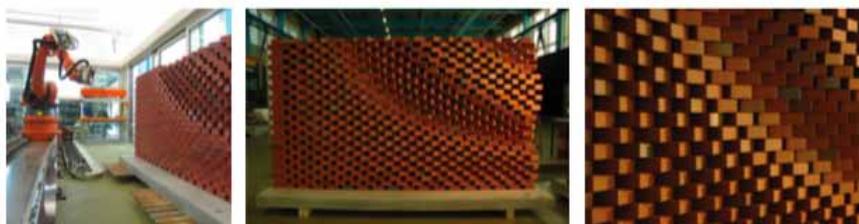


## 2. Tessellation

Tessellation is a collected form that applied on a form or surface. Tessellation are known during ancient Rome and those Byzantine Empire to the screen wall of Islamic Architecture to filter the lights, define space or convey symbolic meanings. Tessellation are strongly related to handcraft culture and digital fabrication gives a different point of view for producing the work of tiling. By working digitally, user can produce nonconventional modules and not depend on standard fabrication. Iwamoto takes the explanation of tessellation definition into another level, digital works reduces handworks constraint. Applying material on curved surface become predictable and creating a fluid process. This explanation makes readers realized that tessellating can be relevance for large scale of building complex. Buckminster Fuller's geodesic dome is one of the early examples, how tessellation principles applied on large scale objects. The Structure was light and its designed for mass production. In 2007, Brennan Buck designs a life-scale prototype that constructed by doubly curved, designed digitally but the fabrication technology is completely standard. This installation consist of fourteen hundred uniquely cut flat panels and it creates a seamless elegance of curved surface. Bucks presents a kaleidoscopic study of three dimensional pattern in an unconventional approach.



Fabio Gramazio and Matthias Kohler,  
*Dormeters Lounge*, ETH Zürich, 2007.  
 Plan and elevation; industrial robot  
 laying brick; completed project.  
 Photos: Gramazio & Kohler



### 3. Folding

Folding is a powerful techniques to turn flat surfaces into three dimensional form. Folding structure has an ability for self-support and wide span structure. Folding principles has been embraced by architects for more than fifteen years and Iwamoto explains this principles in a scope of material operation. The works of Chris Bosse explains the application of folding principles as origami installation that was designed digitally. Each origami modules was made from cardboard.

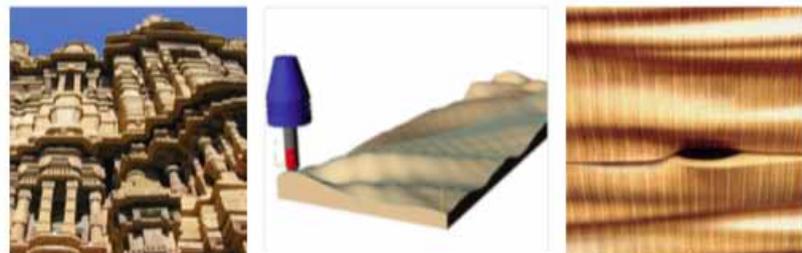
CLOCKWISE FROM TOP LEFT:  
 Baliseokay Klugeyppop, origami instructions.  
 Jern Utzon, Sydney Opera House, Sydney, Australia, 1973. Photo: Craig Scott  
 Walter Netsch/Skidmore, Owings & Merrill, Air Force Academy Cadet Chapel, 1962. Photo: Bryan Chang  
 FOA, Yokohama International Port Terminal, Yokohama, Japan, 2002. Photo: Georgia Ewen-Campbell



### 4. Contouring

Contouring is method to stack flat surfaces to construct 3d objects. Digital fabrication enables this method to transcend the idea of handcrafting in unorthodox practices. The works of Erwin Hauer was supported by this principles named Bone Wall. This works is a group of cell's shape object that should be deformed along the composition of general shape. Each shape has a different scale and unique forms. Contouring method make this installation done smoothly.

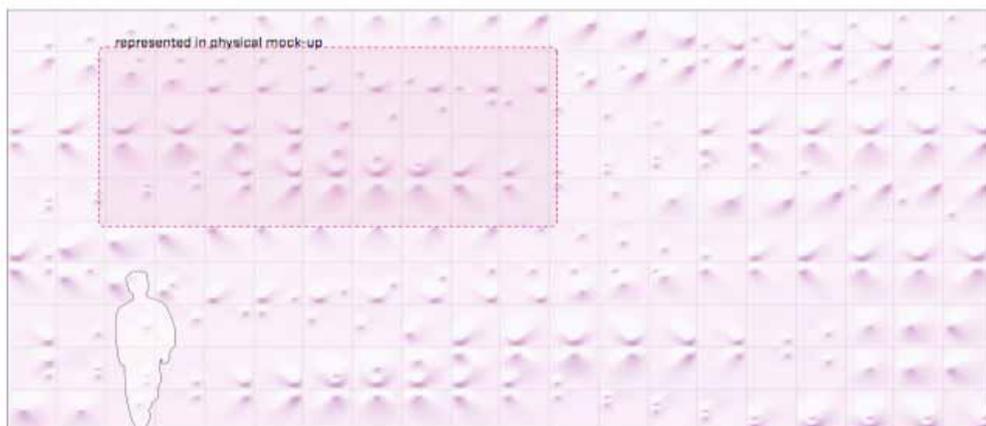
FROM LEFT:  
 Golden Fort, Jaipur, India. Photo: Pavan Gupta  
 Example of tool-path visualization. Photo: Matt Bitterman  
 Office dA, Laszlo Fels, Graduate School of Design, Harvard University, 2002. Detail of drawer pull. Photo: John Horner, Office dA



ABOVE: Freshly milled panel, single panel, installation on-site.  
 BELOW: Routed surface texture.

## 5. Forming

Forming is a mass production method that applicated into Architectural projects. From Iwamoto's explanation, readers can understand the principles of digital fabrication and using it as a ground support knowledge for developing digital design approach.



ABOVE: Final pattern with call-out for physical mock-up.  
Illustrators: Michael Ben-Meir, Kyle Miller, Marcin Szefer  
BELOW: Completed installation.  
Photo: Lindsay May Photographs.