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Mixing Algorithms in Urban Analysis and Transformation

In his research addressing tactics within architectural design studies, Donald Schön identified the possibility of “imposing an arbitrary discipline” as a means of reframing design problems. Schön noticed that designers (such as architects) as grids) as a means of overcoming “stuck” design situations. Scholars who later imposed arbitrary discipline like design moves lacking normative justification. The fact that unintended consequences follow arbitrary impositions is not in itself remarkable. However, the possibility of arbitrary design moves which can result in positive value has important implications for both architectural design and urban representation as a means of re-seeing the familiar.

Given as input an image of any size, it is a simple technical process to slice a digital image according to a vertically-sliced RMA may, as in the case of the image of Jaipur, prompt a visual recognition concerning the presence of horizontal bands, followed by a recognition of commonalities and differences between first- and second-order features. Or, as in the case of the map of Jersey City, the vertically sliced image may prompt a visual recognition of the tendency of red and black lines to run at 45-degree angles to the image edges, followed by insight concerning the correctness of free-riding on existing urban infrastructure. In many cases, the image of Jaipur may prompt a visual recognition of white and black blocks which correspond to different areas (e.g., “parks” or “alvs” (latticed screens) within the building elevations. Certainly, the recognition may be reinforced visually by other means, but the fact that mixed images are capable of prompting these kinds of insights is significant.

The act of comparing mixed images to original images, or of comparing vertically sliced to horizontally sliced images, emerges as a way of generating insights with respect to the relative to original image, and randomly mixed images may prompt visual recognition of an overall balance of color and tone, followed by insights concerning the overall balance of (for example) solids and voids within an elevation of an urban street, or of the image of Jaipur, prompt a visual recognition concerning the presence of horizontal bands, followed by a recognition of commonalities and differences between first- and second-order features. Or, as in the case of the map of Jersey City, the vertically sliced image may prompt a visual recognition of the tendency of red and black lines to run at 45-degree angles to the image edges, followed by insight concerning the correctness of free-riding on existing urban infrastructure. In many cases, the image of Jaipur may prompt a visual recognition of white and black blocks which correspond to different areas (e.g., “parks” or “alvs” (latticed screens) within the building elevations. Certainly, the recognition may be reinforced visually by other means, but the fact that mixed images are capable of prompting these kinds of insights is significant.

Digital models.

Like photographs, digital models constitute a growing documentary genre, with organizations like Google, NASA, and the National Geographic Society maintaining online archives such as Google Earth and the Google 3D Warehouse. In my research, I consider a model of a structure modeled according to a vertically-sliced RMA may, as in the case of the image of Jaipur, prompt a visual recognition concerning the presence of horizontal bands, followed by a recognition of commonalities and differences between first- and second-order features. Or, as in the case of the map of Jersey City, the vertically sliced image may prompt a visual recognition of the tendency of red and black lines to run at 45-degree angles to the image edges, followed by insight concerning the correctness of free-riding on existing urban infrastructure. In many cases, the image of Jaipur may prompt a visual recognition of white and black blocks which correspond to different areas (e.g., “parks” or “alvs” (latticed screens) within the building elevations. Certainly, the recognition may be reinforced visually by other means, but the fact that mixed images are capable of prompting these kinds of insights is significant.

Discerning value within the found or arbitrary.

The value of serendipity in science is well-known (Foster and Ford, 2002; Roberts, 1998). The idea that explicitly stated hypotheses are unnecessary in order to analyze datasets for patterns or trends, and that tools designed to “tame situations” heightening the likelihood of accident.

Schön and the arbitrary.

In the 1970s, Donald Schön, then a professor at MIT’s School of Architecture and Planning, participated in a study of architectural design process driven by randomization. In comparing manual and digital media, in both cases, Schön emphasized the heuristic nature of digital tools and the possibility of intervening with random numbers, mis-scoring, or problematic translation effects.

The results of the study, which Schön and his colleagues conducted, are significant: Neither the explicit design tools nor the arbitrary discipline necessarily resulted in unpredictable architectural design. Instead, the imposition of an arbitrary discipline did not require randomization. Schön found situations, even (or perhaps especially) if those situations were acknowledged as legitimate influences (Kolson, 2001; McLaughlin, 2003; Roberts, 1989). The idea that explicitly stated hypotheses are unnecessary in order to analyze datasets for patterns or trends, and that tools designed to “tame situations” heightening the likelihood of accident.

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To test whether the tools were oblig- ed to include a randomizing component. In Schön’s view, “the imposition of an arbitrary discipline” as a tactic for re-framing design problems operated on the assumption that which Schön encountered a problem which she was unable to resolve using known methods. Specifically, Petra found herself unable to fit discrete architectural volumes onto a sloped site. In the face of this dilemma, in order to proceed, Schön decided to impose an arbitrary discipline (a grid) over Petra’s drawing, which trans- formed the original problem into a new problem capable of resolu- tion. Schön’s assumption was that the impos- tion was characterized as arbitrary, it was ordered rather than imposed. Except when introduced by a means of violating or normative justification, it functioned identically to a “design move,” part of what Schön elsewhere called the “seeing-moving-thinking cycle” (Schön, 1992). The fact that normative justification was not apparent in the current context, Schön argued, did not make the arbitrary discipline obsolete. Instead, it could be expected to perform an important function in design processes.

Herbert and the imposition of randomness.

In a 1997 paper concerned with issues of metaphor and ca- lculus of the algorithms into readily available software (e.g., Adobe Photoshop’s Actions, or AutoLISP running within AutoCAD). The inclusion of this readily available software opens up a realm of new possibilities because of the multitude of ways in which digital models can be made visible to design decisions, including urban design, urban representation as a means of re-seeing the familiar.

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Berlin noted that computer-aided design (CAD) software included software imposes an arbitrary discipline of categories and rela- tionships, as for example when the software prohibits actions otherwise be produced by randomizing processes. Thus, pro- Minsky, designing an addition to his own home in Eugene, Oregon. Her- bert noted that computer-aided design (CAD) software included software imposes an arbitrary discipline of categories and rela- tionships, as for example when the software prohibits actions
The value of mixing algorithms to urban analysis does not derive from hypothesis verification, but instead from how the algorithms enable researchers and designers to re-see the familiar, thereby expanding the range of possible observations; this approach true whether a photograph or a digital model is used as a source. The work described here, though initial in scope, demonstrates how designers, analysts, and researchers concerned with urban morphology and transformation can benefit from the ways in which mixing algorithms enable researchers and designers to re-see the familiar, thereby expanding the range of possible observations; this approach true whether a photograph or a digital model is used as a source. The work described here, though initial in scope, demonstrates how designers, analysts, and researchers concerned with urban morphology and transformation can benefit from the ways in which mixing algorithms operate to make information visible, prompting new insight capable of provoking action and transformation of found conditions.

The first question to arise from my initial attempt to define this toolset was whether the desirable characteristics of mixing algorithms could be identified. Are there certain kinds of mixing algorithms which can be applied successfully to multiple kinds of source material? What qualities characterize a good algorithm? First of all, a mixing algorithm in order to be successful should be simple to apply, that is, it should not involve a tactical move any more complicated than Quist’s imposition of an arbitrary grid by means of tracing paper placed over a drawing. Second, it should be scalable: like Herbert’s work with CAD software, it should capitalize on the inherent functions of the software without being limited by the material relationships it is attempting to represent. And third, a successful mixing algorithm should be capable of accepting multiple forms of input (for example, JPEG images and DWG files).

The second question concerned quality assessment. Are some source materials inherently more amenable to the use of mixing algorithms than others? Can the latent potential of source materials be identified prior to the application of algorithms? For example, do panoramic images have more potential than singular, small-scale images? Are high-contrast images more interesting than low-contrast ones? Does an image which contains a variety of textures contain more potential than a singular textured image? Do digital models of free-standing buildings have more potential than models of joined buildings? How do we determine in advance whether it’s worth the time to execute a mixing algorithm on given source material?

Finally, I question the role of interpretive tactics. As mixing algorithms are applied to source materials, and new materials result, is it necessary for researchers to develop new interpretive tactics, or can pre-existing techniques remain viable? Pre-existing techniques for interpretation include asking questions about observable physical characteristics of a zone or neighborhood or city. It isn’t clear whether such questions are necessarily precluded through the use of a mixing algorithm, because mixed images and models share some of the characteristics of the source material (e.g., average color, in the case of images, or average building height, in the case of models). It is clear at this stage of the research that the act of comparing mixed material to original material is essential, for without comparison, there is a risk that the mixed artifact remains uninformative of anything beyond itself.

In future work, I hope to extend these tactics, first into the analysis of historic photographs, which as mentioned above constitute an immense resource—all which I believe to be amenable to the methodology described here. Second, into the analysis of digital models of urban form constructed by multiple designers, e.g., cities modeled in Google Earth. Like cities themselves, digital environments such as these register conflicting priorities about how the environment should be organized. These digital resources continue to expand, and it’s imperative that our toolsets keep pace.