Cultural Parametrics

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Architecture and Parameters.

The human desire for automation of repetitive processes offers opportunities for the employment of binary computing for these procedures. Architecture and the design of buildings is no exception. With an increase in industrial prefabrication of modestly variable building components, the focus of the practicing architect shifts from the individual design process toward a selection process of parts or components with a defined parametric extent. While this concept of parameterized parts has been used by architects since the first repetitive part was available, the advent of modern CAAD systems, with a growing number of parametric components and parts already integrated, is likely to greatly amplify the impact of predefined parts on buildings. Both industry and research institutions continue to make a great effort to utilize building codes and organizational structures as the basis to develop sophisticated algorithms of rule-based design. Their purpose is to parameterize designs or concepts is twofold: to reduce the time frame of human labor on the design of pieces and concepts which are considered repetitive, and, to install a control mechanism to eliminate mistakes which lay outside of the parametric framework. The implementation of these algorithms in architectural practice and in the educational environment suggests consequences on many levels. In the following, an attempt is made to cast some light on the history of parameters in respect to computing and the problems associated with a predominantly numerically encoded parametric approach.

The world is not the product of reason alone, but of the combination of reason and necessity. We must therefore make a fresh start and examine the working of necessity, the indeterminate cause.¹

Homo Faber.

Inherent in the idea of the Homo Faber is the controlled making of things. Mechanistic fabrication alone, however, has not satisfied the quest for the kind of knowledge which reaches beyond the questions of how things are crafted. Moreover, it is inherent in human nature to conduct an inquiry which departs from the mastery of manual control of means and tools into the ontology of making and of the made. This quest has resulted in an explicit development of theoretical models to contemplate intelligently the complexity of the made object and designate its rank and significance within a larger, existing universal world construct. In the realm of architecture, it is perhaps permissible to identify among these constructs a (general) theory of architecture. Its purpose is simply to formulate and, more importantly, to confirm the existence of the phenomenon 'architecture'. It may then be reasonable to distinguish between this theory of architecture and the numerous individual architectural doctrines, manifestos, theories and hypotheses, which have accompanied historical events through the course of time. Frequently situated within immanent systems of thought, the latter constructs attempt to explain a particular structure of architectural thinking, or, in other words, to furnish substantial reason as to the paradigmatic nature of the dominant formative influences which support the architectural making within this framework. Ultimately, it is the establishment of an architectonic theoretical construct, which does not allow the idea of the Homo Faber to suffice, but mandates the evolution of the not only civilized, but also cultured Homo Sapiens with a reflective, intellectual capacity. Due to this contemplative capacity, a continuous development of new thought and the evolution of new systems is finally possible.²
Modes of Contemporary Knowledge - The Epistemological Crisis.

The basis of any kind of parametric construct is some form of knowledge. A crude analysis of the taxonomy of contemporary knowledge suggests two major streams of thought, Rationalist and Empiricist, as influential in the acquisition of modern knowledge. Therefore, in the study of parameters, it seems appropriate to briefly discuss these roots of contemporary thinking as they contribute to the formulation of parametic systems.

A prime example for the friction between these two predominant world views can be found at the beginning of this century. Husserl's thesis in the essay "Philosophy and the Crisis of European Man" (1935) names as the reason for the deterioration of Western thought the consequence of uncritical reliance on modern self-referential empirical sciences. The extensive success of the empirical method, which even Husserl considers an outstanding accomplishment of the human mind, has also nurtured a prejudice against the encompassing "universal science of the spirit." Husserl regards the mere "physico-chemical explanations" of the "life" world and the absence of phenomenological essentials of a thing in an intellectual thought as an insufficient assessment of a given object, and subsequently an insufficient assessment of the "life" world.

Husserl's diagnosis is appropriated to architecture by Perez-Gomez (1983) who suggests that the demystification of geometry, paralleled by the development of natural scientific methods, is chiefly responsible for dismantling the spiritual dimension in architecture. Instead of myth as a structuring device, the world is made intelligible through the postmodern immediate cause-effect relation of things and events. The retreat of this vital constituent fundamentally undermines the existence of architecture as the powerful contributor to comprehensively order the spiritual world of man. While this may do injustice to the complexity of Perez-Gomez's work, the underlying structure, aside from the direct influence of Husserl, is derived from the polarity of two competing worlds of thinking. He denotes the epistemological difficulty between the relativistic world view and its idealist counterpart as preparatory to an invasion of reductionist logic in architectural thinking, eliminating the tight symbiosis of mythos and logos as construed in the classical paradigm. The actual crisis may be seen as the consequence of Heisenberg's theory of uncertainty, which points out the limits of classical physics by stating the dependence of the accuracy of the result on the method of observation. Therefore, the very foundation of modern science, namely the 'objective' correctness it claims through its scientific methods, is undermined.

Information Theory - Origin of Contemporary Computing.

Perhaps the invention of binary encoding of a message system as vehicle for information, described in Shannon and Weaver's "Mathematical Theory of Communication" (1949) stands out as one the culminating reductionist achievements. Shannon's contribution was the quantitative determination of the message channel based on the removal of uncertainty through the function of probability, while bracketing the semantic content of a message.

Shannon credits Hartley for the principal mechanism of the logarithmic function as a convenient measuring unit for various reasons. Aside from the mathematical practicality of economically encompassing the number of increased choices over time, "intuitive feeling as to the proper measure" has led to the development of the binary digit ('bit' after J.W. Tukey) as the base two logarithm, measuring the quantity of information. With the development of computing devices structured after Shannon's theorem, the research community in the natural sciences enthusiastically pursued the encoding of their world into a highly complex binary notation system, adhering strictly to the premise that information is defined as a function of its (binary) uncertainty. The invasion of commercially available computers accelerated this binary avalanche into every conceivable corner of the Western world.
Scientific Premises in Architecture.

These efforts in the natural sciences found resonance in architecture as well. A. Tzonis (1990), for example, provides an insightful cross-sectional account, starting from the first notable attempts in architecture to employ computable information, by Chermayoff and Alexander as representatives of the "analytical paradigm", all the way to the current efforts in artificial intelligence. Tzonis attributes the failure of this approach toward architectural design mainly to the limited parametrization capability of a design process which remains quantitatively beyond a binary control. In other words, only a small fraction of the enormous volume of complex parametric relationships usually necessary for critical decisions in architectural design was suitable for a computational procedure.9

Tzonis concludes that the "analytical paradigm" was not able to survive due to the necessity to oversimplify the parametric conditions of the design process. Many form-giving vectors had to be crippled or truncated because of their complicated constituents or their great ambiguity, when appropriated to a binary perspective. The difficulty of dividing up an infinite entity into finite components led to the assumption that the focus of research had to concentrate on developing a method of eliminating the vast quantities of binary uncertainty.10

Tzonis considers the allocation of synergetic balance between efficiency and effectiveness the crucial contribution of an architect who is able to discriminate with his senses against unlimited possible, yet unreasonable, solutions. Consequently, he suggests an analogous pre-parametric framework resembling an architectural thought process with intelligent discriminating capabilities. While the previous analysis employs common sense and leaves hardly any room for disagreement, Tzonis's suggestions move into the realm of speculation when he goes about his analytical depiction of Le Corbusier's thought process during the design of the Unité d'Habitation. The result, a diagrammatic flowchart, serves as a structure for this pre-parametric approach11. While the analysis itself is interesting, even insightful, Tzonis selects and presents his findings in a mostly pragmatic light12 perhaps to provide a transitional mechanism based on a direct cause/effect relationship, which obviates the prerequisite of a parametric or pre-parametric binary oriented framework.

The use of an analogue model in Tzonis's approach to covert a complex taxonomy of architectural knowledge into an information-based Boolean-operation system, is not atypical. The reason for this approach lies in the inference which can be drawn from analogue models.13 The logical structure of an analogue model permits a description of its internal relations through often empirically determined quantities, residing in an algebraic precision. The surface precision of these kinds of models is essential to a computational transformation which mandates a clear mathematical mechanism.

Vectors of Form.

The previous research efforts could be paraphrased as the allocation of form-determining forces based on their statistical frequency. (See Figure One)

These models are made operational through an acquisition of finite boundaries (parametric range), to pursue a twofold objective: the determination of the central tendency and the elimination of the theoretically unlimited number of forces, thus eliminating those with a low probability of impacting the actual form of an object. Each force inside the parametric range can be parameterized in itself. Ultimately, the forces become a part of a model with formal-logical rules. A working model should be able to simulate the combined action of all involved forces and predict or propose a meaningful outcome. This premise is in principle perfectly reasonable; the focus of the following is to scrutinize the acquisition tools, the determination of a parameter boundary, and raise some questions as to their appropriateness in the architectural design process.

Para-meter.

The expression parameter is frequently used in
Figure 1: Forming Forces

General form as the resultant of forces is represented by the area underneath the normal curve.

Objects possess form if a group of forces is dominant and provokes a reaction. The influence of all other possible forces decreases toward the outside.

Figure 2: Efficiency/Effectiveness Problem of Setting Parameters

Form as the resultant of most probable forces can be found in the efficiency range of forming forces. Prototypes stay within a confined range.

Determinants of form outside the efficiency range are considered negligibly minor and therefore omitted.

Figure 3: Forces of Form in Aircraft vs Architecture

The high efficiency of aircraft form is based on narrow parametric range. Pragmatic forces dominate this design approach.

Architectural form as a result of a much wider parametric range cannot achieve the same efficiency but has the possibility to perform more effective.

Figure 4: Forming Forces of "Unconventional" Origin

A vector, such as the invention of a new material with an undetermined pragmatic value is taken into account. Form changes accordingly.

In architecture, form changes also occur when the corresponding meaning of the new force is contemplated.
an ordinary sense to indicate the existence of a framework, or the absence of arbitrariness, in which events can be placed. Parameter in mathematics determines "an independent variable through functions of which other functions may be expressed." In professional environments however, a parameter is employed mostly in its statistical significance: a variable which is allocated via evidence from samples, or, "a quantity that describes a statistical population." In this context, Webster's second definition by T.P. Weldon is perhaps the most relevant: "an arbitrary constant characterizing by each of its particular values some particular member of a system." As pointed out before, mathematical rigor requires the substitution of a collection of distinct individual cases (or quantities which characterize a part of the universe within their probability limits), with a definite numerical value. Those sciences, with vast amounts of task relevant data available for which a quantitative analysis can be performed, have had great success in formulating a retrospective mechanism toward solving a problem. The example taken from aircraft engineering will help clarify this.

**Parametrics in Engineering.**

In the design process of an aircraft, the necessity to fly introduces an enormous number of constraints. This imposition suggests that a still unlimited, but perhaps more finite number of formal solutions is possible. The constraints come into existence through the inductive retention of accepted approaches to flying; that is, for example, using the antecedent notion of (in this case fixed) wings which essentially make flying possible by a formal response to the properties of air, more precisely air flow around an airfoil, generally the wing.

The pressure differential between the faster and slower air flow provides the net lift to overcome gravitational forces which perceive as flight. This concept is so essential that it is common to basically all aircraft, from sail planes to pilotless Tomahawk Cruise Missiles. Due to this prevailing formal concept, the solution to the problem of flying is principally defined. As a consequence, a wing is the synergistic result of a prototypical formal constraint. Similar constraints reside in the definition of fuselage, tail, nose, engine, and other parts, all of which are, trivially speaking 'more or less' common to a what is considered an 'aircraft'. The 'more or less' expression naturally describes a range of values which in this case are directly synchronous to the form. As other constraints, such as the type of mission, are added, the parametric ranges for all involved functions are drastically reduced and narrowed down toward a critical mass which can be determined as finite. This determination of a finite entity is absolutely mandatory for a subsequent computational procedure. The form of the crucial components, wing, fuselage, etc., are incrementally computed and compared with each other. Various algorithms for the comparison and selection process have been developed to further optimize the procedures. Ultimately, the mathematical model of an anticipated aircraft is subjected to outside testing, such as a wind tunnel simulation, etc., to provide an external measure of the result.

Noteworthy of the success of this parametric approach to designing an aircraft is that it depends mainly on two points. First, that the number of essential components and subcomponents must be within a narrow 'efficient' range. High efficiency simply demands a number of parts small enough to permit the establishment of interrelations. (See Figure 2)

Secondly, the formal solutions of the parts to be parameterized which lie outside of the realm of 'reasonable' must be 'effectively' eliminated; in other words, the range of uncertainty must be determined. In the aircraft case, the determination of the parametric boundaries is based entirely on pragmatic design criteria which, in concept, do not permit any forces to take influence on the design which are considered 'probably' impractical.

It becomes clear that without a precise definition, or pre-definition, of not only components, but more importantly, of the entire synergistic 'organism', the range of uncertainty with influence on form would simply exceed the present mathematical capabilities. Perhaps in this sense, this process can only operate with the mathematical encoding of a formal nucleus.
Another analogy could be borrowed from biology. The 'genetic material' of an aircraft exists in its restricted parameterized and interrelated components. Thus, only variations of a preconceived form are possible. Given the parametric range, every variation is logically retraceable and its result also predictable. A new design which is not based on the current paradigm of flight, the notion of wing, is not possible.

In summary, a parametric approach to design makes a highly structured and explicit task procedure, sometimes referred to as 'function', as well as a conceptual formal solution toward this task a definite prerequisite. This mathematical model should then be able to fulfill the stipulated performance criteria. These genetic qualities which represent the standard of essential properties of a group constitute what is typically named a prototype. (See Figure 3)

It can easily be recognized that in the example of aircraft design, the pragmatic constraints are extremely high. Perhaps, for example, in the mounting of signs signaling how many enemy aircraft were successfully engaged, a symbolic desire can be detected. This symbolic gesture is tolerated as long it does not infringe on the pragmatic performance of the aircraft. Similarly, the weight of the paint to advertise the name of an airline is part of the little latitude which could be considered a semantic dimension.

If compared to wheel-based vehicle design, e.g., automobiles, one can already see the need for an increase of the parametric range to accommodate a much wider variety of solutions. Perhaps the comparison of formal solutions of any type of aircraft, and the formal solution of any type of wheel-based vehicle give indication that basically all aircraft possess indeed great similarities due to the accountability of their essential component structure. This in any case the reason that an aircraft, no matter under which cultural setting they were developed, reveals these compelling similarities.\textsuperscript{19} Although also highly constrained, in the case of a car, this similarity ceases in those components which do not experience the same degree of pragmatic constraint; a lower constraint allows a greater degree of distinction in forms, while maintaining enough pragmatic performance.

Hence, a car designer of either Ferrari, BMW, or Cadillac will not determine the outer shell of the vehicle exclusively as a reaction to 'scientific facts' derived from such pragmatic concerns as windtunnel measurements, and others, similar in degree. Moreover, any latitude which does not threaten the basic pragmatic premise may be taken as an opportunity to take into account other parameters which can be partly, or even entirely, outside of the realm of pragmatics. The designer will increasingly rely on alternative means or sensus which he deems worthy to 'inform' his decisions.

"Prototype" and "Archetype".

It is perhaps correct to compare the concept of prototypical parameterization to approaches in the crafts tradition. The procedural methods of making in the crafts relies on ancestral models with a given range of correctness conveying how things ought to be done in principle. Typically these procedures experience slow evolutionary changes. Rarely are they replaced entirely by a new model. Changes brought about through events such as the invention of new materials will not abandon the traditional problem solution, but will rather accumulate additional procedures into the body of craft knowledge. This procedural problem solving approach is, in fact, directly comparable to the optimizing procedures in parametrics which were previously suggested, where within a formal framework, called prototype, a suitable, and increasingly refined solution can occur. The parameterised encoding of a finite range of formal solutions essentially prevents any significant paradigmatic change; only a refinement of the known structure is possible. The effects of strictly adhering to a craft tradition can be observed, for example, in the Shaker furniture and in their buildings. Here, the rejection of progress in the procedures of making becomes a form of aesthetic. While architects admire the refinement of craft in their furniture and houses, even cite Shaker pieces as paradigms of simple joinery etc., one hesitates to introduce them as paradigms of architecture.

In the design of buildings, many more drastic changes in the parametric range have to take place, as compared to aircraft or wheel-based vehicle design. The essential components so
clearly exhibited in the identity of an aircraft, or even in that of a car, become in the case of a building increasingly difficult to determine. Even a highly structured classification of buildings by nominal type or function, like ‘church’ or ‘library’, is not likely to do more than pinpoint some commonalities in concept, but will fail to project conclusively a prototypical formal building solution with sufficient intelligent general validity. An examination of the mechanism of pragmatic relations in a building seems also questionable when one assumes that with minor exceptions in the course of a building lifecycle, radical functional changes will occur. The church will become an state assembly house; the library, an office building; the horse stable becomes a bar; the parliament building, a hotel.

The previous is by no means a plea to neglect aspects of proximity, and other utilitarian relationships to accommodate the intentions of usage. However, it is to point out that the feasibility of a prototypical approach toward designing the entirety of a building declines due to the increased number of possible form-giving forces, their parametric range, and most importantly, their complexity. The difficulty lies in the lack of a exact measuring device for human comfort. Thus far, the attempts of brilliant minds, such as Negroponte, Mitchell, Mauer, Schmitt, and others, to employ parameters in a most meaningful way in architecture still result to a mostly pragmatic framework in order to gain a quantitative control over formative vectors, discarding those outside of the ‘normal’ efficiency. Their greatest success has been in the parameterization of sub-components, like column types, wall types, etc. where a high degree of constraints could be imposed through either structural, material, and other, possibly syntactical, rules. The enormous complexity of the entirety of a meaningful building has prevented a sufficient model from which a simulation could originate. The model resting solely on pragmatic constructs has little chance to encompass any aesthetic dimensions.

Based on today’s volume of construction in the USA, some building types could actually be identified as parameterized prototypes. These include the speculative office building and, at a smaller scale, the developer residence. Both types have a substantial sample population from which inference can be drawn as to the kind of normative overall form. They are largely feature based, which allows the parametric definition of essential components. Perhaps inference could be drawn as well from a study of real estate journals and real estate advertising as to what these features are, how they should be ranked, and subsequently, how the target range of ‘successful’ (similar) could be defined. On this general level, it seems quite possible to implement a simulation mechanism which is able to compute an optimized solution within this prototypical framework.

For the prefabrication housing industry, few variables, i.e. minor changes in form, are crucial for maintaining a competitive stand. Ironically, the same industry is eager to emphasize the level of differentiation which their industrial off-the-shelf product might achieve as a quasi tribute to the desire for human individuality. Frequently however, this distinction takes place on an illusory level based on feature like attachments. The essential construct remains unchanged.

It is precisely the stereotype occurrence of such buildings over which the intellectual branch of the architectural community agonizes. The buildings are criticized for their lack of identity and general character despite their ‘specific tailoring’, which may be interpreted as an indicator that variation, as an outcome of prototypical application, does not have the substantive qualities of differentiation. This raises the question of how then form-giving forces are allocated in the building process, or possibly, what is the nature of a structure which allows an architect to effectively make choices, thus achieving a proposition of many dimensions.

In his argument against the recent wide spread use of classical forms, Dutch architect Herman Hertzberger suggests the notion of "musée imaginaire" as an archetypal vehicle from which truly progressive and intelligent formal propositions can be derived. Hertzberger points out that the ‘construction kit-like’ application of classical language can only be regressive as it does not perform according to its own postulate; that is, to pay respect to the historical past. His
idea of the "musée imaginaire" proposes that the process of rethinking the rudimentary structure of human existence will yield a formal equivalent. Its architectural reality assumes "certain" familiarity despite its novel occurrence. In this sense, the architectural form becomes the propriety of human thought.

Archetype as a kind of rudimentary cognitive pattern existing prior to any logic, transmitted from generation to generation, is psychologist Carl Jung's basis for theory of the "collective unconsciousness," enabling individuals to identify some universal concepts. Perhaps it is the notion of archetype in the scholastic philosophical sense, an "idea in the divine intellect that determines the form of a created thing," which becomes a vehicle in the decision process of an architect allowing him the pursuit of an idea, as opposed to eliminating "unreasonable" choices. What Jung, and other scholars propose, is the idea that an archetype does not possess any a priori physical form, as mandated by a prototype, but an a priori ethereal form.

What is puzzling is that even the most entrenched pragmatic mind will admit the existence of buildings which by far exceed their pragmatic value. They are judged this way, because they are didactic, in the sense that they can provide us with an greater understanding of the events which constitute the world. Traces of this acknowledgment of the importance of meaning can be found in their attempts to internalize the concept of meaning on an informational basis. This, of course, leads inadvertently to a pragmatization of meaning, therefore contradicting the premise of expanding the model.

The latter might also be construed as evidence to introduce a distinction between 'ordinary' building and between objects which transcend the ordinary realm of building. Due to their higher value, in whichever way this value may be described, they could be considered examples of architecture. In the light of parametrics, it is certainly conceivable that within the construct of an archetype, procedures which are similar or even equivalent to a parametric approach take place to allocate the relevant forces with a direct impact on form. In fact, most architectural theories, from Vitruvius to present, discuss explicit and prescriptive parameters of form in one way or another. The real structure, though, prior to these theoretical ambitions to point out the relevant forces, is perhaps imbedded in the concept of culture. To make a comparison to the prior graph, a hypothesis shall be assumed for the moment that, as pragmatic constraints do not account as the sole source of values, other, less explicit formative forces of, for example symbolic, semantic, and of other non-discursive origin, yet of no less importance, increase. One could contemplate the parametric range of Mies van der Rohe and redraw the graph. Assumed is that Mies's contribution lies in the celebration of a broad range of ideas of social, humanistic, material, and tectonic nature. All of which find their vehicle of discussion in the qualitative treatment of steel in a precise Cartesian framework. Hence, the employment of new material, for instance, is likely to change the form of a building as a pragmatic response. The idea of a new material, however, as a celebration of progress in making and thinking, as it is perhaps the case in Mies's, and many others, architecture, rivals and surpasses the magnitude of its pragmatic counterpart successfully. (See Figure 4)

Parameters in Culture.

It was suggested, that a study of architecture would not only affirm the existence of qualities described before, but also offer insight as to their origin. Works of architecture are significant in their forms; and so they possess what is conventionally called meaning. In scholarly circles, the study of meaning winds its way from logic, through aesthetics, into language. Interestingly, the constituents of meaning can be traced to the concept of culture. Perhaps to cultivate is more than to mechanically work the soil, to produce essential things for survival. The idea of culture originates when the efforts to sustain life yield more than the bare minimum and allow the luxury of contemplation.

Culture is understood as a coherent system which is discernible to the individual who is a part of it. The internal constructs within, its symbols and signs are complexly codified knowledge. While architecture is a part of this
knowledge, it also makes use of it by employing its signs and symbols. Rarely however, can they be identified directly, but they reside in architecture as a kind of an undercurrent subversive to an idea. Conjectures toward form arise as propositions to either enforce, reject, critique, or assure the values of a culture; as propositions come into existence, culture assimilates them and they become a part of it. A significant amount of research effort has brought about an intriguing retrospective analysis explaining how the interaction between the individual forces of culture takes place.26

While an in-depth discussion of the cultural constituents certainly would offer a much greater understanding of the interaction between the dynamic nature of cultural values and its value generators, it lies outside of the scope of this discussion. However, its diverse explanations suggest an enormously complex taxonomy of encoded knowledge which is necessary to achieve human consciousness.

What is noteworthy of discussion in respect to architecture, is perhaps the notion that a main contributor to cultural progress is the capacity for reassessment of things and ideas, and their possibility for redesign. With a parametric definition of parts, the opportunity to employ formative forces outside of the realm of the ordinary is undoubtedly restricted. In architecture, a massive employment of a prototypical parametric approach to design raises some interesting questions as to the consequences of such an approach. Historically, the acceptance of parameterized (standard) wall constructions is not new. On the opposite, the tool of the typical example is quite common. The difference lies in the potential for change of the parameters of a (archetype) which ideally includes all fundamental knowledge of its constituents vs. the basically static model of a prototype which does not really require this kind of knowledge, rather than a knowledge of its parametric range. In office practice, the use of a slightly modified standard detail is a prime instance of prototype modification. The dilemma of increasing the range of a parametric framework, to encompass a wider scope of solutions, was already discussed. As much of the actual re-definition of parts occurs when contemplating the individual forces (or their parameters) which make this part, the chances for a critical re-definition decrease when the acceptance of parameterized parts is uncritically sanctioned.

The difficulty of a parametric prototype does not only occur in architectural practice. In architectural education, for example, educators go to great lengths to comprehend and convey the extensive thinking framework of extraordinary architects. On the other hand, modern CAAD systems foster the use of the static prepackaged definition of a wall, column, or stair. Granted that the employment of parametric parts may eliminate simplistic errors, hazards, or just the threat of litigation; it undoubtedly encourages also a mechanistic control of averaged ideas. Assumed that the university still holds the place where education takes precedence over training, the current state of architectural parametrics contradicts the common pedagogy to explain the significant architectural ideas of a L. Kahn or C. Scarpa via the example of intelligent re-definitions of ordinary parts toward a new meaningful entity, hence brilliantly encompassing the dynamic forces of a culture.

Thus far, architecture's capacity for change makes use of forces inside a culture, even if their nature is evasive and hard to explicitly define. Perhaps one might hypothesize that it is exactly the evasive and non-discursive forces for which humanity invented architectural form, so they can become subject of a discussion and consequently part of an intelligible system or knowledge. This makes it virtually impossible to construe them with a mathematical accuracy which is, as proposed, a prerequisite for prototyping. The model of the archetype is perhaps best described as a tacit order among individual forces inside a cultural realm which takes form through built didactic entities called architecture.

Conclusion.

Seen in the light of 'cultural product', architecture as an art will resist any static mechanism. This would contradict its own purpose of making propositions toward what we are, how we see ourselves, and how we reconcile the contradictions and paradoxes which are part
of our human nature.

Perhaps there is not a precise line marking the threshold where an archetype becomes a prototype. Prototypical traces can be detected in archetypes, particularly when a compelling logic is applied to a particular problem. Here, parametrics in architecture may be useful as a measuring device of the ‘ordinary’. However, in the history of mankind, architecture has long left the stage of plain shelter. Moreover, a definite value can be attributed to the symbolic content of architectural form which denies the notion of solution to a problem through the elimination of impossible solutions.

The telos of architecture has its emphasis on certainty (in the sense of how it is used in its linguistic understanding; a ‘certain’ idea...), a ‘certain’ elegance... etc.), without being able to supply any further proof or iterative explicit breakdown into smaller components. Architecture is a contemplated mastery of a technology, old or new, toward a higher cultural goal which is far from a process of choices as mechanistic ritual. Uncertainty, or its elimination, can be placed opposite to a prototypical immanent procedure. On a metascale, the creation of universal architectural prototypes can only result in the pragmatizing of aesthetic judgement, which is naturally self-contradictory and self-destructive.

The attempt of parametric prototyping will inadvertently continue in architecture; this is part of culture. It is not the purpose of this construct to crusade against the use of parametrics. However, as long as the difficulty of representing various kinds of culture based knowledge, which is crucial for the design process, exists, parametrics can only assume a subservient role in architecture. The task which lies ahead is to judge the contribution potential of parametric parts, which lies in their scale and extent. As new conjectures are submitted, perhaps the current paradigm of the cultural notion as a primary form-giving force will some day be overturned. As we have to make things operational with what we know today, the strength of architecture continues to draw from sources outside of what is known as average and ordinary. Parametrics, based on mere probability of formative forces, still remains an empirical method of deterministic cause.

Postscript.

The previous argument presupposes that architecture is a form of art. It serves as a cultural constituent not always pleasantly, but it occurs many times in critical and rough form of no lesser value.

Art will always ‘turn’ back, it will always be reactionary. It is with good reason that it has always been included, like religion, among the anti-democratic forces; and to compare the artist with the ‘intellectual’ is democratic humbug. Never will art be moral in the political sense. Never will it be virtuous; never will progress be able to count on its assistance. Art has a basically unreliable, treacherous streak; its delight in scandalous irrationalism, its love of that ‘barbarity’ which produces beauty is ineradicable. Even if one wanted to call this love hysterical, unintelligible, immoral to the point of endangering the world, it remains an immortal fact. And if one wanted to, if one could extirpate it, one would both be freeing the world from a grave danger and ridding it of art.27

Numerically parameterized design presents an extraordinary challenge to architecture in both practice and education. The fundamental questioning into the nature of a wall or column is about to be replaced with the question of what kind of wall and column. While the probability for failure on the pragmatic level will decrease with the parametric selection process, it suggests at the same time a reduction of an architectural amplitude toward an average. The greatest value of a parametric approach may be in the active construction of such a parametric system, rather than its use. The construction of the rule structure itself will be under scrutiny by default and its limitations will be perfectly obvious. The challenge to utilise such an instrument advantageously will lie in the intelligent judgment of a sufficient range of influences on architectural form, wherever they may be found. Within a broad framework, the prototypical form of the parameterised entity may then perhaps be positioned at its proper place.
References:


Footnotes:


2 Of these architectural constructs, Vitruvius remains the first comprehensive written account, not discarding the sufficient evidence in built form hinting the existence of theoretical architectural engagements prior to the Vitruvian tractatus. As we shall see later, these constructs contain an account of implicit and explicit parameters toward a paradigm of architectural form.


5 From this perspective, it may be a fair to claim that Peres-Gomes’s assessment of the deterioration of architecture’s mythical dimension is a pretext to a critical opposition to logical functionalism.

6 Ibid., p.32.

7 Ibid.

8 Teonis, A. "Hütten, Schiffe, und Flaschengestelle", Architese, 3-90, pp.16-19.

9 Ibid., p.16. The example of computing merely thirty-three simple parameterized requirements which result in 10,000,000,000 calculations substantiates his point.

10 Ibid., p.19.

11 Ibid., pp.22-25.

12 Ibid., Example: Teonis names as one of L.C.’s reasons for employing pilots, the unhampered circulation of air underneath the building, which he considers environmentally healthy. This speculation may be countered even on a pragmatic level with another possibility: The wind problems due to negative air pressure differentials in larger buildings, such as the Unité d’Habitation, is generally in fact a nuisance, if not a health hazard. Perhaps, L.C.’s choice of the pilotis could be construed as the fascination of simply lifting the main volume; the disengagement with the ground as the absence of the classical base provides a framework capable of bearing a symbolic content.
of the Modern idea of progress and the celebration of human achievement in technology over gravity. In this sense, integration of the column, the idea of air circulation, and other primarily utilitarian concerns may be only secondary, at best. Other speculations can be found, for instance, in Sherwood, R., Modern Housing Prototypes, Cambridge: Harvard University Press, p.120.

For an in-depth discussion see for example Choudhury, S., "On Models", Design Methods and Theories, Vol.13, Number 2.

For a range of definitions, see Webster, Third International Dictionary, Springfield: Merriam Company, 1965.

For this argument, rotary wing, ballistic missiles, and other exceptions shall be excluded.

The ACSYNT group at VA Tech under Dr. Myklebust is currently developing this parametric approach conceptual aircraft design.


Naturally, any aircraft expert will disagree. However, the essence of what an expert would call a radically different approach lies in the manner of aircraft components and, to some extent, their geographical relation to each other. No radical changes in the concept of flight are introduced.

An interesting application of parametric component and prototype modelling can be seen in Schmitt’s reconstruction simulation of the Roman town Avesticum at the ETH, in Schmitt, Flemming, Madraso, "Design Support Systems", Architex, Vol 3:90. Under the subtitle "Intelligent Prototypes", the retrospective advantage of a strong rule-based historic scene is acknowledged, as well as the difficulty to employ these methods for future projections. While this simulation process of reconstruction is an outstanding achievement, it should be noted that a parameterised reconstruction effort will produce one of many possible solutions, unless each parametric value range is replaced by a definite value., p. 33.


Similar to this construct is the Kantian circularity, namely that intuition is dependent on concept, as concept is on intuition.

In the second half of this century, even our empirical research suggested a value in 'meaning'. It was made explicit, for instance, with the advent of 'decorative postmodernism' in the speculative office building, employing signage-like iconography to imply meaning and hereby increase the value of the object.

Kroeber and Kluckhohn, for example, (1952) cite 164 definitions of culture from various sources in Kroeber A.L. and C. Kluckhohn, Culture, New York: Random House, 1952.