Algebras, Geometries and Algorithms, Or How Architecture fought the Law and the Law Won

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An Architect is required to deal quite often with a restrictive piece of Building Code during his/her practice, especially in traditional and hence protected environments. The paper examines the algorithmic nature of such a Building Code and in particular the President's Decree governing the design and architecture of traditional housing in the Old Town, "Ano Poli", in Thessaloniki Greece. The nature of the constraints and descriptions the Decree contains is algorithmic, which means that the descriptions of the constraints is procedural with a specific start and a specific finish for a house design. The problem with such descriptions in a Law is that, although an architect can develop his/her own interpretations of the traditional language of the area, or even be able to trace his/her designs using shape grammars derived from traditional buildings preserved until today, the final result cannot be approved for a building permit since it does not comply with the Presidential Decree. We suggest that the nature of such legislation should be algebraic in nature and not algorithmic, since algebras allow an amount of freedom in development of architectural language while also permitting the restriction of scale, height and so on. This coupling of architectural design freedom and effective restriction on metrics of new buildings contained in algebraic systems can be shown to be much more effective than the established algorithmic system. The Decree's content comprises of regulations concerning the volume, form and use of new buildings in the protected and conserved built environment of "Ano Poli" in Thessaloniki.

The Decree was developed in 1979 by a team of architects inside the Ministry of Built Environment in Greece with the purpose of protecting the sensitive traditional area of "Ano Poli" in Thessaloniki, where a large number of traditional houses (the number varies from 2000 to 4000 depending on sources) were still intact. The area needed special protection since its colorful and traditional nature was threatened by the rapid development of the building industry in the 60's and 70's. Tools where developed during the period 1978 to 1979 to assess the rules comprising the traditional architecture of the area. These rules where extracted from a detailed observation and interpolation of the rules used in the surviving buildings at the time. These rules were then codified inside "algorithmic tools" in the Presidential Decree text, encapsulating constraints, directions, restrictions and vectors for the architecture of new constructions in the area of Ano Poli. The tools that are used in the Decree are design constraints and descriptions of the new buildings. These constraints and descriptions provide an algorithmic approach to new designs that unfortunately is not universal but is a collection of algorithmic parts. This partiality has one direct and one indirect result:

1. Various inconsistencies and conflicts arise in the new designs and buildings -During the design of the whole building a form imposed in one part of the building can clash with the form or use imposed by the Decree in another part of the building.

2. The Decree's application during the last 30 years has been ensured by a a committee of architects, both free lancing and public servants. With changes in the committee representations over the years, opinions on the algorithmic nature of the Presidential Decree change inside the committee often leading to conflicts with decisions by previous members of the committee. The result is a that the architecture of new buildings in the

traditional area on Ano Poli has changed over time and various languages or styles of architecture are evident and can be traced back to specific configuration of the committee from 1979 onwards. These architectural styles are in conformance with the letter of the Law but they clash with the stated goal of the Presidential Decree, to protect the traditional area of Ano Poli, since this variety of styles finally concludes to a cacophony of styles and forms.

These conflicts can be very damaging to the design process (and of course the final building) since the architect almost designs like an automaton following the algorithm of the building code, without any chance for developing contemporary designs. Furthermore, the conflicts the Decree has hidden inside its collection of algorithmic parts coupled with the low resolution text has in defining over specific rules of form, can bring the design procedure to a halt and abort with no alternative exit. In contrast to that an algebraic approach to defining constraints can serve the purpose of enabling the architectural interpretations individual architects make of the traditional architecture of the area, while restricting the geometrical features of the outcome via simple universal rules: addition, subtraction, intersection, multiplication and so on. After developing an Algebra specific to the traditional architecture seen in Ano Poli, while maintaining the constraints of the established Presidential Decree, we try to generalize the process of extracting an algebra from a building code, or constructing one if extraction is impossible. It is in this generalization that we try to answer the questions of "architectural ethics" that emerge:

1. Are computing tools robust enough to represent and direct our intervention in sensitive and protected environments?

2. Why and how should we use computing tools like geometric and shape algebras inside generic building codes?

Even though it would appear as a strange coupling, matching computation tools (in the area of regulation and legislation) with the formal language of traditional architecture of an area can provide a new materiality: Since we no longer built with the techniques and materials of a past era, the architect would now treat forms as a traditional material. From this treatment of "Form" as a Material one can assess the ecosystem that algebraic computing tools provide for the designer. Instead of only handling pure representation the designer can establish structural connections between forms, in the way of the shape grammar paradigm. The crucial question is whether establishing such an algebra inside such a specialized building code would improve the stated goals of the legislation: In our opinion just creating an algebra would not provide any clear benefits, but an algebra that takes into account the traditional architecture of the area of Ano Poli and is feature complete concerning said architecture would provide clear goals and descriptions for the designers and architects to follow when they design an new building for the region. This feature completeness can only be created when one considers the most basic structures and forms of traditional architecture, without describing them in a unique and singular manner. Thus instead of restricting the design of new buildings, one would be able to infer new designs that are close relatives of the traditional architecture in question, even though no such direct equivalent of a traditional building remains until today.

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