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PhD

ILLUSTRATED ALGORITHMIC DESIGN

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Algorithmic Design (AD) in Architecture

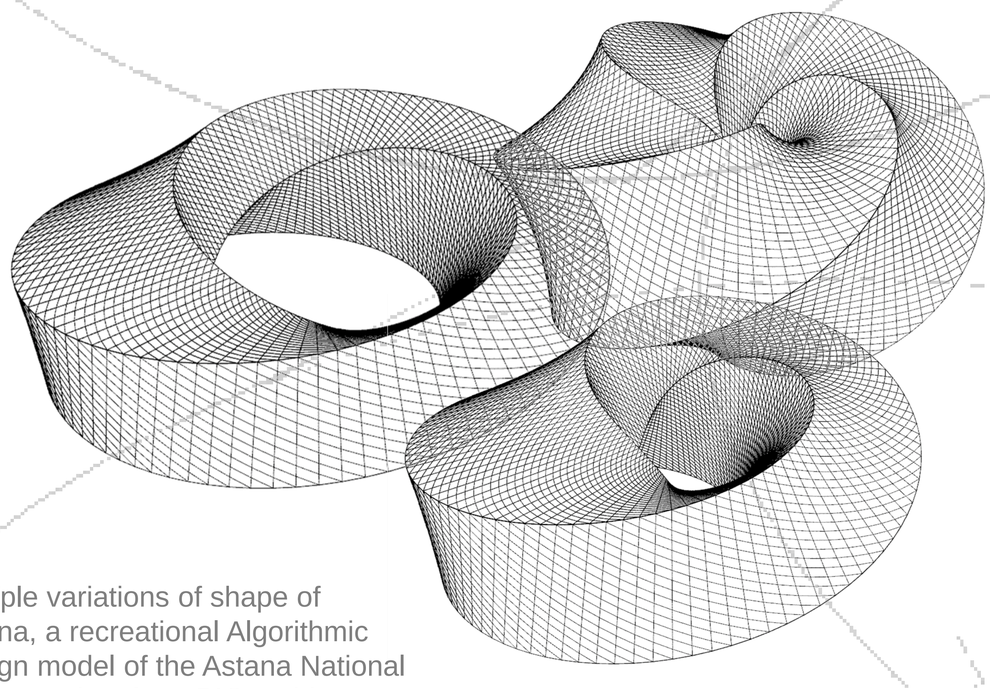
An innovative manner of conceiving architecture, which defines the creation of forms through algorithms - meaning architects can describe shapes through a series of rules and constraints.

AD MODEL | A program with an abstract representation of the model, which can be generated in a multitude of tools depending on its purpose. The entities in the design are logically connected, hence, changes applied to the parameters are automatically propagated to the rest of the model.

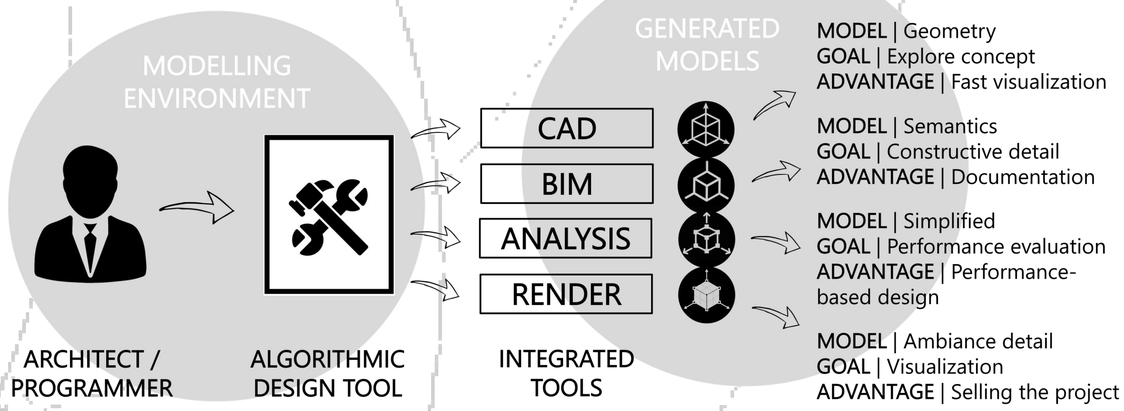
✓ **VARIETY |** Designers can explore a variety of ideas with no extra modeling effort – meaning the iteration process triggered by the changes proposed, either by clients or engendering experts, is faster and easier.

✓ **MULTIPLE TOOLS |** AD holds the potential to integrate in a seamless process all of the necessary tools for the project's development, such as Computer-Aided Design (CAD), Building Information Modeling (BIM), analysis, render, among other tools.

X **PROBLEM |** Architectural firms today are slowly walking towards the inclusion of computer science in their workflow. AD is still a representation method that radically differs from the current ones used in architectural practice, which demotivates many experts from its use.



Multiple variations of shape of Astana, a recreational Algorithmic Design model of the Astana National Library project from BIG architects.



Illustrated Algorithmic Design methodology – scheme of an Algorithmic Design workflow applied to the modeling of an architectural project

Illustrated Algorithmic Design (IAD)

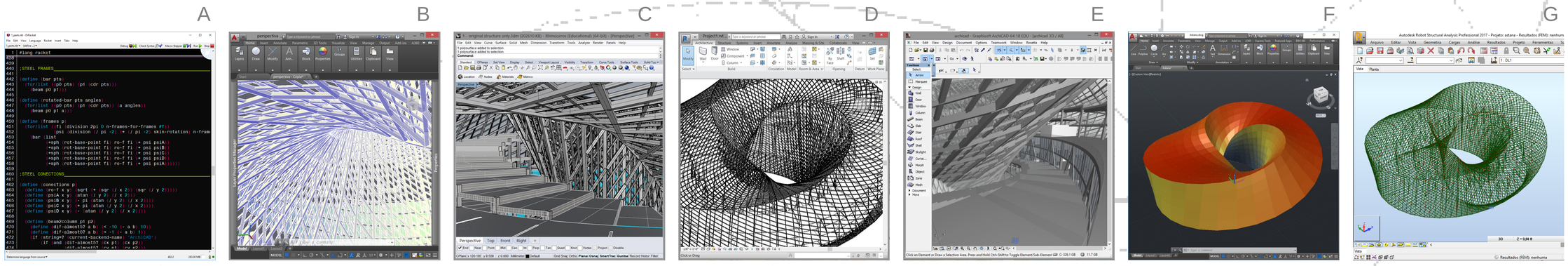
This investigation proposes a different method of using AD in the context of architectural projects: a computational approach with which architects can benefit from AD's advantages, while working with design tools they feel comfortable with.

✓ **AD BENEFITS |** Architects can explore and develop more challenging projects; integrate different paradigms and tools in the process; and receive feedback, from analysis and simulations, they can use to improve their design.

COMPUTATIONAL ARCHITECTURE | During the course of this investigation a guide will be produced, that depicts the following issues:

- Benefits and burdens of using AD;
- The necessary programming background practitioners must acquire;
- Different programming paradigms and their respective possible applications within the architectural context;
- Bringing programming environments closer to this discipline, namely by guarantying features such as traceability, immediate feedback, and sketch integration.

✓ **MERGING DISCIPLINES |** The combination of the advantages computer science brings into the practice with the best representation methods the practice can offer, will not only make AD a more advanced architectonic representation method, but also a more accessible and accepted reality for architects worldwide.



Recreational model of Astana National Library (A - algorithmic description) generated in CAD tools (B – Rhinoceros and C - AutoCAD), BIM tools (D - ArchiCAD and E - Revit) and analysis tools (F - Radiance's radiation analysis results shown in AutoCAD and G - Robot's structural analysis)

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