Know Where You're Going: Hybrid Analog and Digital Approaches to Landforming

Benjamin Hackenberger
Digital Landscape Architecture Conference
Harvard University Graduate School of Design
JUNE 2022

Traditional grading wisdom suggests that a landscape designer should begin with established vertical and horizontal control points to create an appropriately sloped set of paths that in turn define landscape spaces that balance vertical circulation with drainage. Throughout the design process, a landscape designer should craft beautiful and sculptural spaces, but also "know where one is going" to ensure the mathematical accuracy of the "final design".

Analogue grading approaches suggest a procedural approach to landform design. One should:

1. Establish vertical and horizontal 'control points'.
2. Identify paths between these points.
3. Calculate appropriately sloped paths between them.
4. Identify programmatic spaces between these paths.
5. Calculate appropriately sloped paths between them.

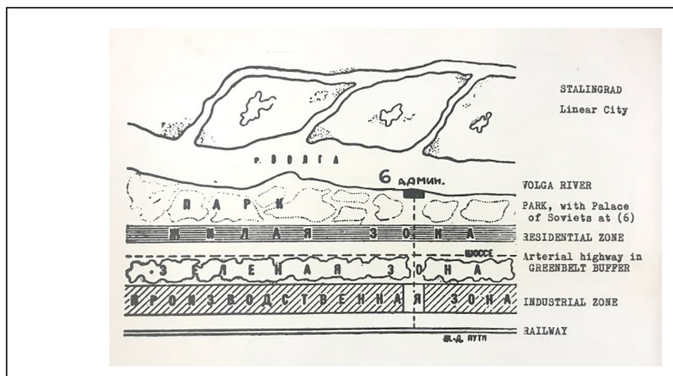
This poster presents the initial results of practice-based research in hybrid digital and analog landform workflows that complement analog grading design methods with scripting in Grasshopper. Initial findings suggest an approach to design workflows based on three principles: integration, analysis, and iteration.

Beginning with the principles of analogue landform design unlocks a long history of knowledge of material performance, circulation, and spatial composition. By approaching the task of digital landform design with an emphasis on iteration and mathematical rigor, the designer can make use of visual scripting software Grasshopper builds on analogue approaches to grading instead of supplanting or upending them. By integrating the project into a set of spatial parameters and spatial outcomes, a designer can begin to identify the trade-offs and compromises required to create a functional and beautiful landform.

Special thanks to:
- Sarah Cowles
- Rosalea Monacella
- Laura Solano
- Karen Janosky
- Kira Clingen

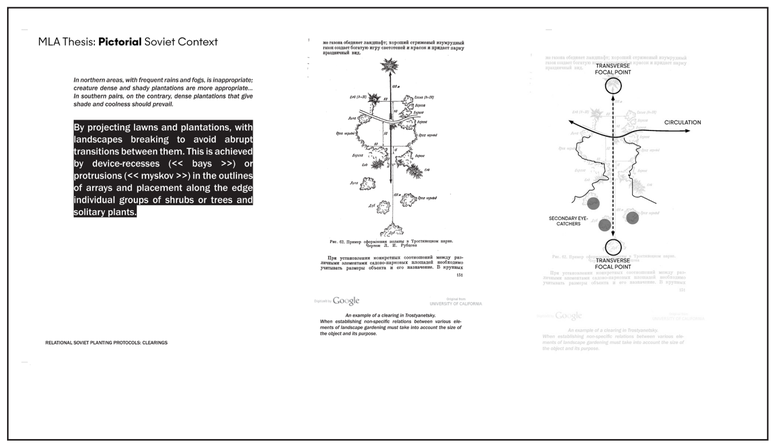
1. Integration:

A spatially integrated approach to landscape can be understood through the formal paradigms of **the Soviet linear city**, which elaborates ideal sectional relationships between spaces for labor, education, relaxation, industrial production, transportation (infrastructure), and nature. This framework is compelling because it challenges designers to map ideal formal relationships and spatial affordances to real-world conditions.



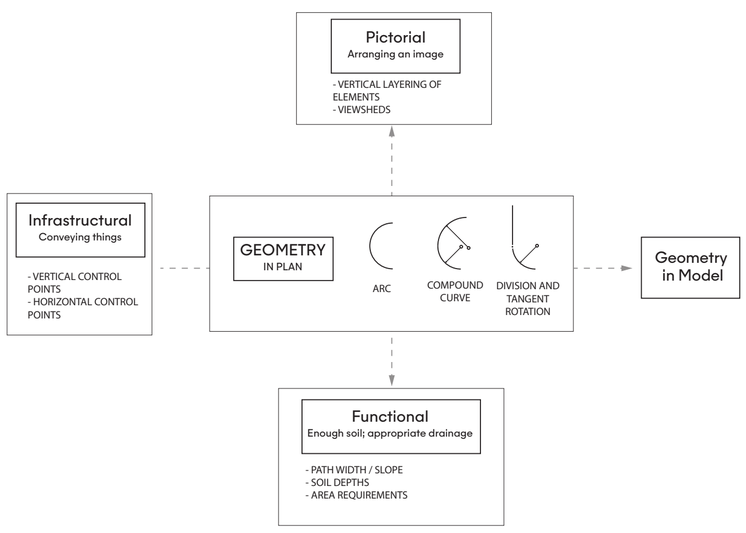
Sotsgorod; the problem of building socialist cities. Translated ... Miliutin, N. A. (Nikolaĭ Aleksandrovich), 1889-1942.

1. Soviet model for linear cities by Nikolay Alexandrovich Milyutin presents an ideal section that captures adjacencies and imbues abstract urban space with a set of spatial values.



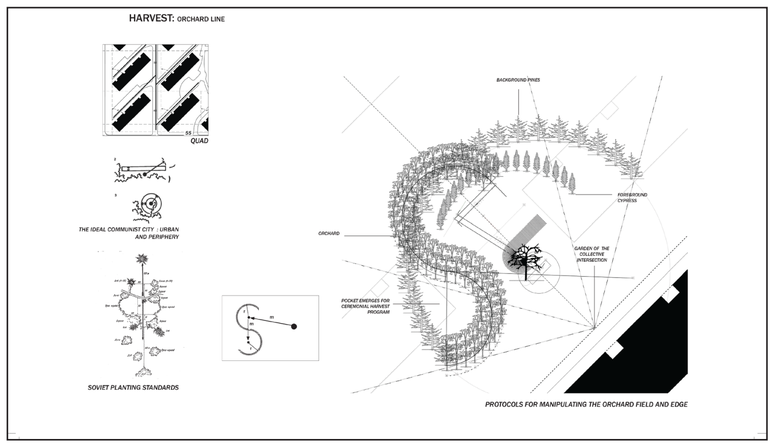
2. The mid-century Soviet model for public space design articulates how landscape elements can be arranged around circulation to create pictorial space.

2. Iteration and Analysis:

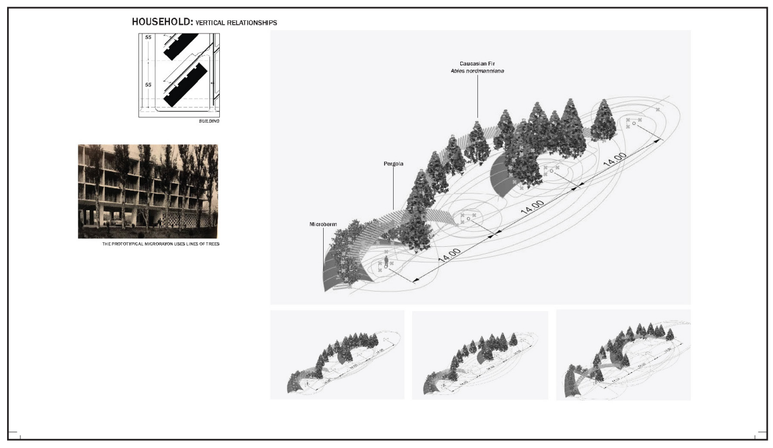


The computational power of Grasshopper allows the designer to simultaneously analyze design work in plan, section, and perspective. With so much data about the project easily available, it is even more important to keep the pictorial, infrastructural, and functional goals of the project in clear view.

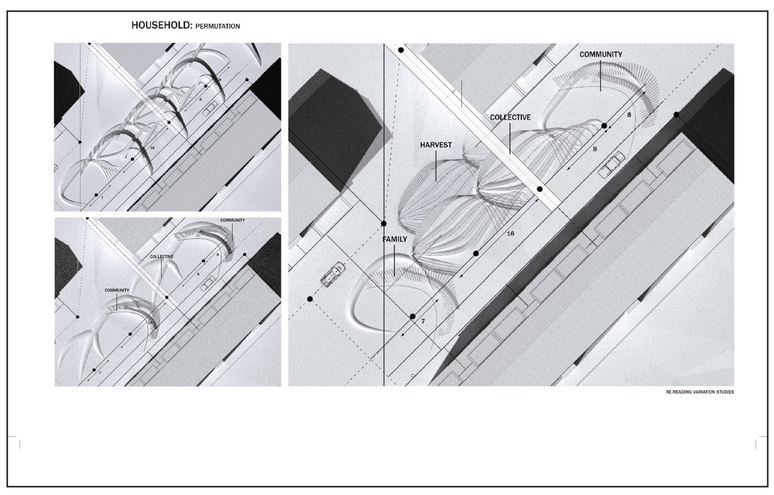
Documentation in Grasshopper allows the designer to isolate and manipulate individual spatial parameters of their work in order to quickly determine the impact on the overall spatial composition.



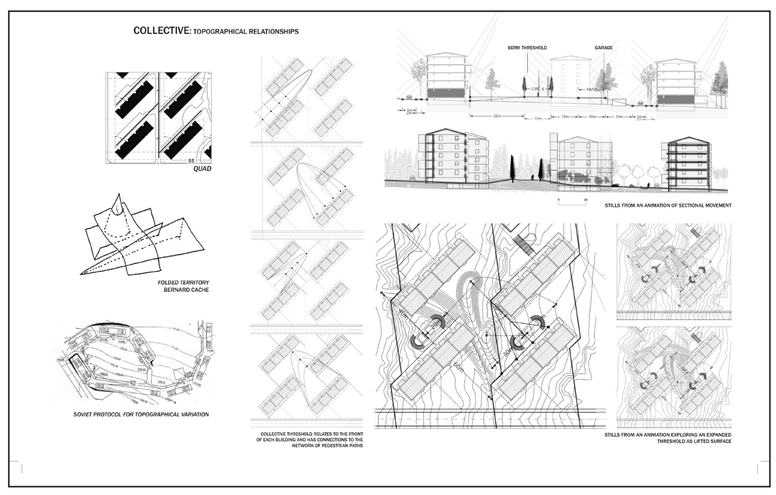
3. Application of the framework of landscape elements to pictorial space.



4. Introduction of landform to bolster the system of linear landscape elements.



5. Iteration of landform to create programmatic regions.

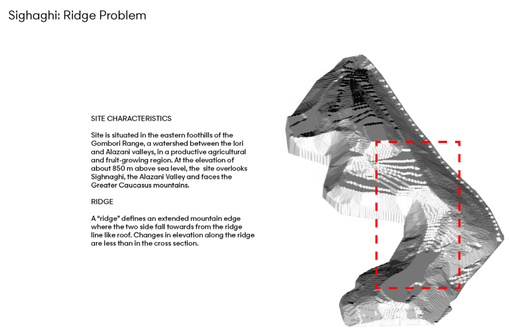


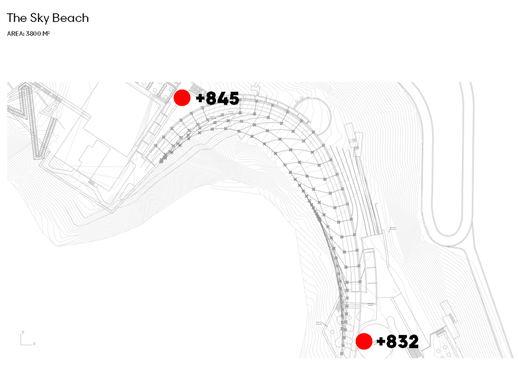
6. Integration of landform with circulation

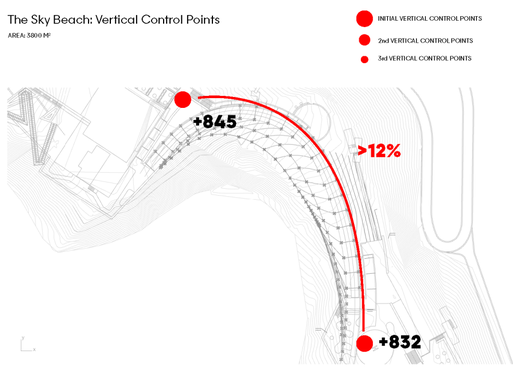
3. Case Study: Sighnaghi 'Sky Beach'

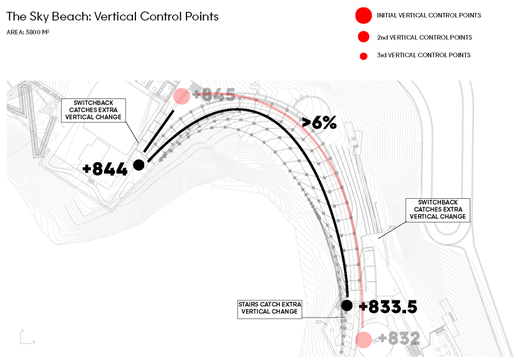
This case study presents an isolated stage of the larger design process in which the infrastructural parameters of the project are supplemented by an exploration of sculptural land forming and an introduction of programmed spaces. In this stage, a portion of the model is further iterated to introduce programmatic thickness (the flatter area of the Sky Beach) and fine-tuned sculpting (the vertical articulation of the curve in plan).

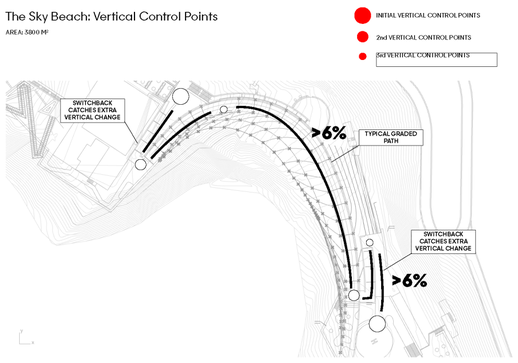
The following slides walk through the steps of the traditional grading process which are recorded in Grasshopper and iterated to achieve the formal proposal.

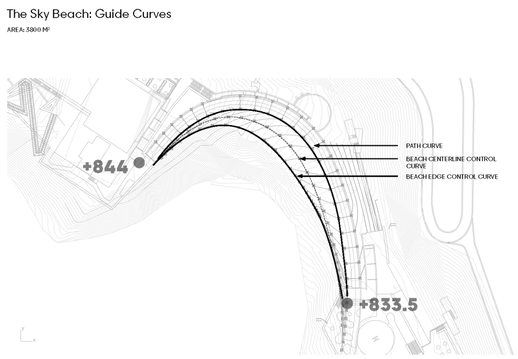


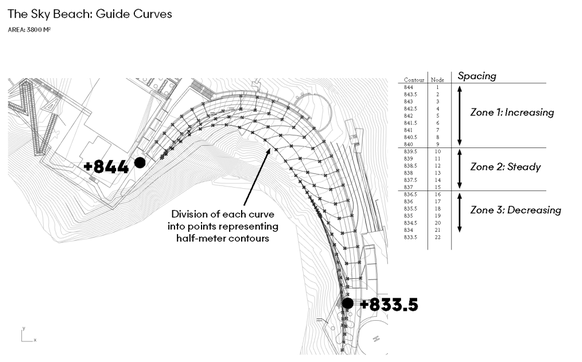


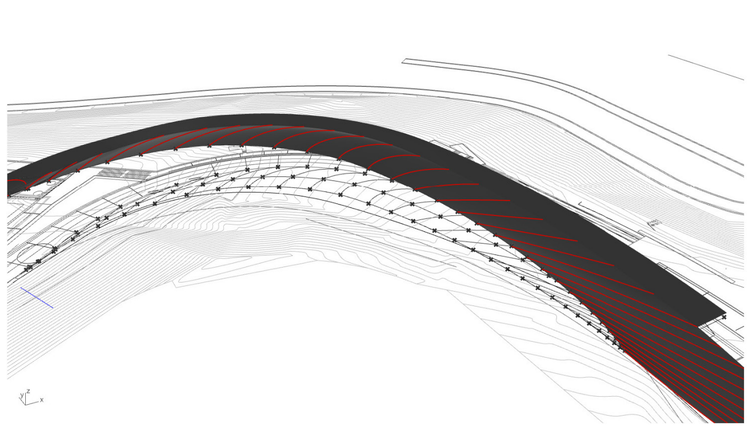












Resolving the grading problem in plan facilitates rapid and measured 3D representation.

Geometrical simplicity allowed for the Sky Beach to be quickly laid out and rough graded.

Rapid iteration in measured 3D curve fitting facilitates compositional sculpting.