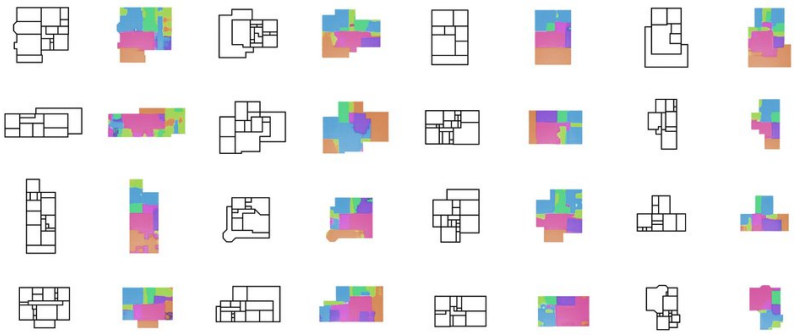
Enabling Alternative Architectures

Collaborative Frameworks For Participatory Design

Enabling Alternative Architectures was an independent research project that was completed as part of the Master in Design Studies in Technology Degree at the Harvard University Graduate School of Design. This project, as well as the development of the accompanying web application, *Yona,* was conducted over a period of four months in the spring of 2018.



This project is a prototype of a spatial design app that empowers non-architects to design and build structures collaboratively. The app is hosted on the web and developed in the open source, allowing anyone with an internet connection and a computer to access it and begin shaping their own built environment.

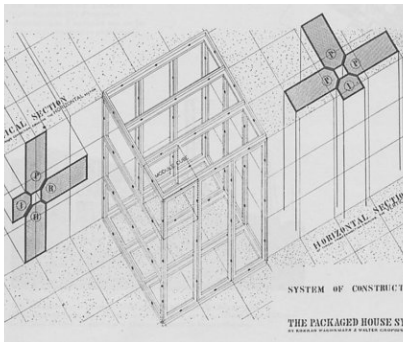
Architectural theorists of the 1960's and 1970's such as Yona Friedman and Cedric Price envisioned the future of architecture as temporary and personalized. Three dimensional grid structures and modular frameworks provided an infrastructure for alternative architectures that could respond to complex and ever-shifting demands of human users. During the same time period, Nicholas Negroponte's research at MIT used participatory user design exercises as some of the earliest experiments in the application of computing to the field of design. For the architects and thinkers of this generation, systemized approaches were inherently more humanist, as they allowed for an adaptability that deterministic architectural schemes could not. Technology was seen as the missing component of a more fluid kind of participatory design that could potentially occur between non-architects, or between professionals and the public.

Today, the 20th century vision of technologically mediated democratized architecture has yet to take hold. This project is an attempt to embody those ideals in the structure of a web application. Users can start by editing the design of a preexisting structure that resembles their personal needs, or draw from scratch either alone or with friends. Data from the collection of user generated designs is analyzed to provide suggestive design tips that can help users make informed design decisions

---

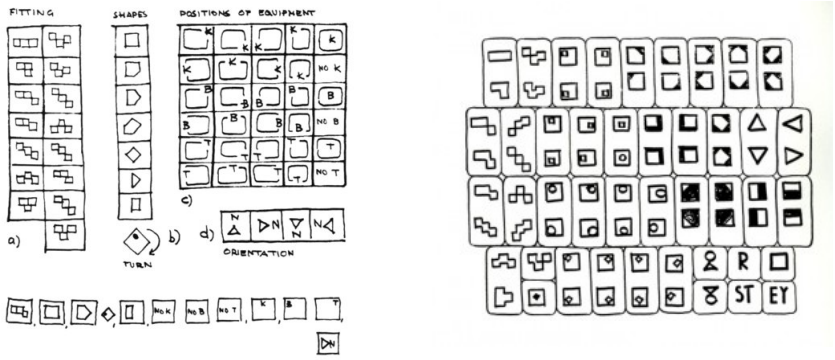
Early Approaches To Participatory Design

Walter Gropius - Packaged House System



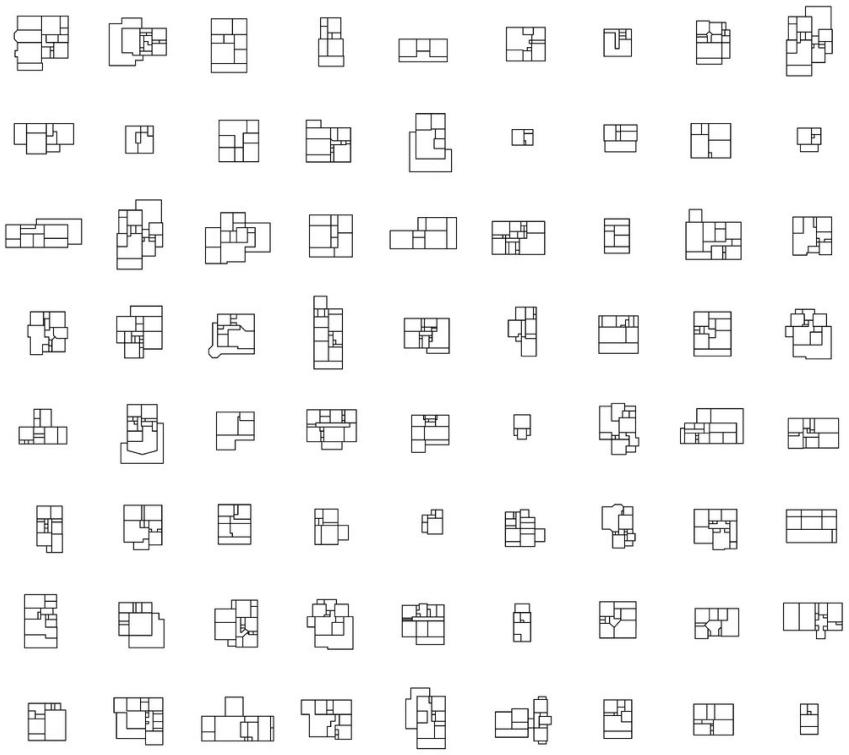
The Gropius system in theory gave anyone the tools to design their own home, but not everyone is a designer. Gropius took his natural ability as a designer for granted, and assumed that anyone could see the opportunities that an open ended kit-of-parts system for housing could afford. In hindsight, the flaw in the project is obvious. Even if the kit system solves the problems of construction and manufacturing, you still need the time and attention of a trained architect to customize every single house built with the system. The success of their Packaged House system depended on economies of scale, but we only have so many architects.

Yona Friedman



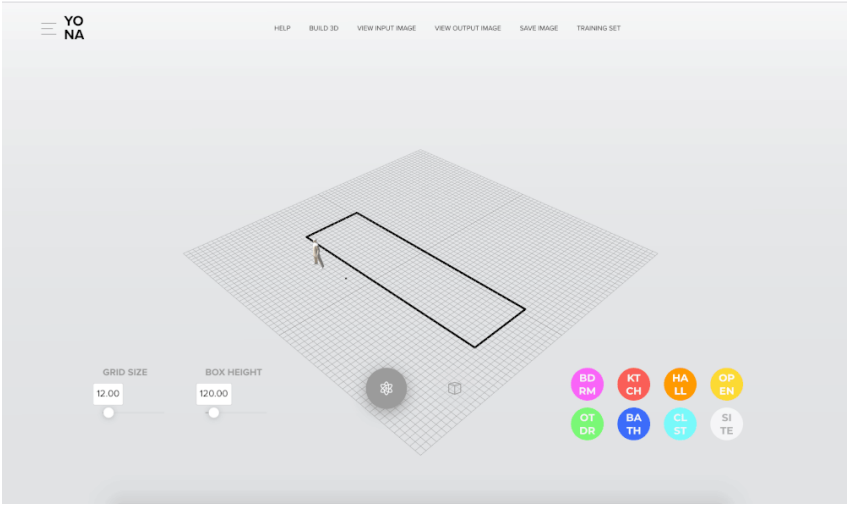
The work of Yona Friedman shared in Gropius's dream of empowering society through participatory design, and rejected the idea of the "Average Man" (*Modulor*) popularized by Corbusier and other modernists. Villa Spatiale was response to his perception of an emerging "mobile society". The people that surrounded him did not share the values or needs of the "average man" that the style of architecture he was taught in school was intended to serve. The Villa Spatiale was theoretically designed to disassemble and move with its owners. The infrastructure was static, but the modules that it supported would morphing and shifting, mirroring their transient inhabitants.

Towards an Open Framework

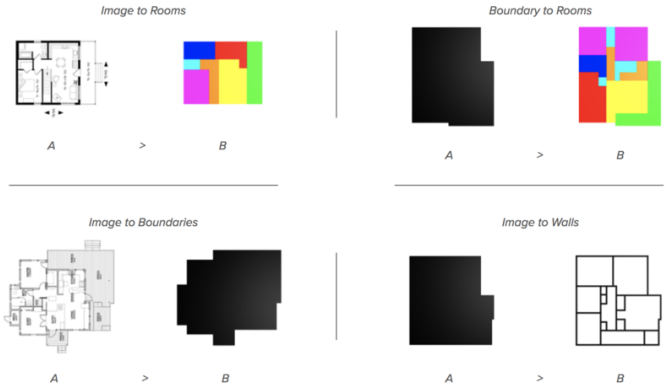


Nathan Peters

In the design of living spaces, an architect provides the invaluable service of meshing the needs of residents with the building's context, local climate, and a myriad of other factors. The unfortunate reality is that for most people, this service is a luxury that is financially out of reach. Gropius and Friedman, through different means, tried to engage with this truth through the technologies available to them at the time, but never managed to reach a large audience. I chose to approach this same problem in a similar way - by leveraging emerging technology to assist non-designers in the architectural design process, and attempting to build a framework that allows anyone interested in customizing their own residence to do so for free over the internet.

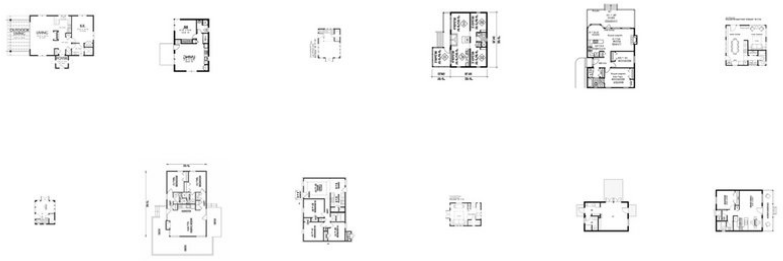


Applied Neural Networks for Assisted Design



Designing the Dataset

Nathan Peters



Scraped Image
(800px by 533 px)
No Scale

Scale to Bounding Box
(64' by 64')

Overlay with Spatial Data
(64' by 64')

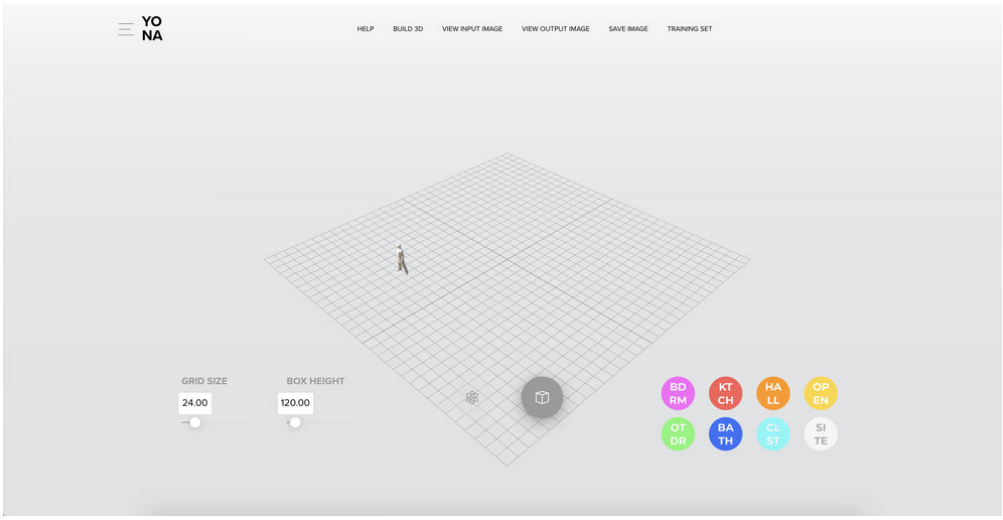
Export Room Perimeters
(64' by 64')

Export Plan Boundaries
(64' by 64')

Resample to pix2pix Format
(256px by 256px)
(1px = 3')

Outputs from the Neural Network

Design Application Interface



Modeling Tools

For more detailed designs that the neural network may not be able to clean up automatically, the 3D drawing tools in the app can be used to trace over the raw output.