



RESPONSIBLE CONTROL AND GENERATIVE DESIGN TOOLS

A discussion for the future of architectural practice in California and beyond

THIS TIME TOGETHER

1. Introductions

Name

Position

What do you think are we talking about?

Landscape

2. Background

3. Large Language Models vs. Generative design tools

Future

4. Responding

5. Discussion

[*Possibly new*] TERMS

Artificial Intelligence - intelligence exhibited by a machine, particularly a computer systems.

It is a field of research in computer science that develops and studies methods and software that enable machines to perceive their environment and uses learning and intelligence to take actions that maximize their chances of achieving defined goals.

CAN AN AI PASS THE ARE?

Hmmmm.

<https://www.construction-physics.com/p/could-chatgpt-become-an-architect?triedRedirect=true>



HISTORICAL MILESTONES TO CONSIDER

● 1950s

Early discussions on machine intelligence and consequences by Alan Turing, Norbert Wiener, and others.

● 1976

Early ethical guidelines for AI proposed by the first AI ethics pioneer, Walter Maner.

● 2016

Alpha Go, an AI machine, beats human grand master at "Go" strategy game

● 2021

The EU proposed the world's first legal framework for regulating AI, the AI Act.

● 1960's

Computer Aided Design conceived and implemented

● 1990's

Introduction of 3D CAD / Building Information Modeling

● 2000's

Introduction of Building Information Modeling

LARGE LANGUAGE MODELS - LLM



Large language models are AI systems trained on vast amounts of text data

These models can generate human-like text, making them useful for various applications.



They have the potential to revolutionize content creation and automation

With their ability to understand and generate natural language, LLMs can assist in tasks like writing, summarization, and code generation.



Responsible development and deployment are crucial

LLMs can perpetuate biases present in their training data, and their outputs should be carefully monitored and filtered.

Large language models are powerful tools, but their responsible use and ethical considerations should be prioritized.

MIDJOURNEY - DESIGN A HOSPITAL



CHAT GPT - CAN A "LLM" BE AN ARCHITECT?

Asked to Chat GPT: <https://chatgpt.com/>

In a metaphorical sense, sure!

While a language model like me isn't designing physical structures, it's architecting responses and generating content based on input and parameters provided.

Just as an architect considers various factors when designing a building, I take into account context, intent, and the nuances of language to generate relevant and coherent responses.

So, while I'm not a traditional architect, you could say there are similarities in the process of creation and design.

CHAT GPT - HOW DO I DESIGN A HOSPITAL?

Designing a hospital involves a comprehensive approach that considers numerous factors to create a space that is functional, efficient, and conducive to healing. Here's a general outline of how I would approach designing a hospital:

Needs Assessment: Understand the specific requirements of the hospital, including the services it will provide, the number of patients it will accommodate, and any special considerations such as pediatric care, geriatric care, or specialized medical units.

Site Selection: Choose a suitable location for the hospital, considering factors such as accessibility, proximity to other medical facilities, transportation options, and available space for future expansion.

Functional Layout: Design the layout of the hospital to optimize patient flow, staff efficiency, and communication between different departments. This includes arranging patient rooms, treatment areas, operating theaters, diagnostic facilities, and administrative offices in a logical and accessible manner.

Safety and Compliance: Ensure that the hospital design complies with building codes, healthcare regulations, and safety standards. This includes provisions for fire safety, infection control, accessibility for people with disabilities, and environmental sustainability.

Patient Experience: Pay attention to the comfort and well-being of patients by incorporating elements such as natural light, soothing colors, comfortable furnishings, and quiet areas for relaxation and reflection.

Technology Integration: Integrate advanced medical technologies and information systems into the hospital design to support efficient healthcare delivery, data management, and communication among healthcare providers.

Flexibility and Adaptability: Design the hospital with flexibility to adapt to changing healthcare needs and advances in medical technology. This may involve modular construction, flexible room layouts, and infrastructure systems that can be easily upgraded or expanded.

Collaboration and Communication: Foster collaboration and communication among healthcare providers by creating shared spaces, such as conference rooms, break areas, and interdisciplinary care teams, to encourage teamwork and information exchange.

Community Engagement: Involve the local community in the hospital design process to ensure that the facility meets the needs and preferences of the people it serves. This may include soliciting input from patients, families, healthcare professionals, and community leaders through surveys, focus groups, and public forums.

Continuous Improvement: Design the hospital with a focus on continuous improvement, feedback, and evaluation to identify opportunities for enhancing patient care, operational efficiency, and staff satisfaction over time. By considering these factors and engaging in a collaborative and iterative design process, architects can create hospitals that are not only functional and efficient but also supportive of the health and well-being of patients, staff, and the community.

CHAT GPT - WHAT IS REQUIRED IN AN MRI SUITE

Designing an MRI suite in a medical facility requires careful planning to ensure patient safety, comfort, and the optimal functioning of the MRI scanner. Here are some key components and considerations for an MRI suite:

Room Layout: The MRI suite typically consists of several areas, including the control room, patient preparation area, and the MRI scanning room itself. These areas should be laid out in a way that allows for efficient workflow and easy access for patients, staff, and equipment.

Magnetic Shielding: MRI scanners generate strong magnetic fields, so the MRI scanning room must be properly shielded to contain the magnetic field and prevent interference with nearby equipment or devices. This often involves installing ferromagnetic shielding materials in the walls, floor, and ceiling of the scanning room.

Safety Protocols: Safety is paramount in an MRI suite. Strict safety protocols should be followed to ensure that patients and staff are protected from the potentially harmful effects of the magnetic field. This includes screening patients for any metal implants or objects that could pose a safety risk in the MRI environment.

RF Shielding: In addition to magnetic shielding, the MRI scanning room must also be shielded from radiofrequency (RF) interference to ensure high-quality imaging. This involves installing RF shielding materials in the walls, floor, and ceiling of the scanning room.

Patient Comfort: MRI scans can be intimidating for some patients, so it's important to design the MRI suite with patient comfort in mind. This may include providing amenities such as comfortable seating, soothing lighting, and calming music to help patients feel more relaxed during the scan.

Accessibility: The MRI suite should be accessible to patients with mobility impairments or disabilities. This may involve providing wheelchair ramps, spacious changing rooms, and other accommodations to ensure that all patients can easily access the MRI scanner.

Emergency Preparedness: In the event of a medical emergency during an MRI scan, the MRI suite should be equipped with emergency response equipment and protocols to ensure that patients receive prompt medical attention. This may include emergency call buttons, medical gas outlets, and crash carts stocked with essential supplies.

HVAC Systems: Proper heating, ventilation, and air conditioning (HVAC) systems are essential in an MRI suite to maintain a comfortable temperature and humidity level for patients and staff, as well as to prevent equipment overheating and ensure the integrity of the MRI scanner.

Control Room: The control room houses the MRI scanner control console and monitoring equipment, allowing technologists to operate the scanner safely from a separate room while observing the patient through a window or video monitor.

Utility Connections: The MRI suite must be equipped with appropriate utility connections, including electrical outlets, data ports, and medical gas lines, to support the operation of the MRI scanner and other equipment in the suite. By addressing these components and considerations, architects can design MRI suites that provide a safe, comfortable, and efficient environment for both patients and staff within a medical facility.

UP CODES - FINDING BUILDING CODES

The screenshot shows a web application interface for finding building codes. The top navigation bar includes a search bar with the text "Search Building Code 2018 of Wyoming" and a magnifying glass icon. To the right of the search bar are links for "Codes", "Projects", and "scott".

The left sidebar is dark blue and contains several icons and a list of items under the heading "CODES". The list includes "Building Code 2018 of Wyoming" (with subtext "ADOPTS WITHOUT AMENDMENTS International Building Code 2018 (IBC 2018)") and "Chapter 10 Means of Egress". Under "Chapter 10 Means of Egress", there are several expandable sections: "1001 Administration", "1002 Maintenance and Plans", and "1003 General Means of Egress". Under "1003 General Means of Egress", there are sub-sections: "1003.1 Applicability", "1003.2 Ceiling Height", "1003.3 Protruding Objects" (with sub-sections "1003.3.1 Headroom", "1003.3.2 Post-Mounted Objects", "1003.3.3 Horizontal Projections", "1003.3.4 Clear Width"), "1003.4 Slip-Resistant Surface", "1003.5 Elevation Change", "1003.6 Means of Egress Continuity", and "1003.7 Elevators, Escalators and Moving Walks". Other sections in the sidebar include "1004 Occupant Load", "1005 Means of Egress Sizing", "1006 Number of Exits and Exit Access Doorways", "1007 Exit and Exit Access Doorway Configuration", and "1008 Means of Egress Illumination".

The main content area is titled "Chapter 10 Means of Egress" and has a sub-section "Section 1001 Administration". Under "Section 1001 Administration", there is a sub-section "1001.1 General" with the text: "Buildings or portions thereof shall be provided with a means of egress system as required by this chapter. The provisions of this chapter shall control the design, construction and arrangement of means of egress components required to provide an approved means of egress from structures and portions thereof." Below this is another sub-section "1001.2 Minimum Requirements" with the text: "It shall be unlawful to alter a building or structure in a manner that will reduce the number of exits or the minimum width or required capacity of the means of egress to less than required by this code." There is also a section "[F] Section 1002 Maintenance and Plans" with sub-sections "[F] 1002.1 Maintenance" (text: "Means of egress shall be maintained in accordance with the International Fire Code.") and "[F] 1002.2 Fire Safety and Evacuation Plans" (text: "Fire safety and evacuation plans shall be provided for all occupancies and buildings where required by the International Fire Code. Such fire safety and evacuation plans shall comply with the applicable provisions of Sections 401.2 and 404 of the International Fire Code."). The main content area ends with "Section 1003 General Means of Egress" and a sub-section "1003.1 Applicability".

The right sidebar is titled "Linked Resources" and contains a section "ILLUSTRATIONS" with a grid of diagrams. The diagrams are: "Egress vs. Net Area", "1003.4 - Dead End Corridors", "Common Path of Egress Travel", "Minimum Corridor Width", "Occupant Load Calculation", "Dead End Corridors", "Single Exit Condition", and "1003.5.1 - Separation of Exit and Exit Access Doors".

**"AI IS ALREADY DEMONSTRATING IT HAS THE
POWER TO COMPLETELY REVOLUTIONIZE THE
ARCHITECTURAL WORKFLOW, WHETHER IT BE
GENERATING VISUALS BASED ON TEXT PROMPTS
OR ENHANCING RENDER QUALITY AT THE CLICK OF
A BUTTON."**

- Chaos and Architizer, the State of AI in Architecture Report

GENERATIVE DESIGN TOOLS

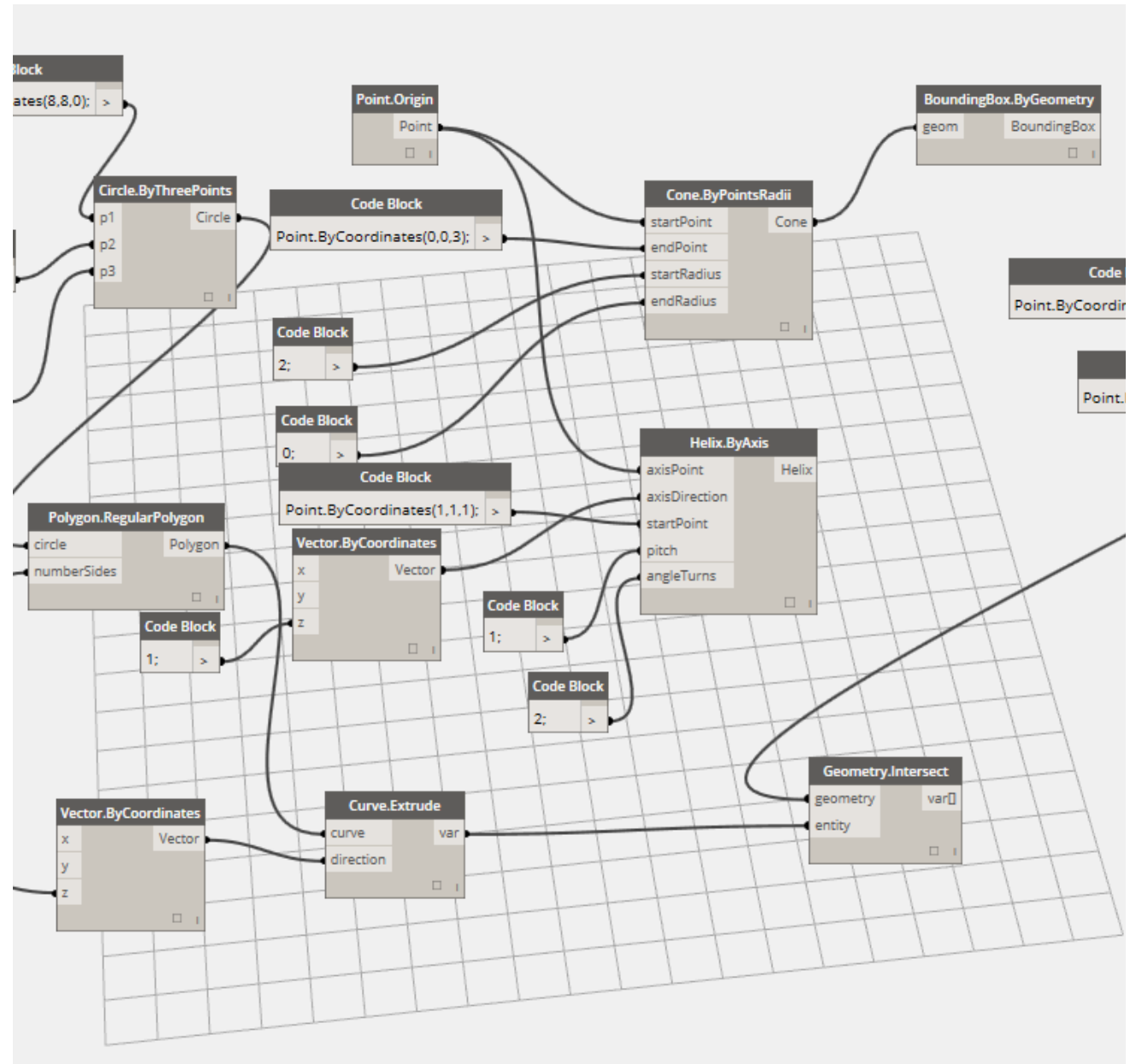
Generative design tools utilize artificial intelligence and computational techniques to explore a vast design space and generate a diverse set of design solutions. These tools have the potential to revolutionize various industries by automating and optimizing the design process.



DYNAMO

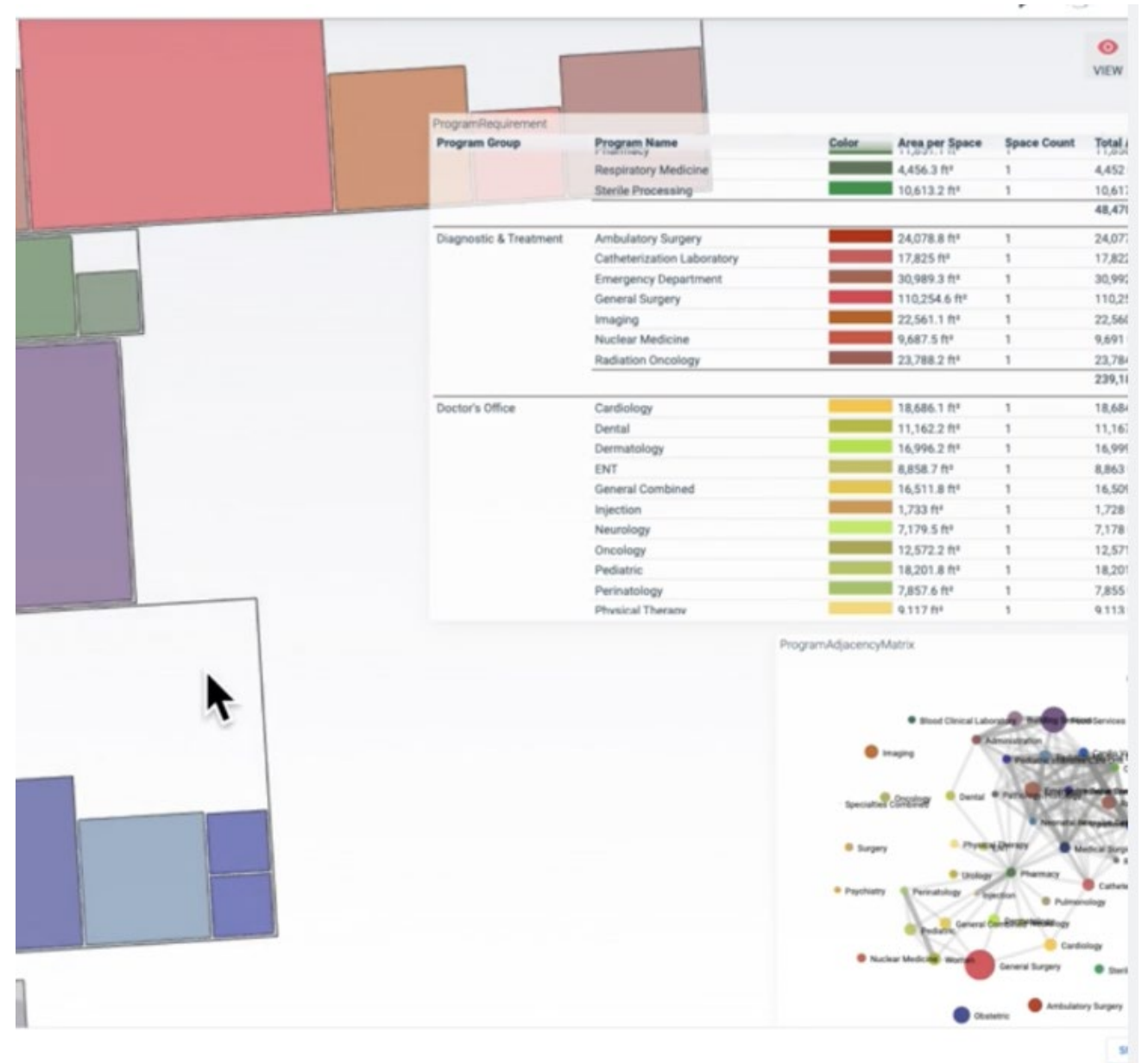
Dynamo is an open-source visual programming language for Autodesk Revit, written by engineers and construction experts. It is a programming tool that permits you to type lines of codes and scripts, while also developing an algorithm that consists of nodes.

Dynamo helps you create programs by using graphic elements called “nodes”. It’s a method of programming better appropriate for visually oriented types, like architects and engineers, or even [BIM developers](#).



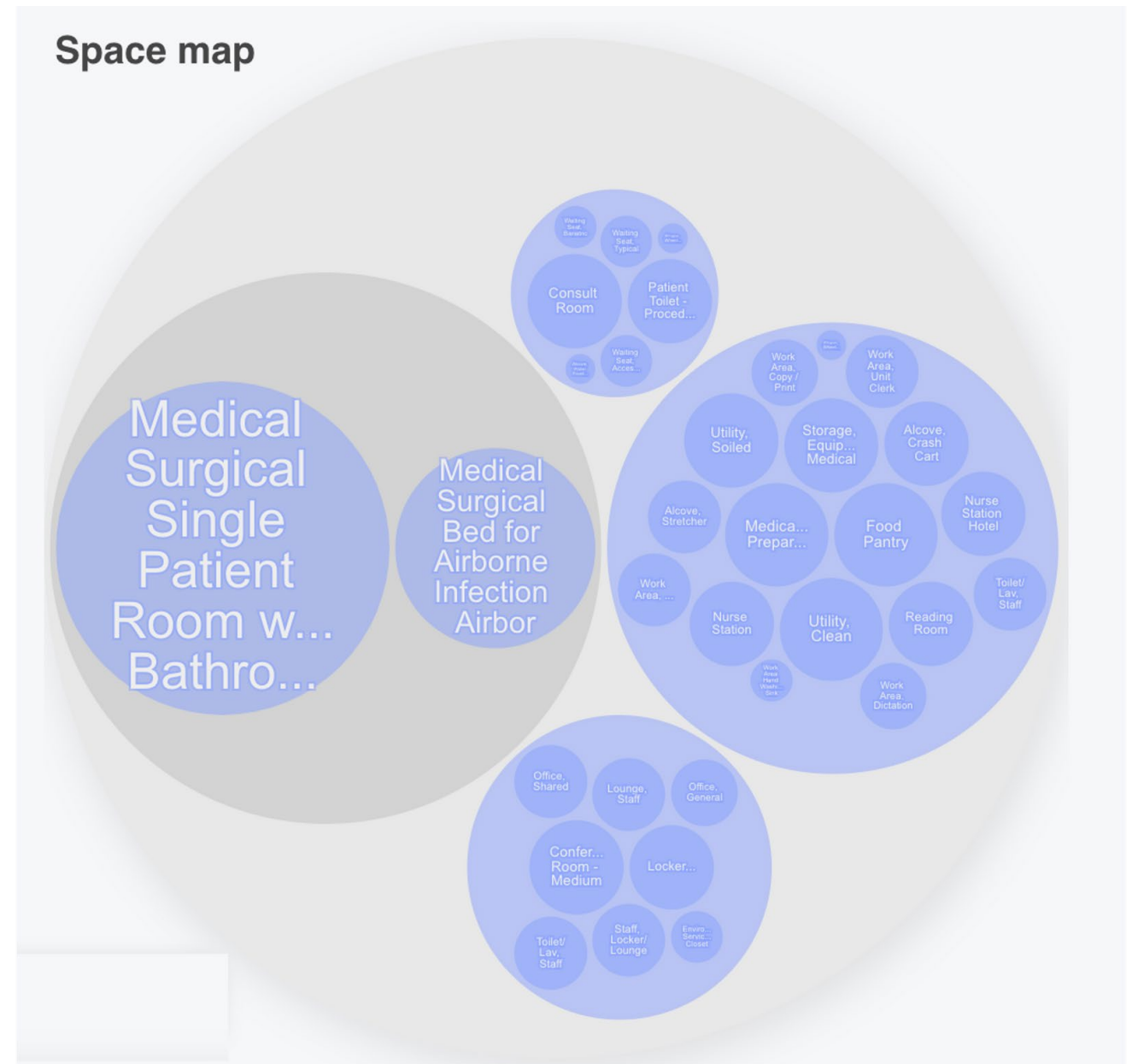
HYPAR

Hypar is a design automation platform for buildings. Anyone, anywhere can create and share design logic so everyone can build better. Hypar delivers sector-specific applications, like our workplace planning solution, powered by our platform.



FORSIGHT

Forsight is a functional space programming tool based on population and burden of diseases to determine functional space requirements based on rules



**“WITH GREAT POWER COMES
GREAT RESPONSIBILITY.”**

VOLTAIRE

“TRUST, BUT VERIFY.”

PROVERB

**“ASSUMING TRUST,
BUT ALWAYS VERIFY.”**

FRAME OF MIND

WHERE DOES THE PRACTICE ACT, FIT IN?

A QUESTION TO BE CONSIDERED

HUMAN



MACHINE

We will coexist, stronger, if we can act together

RISKS AND CHALLENGES

Likelihood of occurrence with generative design tools

75%

Algorithmic Bias
(Especially in LLM's)

65%

Privacy Breaches
(In the end product, but possibly in the making)

55%

Malicious Misuse
(Both practitioners and imposters)

40%

Regulatory Compliance Issues
(How the algorithms are informed)

FUTURE THOUGHTS

Adoption of Ethical AI Frameworks and Governance



Integration of Explainable AI Systems



Development of AI for Social Good



Focus on Privacy and Data Security



THOUGHTS? QUESTIONS?

Open to feedback and discussion



CALIFORNIA ARCHITECTS BOARD

Thank

You