

EmergentAI

“How to use AI properly to design space”

An agentic LLM that reads a real Rhino model, designs within it, and checks its own work — with the designer steering every step.

Arturo Tedeschi & Henrik Cheung · Phase 1 pilot · July 2026

5 schemes from one brief	5 designer-gated steps	~218 numbered lessons	1,017 m² lobby site	6-week pilot
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The big idea. Most “AI for floor plans” tools hand you one finished drawing and stop. EmergentAI works more like a studio: the AI is given a real Rhino model, proposes a design inside it, checks its own work against the rules, and shows it to the designer at every step. Over a six-week pilot this grew from a rough text-to-3D experiment into a repeatable five-step workflow that turns one brief into five preliminary hotel lobby schemes — every one of them audited before review.

“Not text-to-image — text-to-geometry, drawn into the file you already work in.”

01 Existing LLM-to-3D methods in architecture

Before building EmergentAI we mapped how large language models currently reach 3D in a Rhino / Grasshopper environment. Four approaches dominate, and they differ in one decisive property: **design-context awareness**. Three of them generate blind to what is already in the model. Only LLM-RhinoMCP an agent acting on the live Rhino model through the Model Context Protocol — reads the environment’s metadata (layers, boundary, columns, cores) before it draws. EmergentAI is built on that last approach.

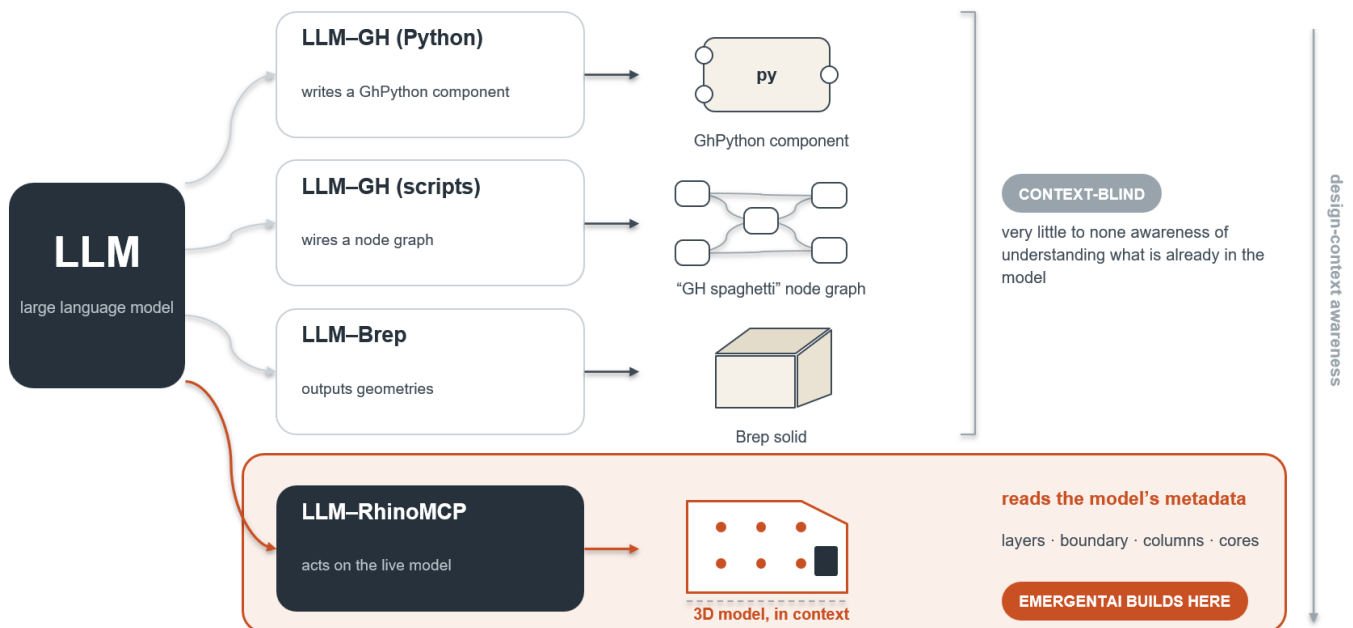


Fig. 1 — Four ways an LLM reaches 3D, ordered by rising design-context awareness. The first three are context-blind; LLM-RhinoMCP reads the model's metadata before drawing.

02 The EmergentAI Protocol

Everything starts from three typed inputs — the **site context** (boundary, columns, windows, entrances), the **designer’s intention** (open, maze-like, central, linear...) and the **programme** (gallery, showroom, event). The engine is an LLM wired straight into Rhino through RhinoMCP; it reads the real model and draws back into it — circulation, zones and partitions first, then furniture with the reasoning behind each move. A design loop closes the system. Currently the the evaluation is primarily a **geometric audit**; future behavioural simulation such as pedestrian flows can be implemented into the future EmergentAI.

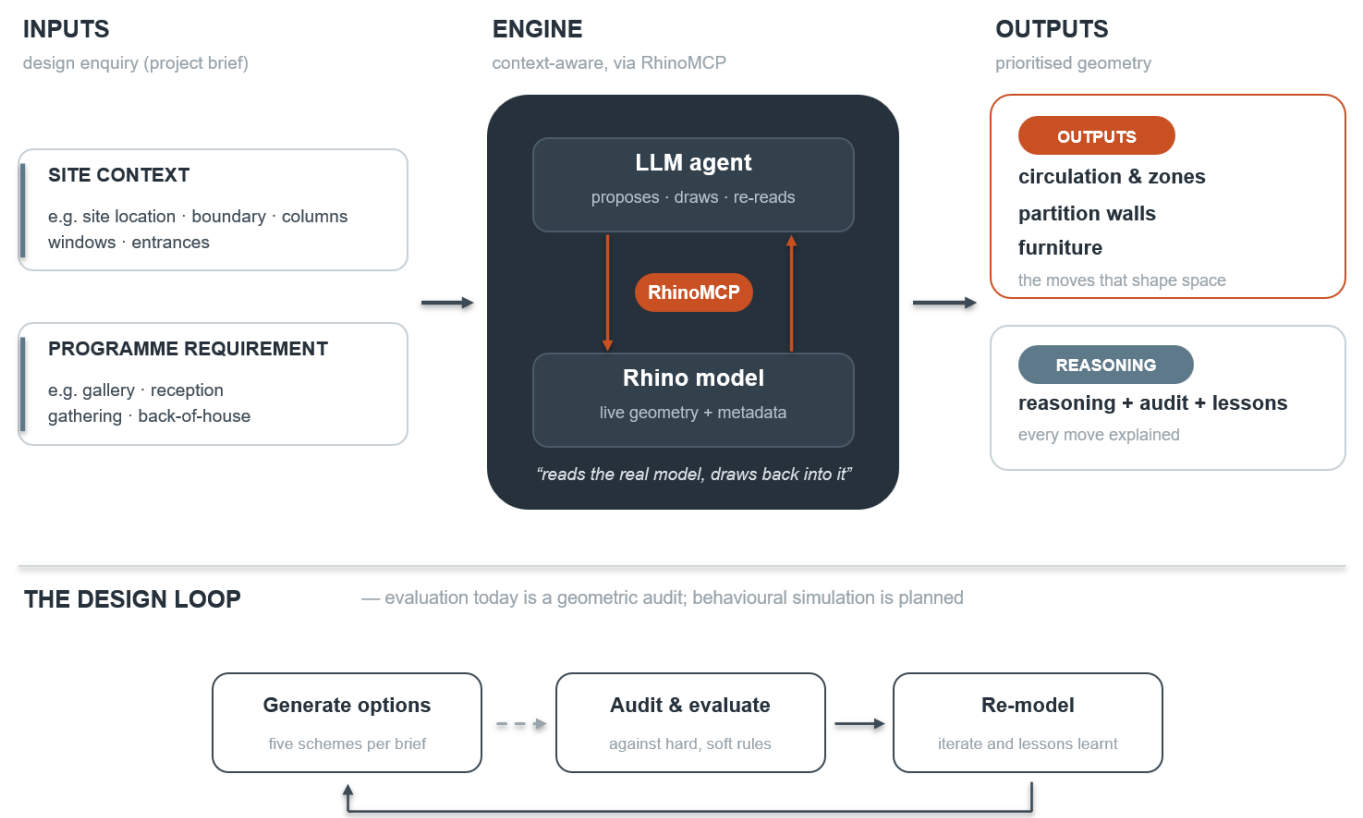


Fig. 2 — The mechanism: three input layers → a model-aware engine (LLM + Rhino via RhinoMCP) → prioritised outputs; below, the design loop, with “Simulate behaviour” marked as planned.

03 How the protocol developed (T1 → T6)

The workflow earned its shape over forty-plus runs, adding one discipline at a time — then finalised with T6: site analysis first, followed by precedents and concept, zone planning, floor plan and 3D designs. It flips the logic from one-time generation to step-by-step design reasoning process:

T1	Baseline	a plain prompt, no rules — fast, generic, unaware
T2	Soft rules	T1 + spatial guidelines the agent should follow
T3	Hard rules + audit	T2 + regulatory minima, checked automatically after every run
T4	Web case studies	T3 + precedent research feeds the brief
T5	Representation	T4 + a push on drawing quality and legibility
T6	Concept-first workflow	Compiled into five steps, a designer sign-off between each



Fig. 3 — The T6 workflow: five steps, left to right, with the designer approving at every gate.

THREE KEY FEATURES

1 Shared vocabulary

A formal design language: every spatial element has a defined size, placement and set of variations — and the model's layer names are the same words the checker reads.

2 A keep-learning system

Every correction becomes a numbered lesson (~218 so far) that feeds back into the skills and the checker, so the system improves between runs instead of repeating old mistakes.

3 Fatigue-aware phasing & diary

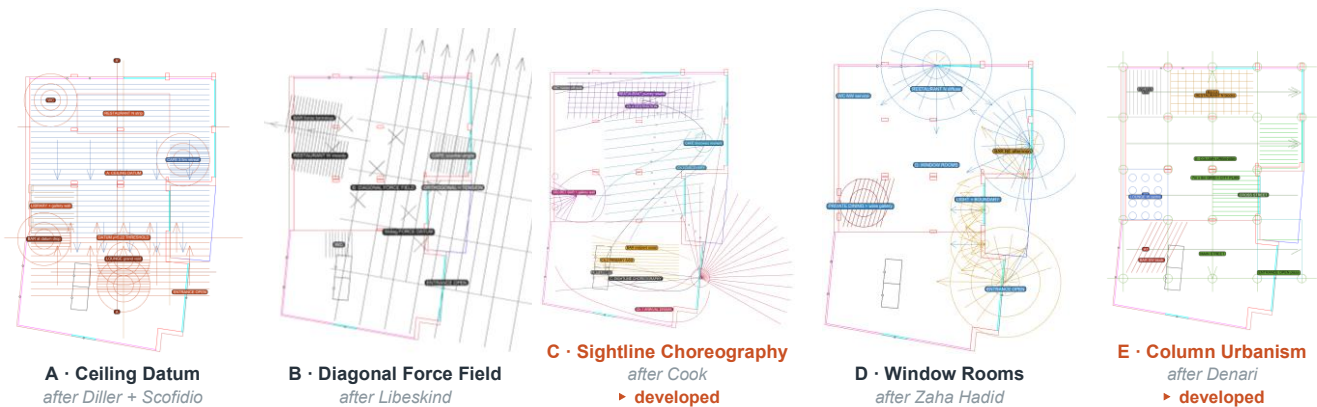
Long sessions erode the rulebook. Work is split into per-step phases; each documents itself — screenshots, checks, feedback — and cannot advance until it is signed off.

04 Case study: re-designing the Grand Emily Hotel lobby

To test the protocol on a real brief, the agent re-designed the lobby of the Grand Emily Hotel. From one brief, step 2 of the T6 workflow produced five genuinely different concepts — and each is deliberately drawn in a different architectural representation method, treating representation as a generative variable rather than a garnish. All five were then carried to floor-plan level and measured by the same audit.

THE SITE

Grand Emily Hotel lobby (YOD Group)
irregular plan, ~1,017 m²
two entrances · sixteen columns
dual-height ceiling: 12 m → 3.5 m



Step 2 of T6 — five concept diagrams from one brief, each in a distinct drawing language. Options C and E are featured overleaf.

EVERY SCHEME, MEASURED BEFORE REVIEW

A 87 seats · PASS **B 105 seats · PASS** **C 123 seats · PASS** **D 174 seats · PASS** **E 149 seats · PASS**

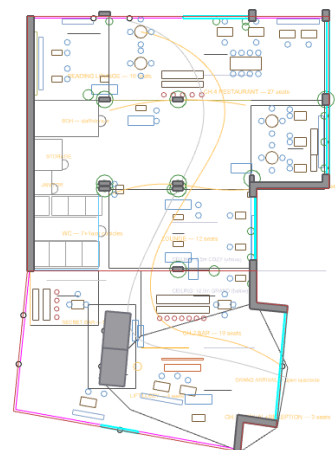
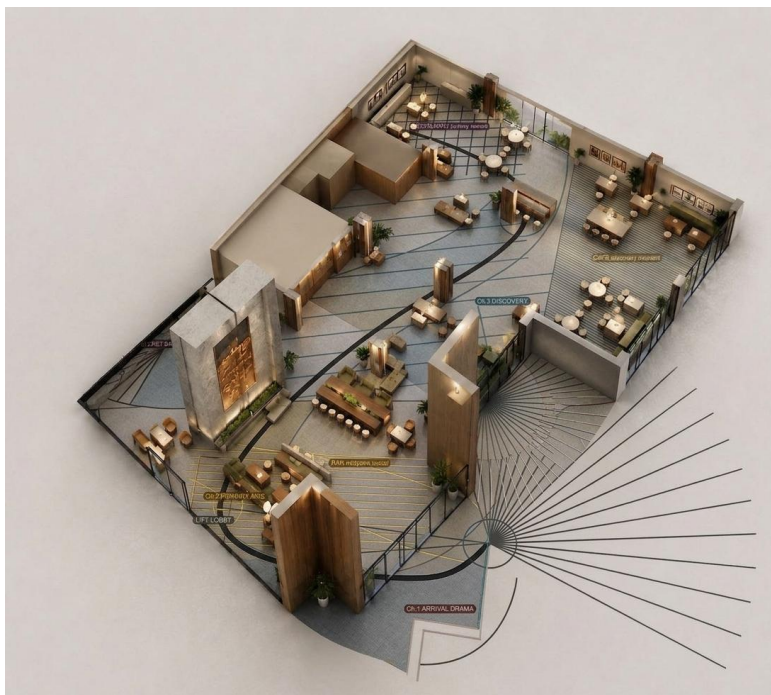
Three-tier audit:

- (1) **hard-rule audit:** boundary containment, clearances, lift-core and entrance zones;
- (2) **spatial metrics:** edge activation, view corridors and programme variety; and
- (3) **qualitative review:** concept fidelity, spatial sequence, thresholds and composition.

TWO OPTIONS, ONE BRIEF — A DELIBERATE CONTRAST

The EmergentAI evaluation system ranked **C · Sightline Choreography** first — the strongest narrative, a curved, staged journey. Its sharpest counterpoint is **E · Column Urbanism** — the clearest structural logic, strictly orthogonal, the 4×4 column grid treated as a miniature city. Same site, same rules, opposite temperaments:

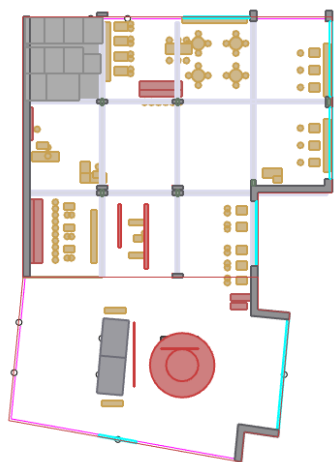
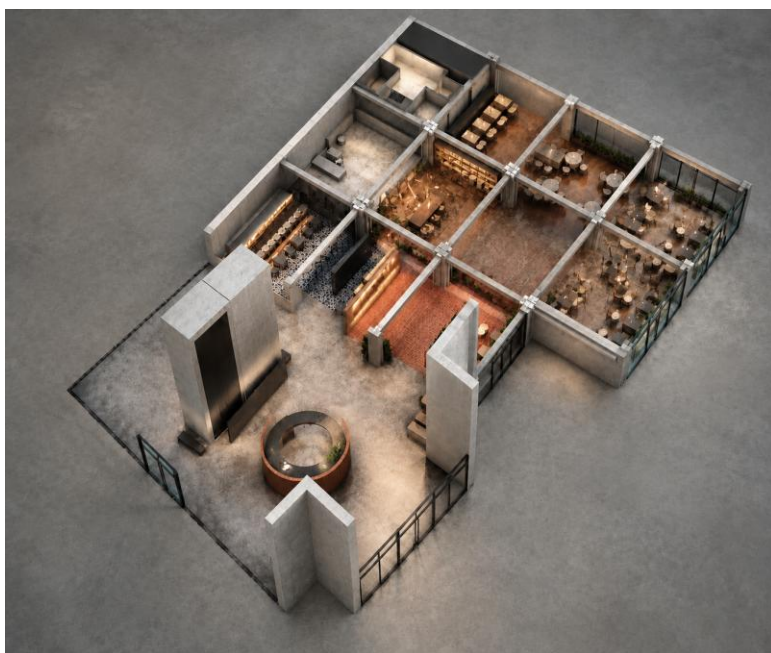
OPTION C · SIGHTLINE CHOREOGRAPHY 123 seats · audit PASS



A choreographed journey — arrival drama, a primary axis past the bar, a café discovery moment, a restaurant reward; the secret bar sits off-axis behind the gallery wall.

Option C — final render beside floor plan: the architect's standard pairing, perspective and plan.

OPTION E · COLUMN URBANISM 149 seats · audit PASS



A city in a room — the 4x4 column grid (7x8 m bays) read as an urban plan: each bay a block with its own programme, overhead beams tracing the "streets", a show kitchen and communal table anchoring the restaurant.

Option E — final render beside floor plan: strict orthogonal order against C's curved choreography.

05 What's next

The most valuable lesson is about **"What"** mechanisms are effective for AI-emerged architectural design. Issues such as context-fatigue have to be further tamed. Phase 2 targets to develop the protocol into a multi-step-based application to reinforce the stability and controllability of EmergentAI.