Morfis: AI-Assisted Physical Product Customization

Startup Track

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Abstract

Morfis is an AI-native design platform that makes Computer Aided Design (CAD) accessible to non-experts by allowing users to create and edit manufacturable CAD models using natural language and visual input. Unlike traditional CAD tools that require specialized skills, Morfis lets hobbyists, educators, and product teams design through semantic prompts. It uses a modular, multi-agent architecture powered by vision-language models to interpret input, generate CAD logic, and execute it in open-source environments like FreeCAD or CadQuery. Outputs are fully parametric and ready for processes like 3D printing.

1. The Problem

Physical products are deeply tied to personal identity, yet real personalization remains out of reach. While AI-powered tools have made it easy for anyone to create and customize digital assets, the same ease does not exist for physical objects. Customizing tangible products still requires professional-level skills in complex CAD software, which was never designed for casual or non-technical users. As a result, turning ideas into manufacturable designs is often slow, expensive, and out of reach for most people. This gap limits creativity, discourages iteration, and prevents broader access to personalization in the physical world.

2. Morfis

The Morfis Platform. Morfis is a multi-stage framework that uses vision-language large models (VLLMs) as CAD agents to convert user input, in text or image form, into executable CAD code. The VLLM interprets the intent, generates a high-level plan, and translates it into Python code using libraries like FreeCAD or CadQuery. This code runs in a CAD environment, where any errors trigger an iterative repair loop. Final output is semantically validated for structural soundness and manufacturability. Morfis also uses external tools for documentation and real-time rendering to support generation and verification.

Uniqueness. Morfis departs from traditional CAD software as an AI-native platform that allows users to design through semantic inputs. Unlike mesh-based generators, it produces editable, manufacturable CAD models. In contrast to recent tools aiming to enhance the productivity of expert engineers, it is purpose-built for non-experts, requiring no engineering background. The Morfis platform will integrate social features that foster community and collaboration.

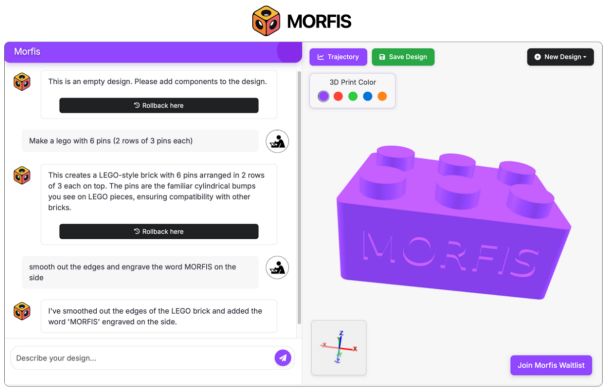

Figure 1: Designed of an engraved lego block via Morfis.

Scientific Foundation. Morfis builds on our recent work the CAD-Assistant [1], a generic agent for AI-assisted CAD based on a tool- augmentation with CAD specific tools.

Impact and Vision The Morfis project, aims to democratize product design and empower diverse customers to create products that precisely match their needs, requirements, and aesthetic preferences.

Development Milestones We have developed a functional prototype of the Morfis platform, which has been showcased in both industry and academic settings in Luxembourg and, notably, accepted for demonstration at this year's CVPR demo session. The project is currently under review for commercialization funding through the Luxembourg National Research Fund's JUMP program. Several partners have already expressed interest in collaborating.

Buisness Model. Morfis will use a usage-based pricing model that starts with credit packs for casual users and scales up to SaaS subscriptions, team workspaces, and enterprise API licenses. Revenue streams include monthly plans, pay-as-you-go credits and print referral fees.

[1] Mallis et al, *CAD-Assistant: Tool-Augmented VLLMs as Generic CAD Task Solvers*, Arxiv, 2025