R&D Engineer - Computer Graphics
Developing a Blender Add-on for 3D Design Drawing

Advisor
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Duration: 12 months

Context and Objective

Designers draw extensively to externalize their ideas and communicate with others [1]. However, drawings are currently not directly interpretable by computers. To test their ideas against physical reality, designers have to create 3D models suitable for simulation and 3D printing. But while drawing is visceral and quick, 3D modeling requires careful planning, precision and constraints to manipulate 3D shapes on screen.

The ambition of our research group is to bring the power of 3D engineering tools to the creative phase of design by allowing designers to create 3D models by drawing. To this end, we have developed a technology capable of automatically lifting design drawings to 3D [2]. Our goal is now to demonstrate how this technology can streamline the Computer-Aided-Design workflow, and to take the first steps in industrializing this technology.

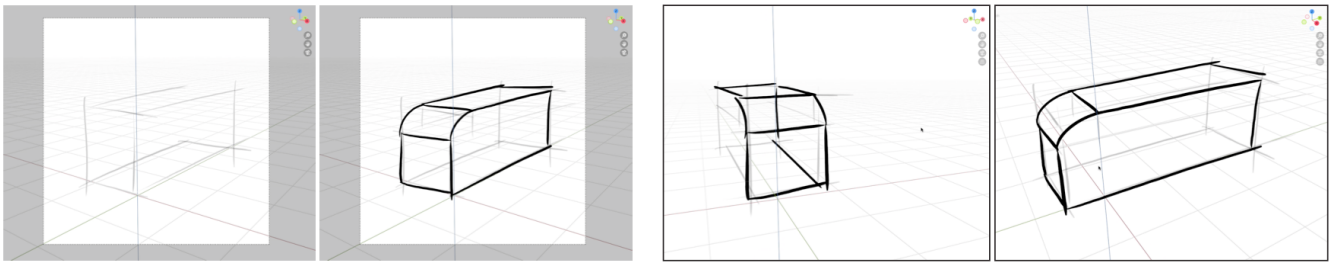

Figure 1: Preliminary prototype of our algorithm within Blender. The user draws a shape in perspective (a), and our algorithm lifts the pen strokes to 3D to be seen from novel viewpoints (b)

Work program

Achieving our goal entails three complementary sub-objectives:

- Implementing a demonstrator of our 3D drawing technology within a professional CAD software.
- Testing our demonstrator with expert designers.
- Transferring our technology to leading CAD software editors.

Based on preliminary discussions with CAD users and software editors, we have identified a set of key features to unleash the potential of our technology. Our first goal is to implement

these features as an add-on to Blender [3], an open-source industry-grade 3D modeling software. Blender will serve as an independent platform to test our technology with expert CAD users, and to demonstrate how our algorithm can seamlessly bridge the 2D drawing and 3D modeling tools available in the established CAD pipeline. Figure 1 illustrates a preliminary prototype that we have implemented using Blender's Grease Pencil drawing interface [4].

We will hire professional designers and 3D modelers to stress test each of these features, first to make them robust to the diversity and complexity of real-world design drawings, but also to assemble a portfolio of artworks that will illustrate diverse ways in which our technology can be used in practice.

Within each iteration of feature development and testing, we will work hand-in-hand with software companies interested in our technology to assess how it addresses their specific needs.

Location

The project will be developed at Inria Université Côte d'Azur, in the GraphDeco group (https://team.inria.fr/graphdeco/). The group does research on image synthesis and computer-aided design. Salary will follow the Inria grid and depends on experience.

Requirements

The successful candidate should have knowledge in computer graphics and/or computer vision. The candidate must have experience in Python programming, and be interested in 3D modeling and related topics (geometry processing, human-computer interaction, numerical optimization). The candidate should also have an interest in developing tools for designers and in interacting with such expert users.

References

[1] Sketching, The basics. Koos Eissen en Roselien Steur. BIS Publishers.

[2] Symmetry-driven 3D Reconstruction from Concept Sketches.
Felix Hähnlein, Yulia Gryaditskaya, Alla Sheffer, Adrien Bousseau. SIGGRAPH 2022
https://ns.inria.fr/d3/SymmetrySketch/

[3] Blender 3D modeler. https://www.blender.org/

[4] Grease Pencil. https://www.blender.org/features/story-artist/