

# **A Taxonomy of Modeling Techniques using Sketch-based Interfaces**

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Traditional user interfaces in modeling have followed the WIMP (Window, Icon, Menu, Pointer) paradigm; while functional and powerful, the creation of complex models requires much expertise and effort. A recent trend in modeling is the use of sketch-based interfaces, allowing for hand-drawn sketches to be used from rough model creation through to fine detail construction. Such interfaces are intended to be more natural than traditional ones, making them accessible to novices and experts alike.

Sketch-based modeling systems represent an intriguing confluence of several domains in computer science. Standard modeling techniques are required to represent and manipulate objects; the design and implementation of intuitive user interfaces relates to human-computer interaction; software engineering is necessary for determining user expectations; and, the task of interpreting 2D sketched input as a 3D model is similar to the single-image recognition problem in computer vision.

In this state of art report, we present and classify both the canonical and recent work in sketch-based interfaces. A common element of each is the need for sketch acquisition, possibly followed by a filtering or processing stage. The main stage in a sketch-based system is sketch interpretation, which is where the systems differentiate themselves. In geometric modeling, sketched input is used to: create models from scratch, augment existing models with additional components or details, and to transform and manipulating models.

Sketch-based interfaces have found utility in many other areas of computer graphics and computer science as a whole; several important classes of applications are presented in this paper. To conclude, we discuss important challenges and open problems for researchers to tackle in the coming years.