A Quick Course in SketchUp



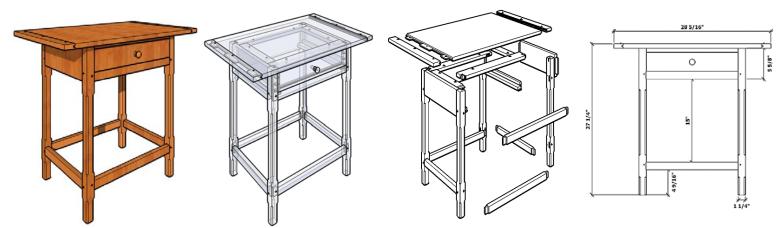
This powerful 3D drawing program is easy to use—and it's free

BY TIM KILLEN

Por years I dreamed of using the computer to design furniture—being able to work out the proportions easily, preview the construction and avoid mistakes, even to see how the piece would look in the room. The 2D computer-aided drawing (CAD) systems I tried were OK but limited. For example, they didn't let me see a piece in perspective, the way a viewer would see it later, or create exploded views of assemblies, or design complex joints.

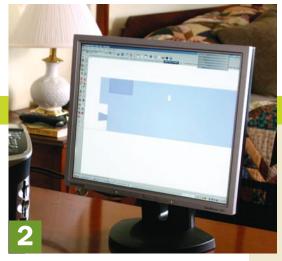
Then, two years ago, a breakthrough—I found Google SketchUp, a 3D drawing program from the company that operates the biggest Internet search engine. Better yet, Google offers a free version that's comprehensive enough to let you design very complex furniture. SketchUp Pro, a for-pay version that I use in my business, sells for \$495 and includes features that I seldom use. Both versions run on Windows or Apple computers.

A half-day training course offered by the program's developer convinced me that SketchUp could let me render the necessary shapes, moldings, curves, and joinery I use when I design furniture (Google still offers the training). I was especially struck by the power of SketchUp's "component" tool, which treats the 3D shapes I draw like solid



A SCALE DRAWING . . . ALSO YIELDS AN X-RAY VIEW . . . AN EXPLODED VIEW OF THE PIECES . . . AND DIMENSIONED 2D VIEWS







FROM COMPUTER TO SHOP

Dial in a design. Killen begins each project with a 3D SketchUp rendering of the overall piece (facing page). At this stage, he tweaks the drawing to make the proportions and overall aesthetics just right. Then he zeroes in on individual components, checking sizes and details of joints (1). Once he's sure that pieces fit together properly, he switches from 3D to 2D views (2), then prints out templates (3). In the shop, he uses the templates to lay out the separate elements of the real piece (4).

objects, not just a collection of connected lines. Each component is rendered separately, then easily moved, copied, changed, rotated, and connected to others.

SketchUp allows you to produce an exploded view of all the components that go into a piece of furniture, use an X-ray view to model details of the joints, and produce detailed, dimensioned views of each component. Once I'm satisfied with each component in a design, I print full-size templates of the joints (see photo, right) to mark out the lumber in the shop.

I've heard people say that SketchUp is just a conceptual tool, good for quick design sketches but limited for making detailed construction plans. Not so. I've used SketchUp for precise, highly detailed renderings, including a Gothic-style cornice and compound-miter

joints. I'll never go back to 2D CAD, nor will I go to the shop without first building a piece in SketchUp.

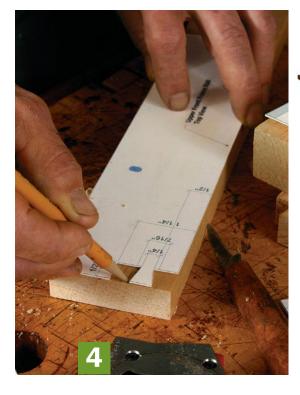
Sure, it's daunting to learn another computer program. But this one is worth it, especially for woodworkers. You can learn the basics of SketchUp in half a day, using tutorials available free on the SketchUp Web site. You may need a couple of long weeks of practice to gain a reasonable level of confidence, but the advice I give here will help you shorten that learning curve. And SketchUp will change and improve the way you design and build furniture.

Designing and building in SketchUp

Whether I'm working from a photo or designing from scratch, I begin by roughing out the shape and size of individual



To read and learn more about SketchUp from Tim Killen and other bloggers, go to **FineWoodworking.com/extras.**





spent fine-tuning a design in SketchUp can make the actual construction go faster, with fewer slip-ups.

Simple tools make building easy

































parts, working only on the front view, usually. This very preliminary stage produces only surface planes. I don't worry about the third dimension at this point.

Once I have a rough drawing, I begin to flesh it out. Using SketchUp's "push/pull" tool, I give each element thickness, width, and length. Push/pull is probably the most used of SketchUp's unique tools; it turns a flat 2D shape into a solid object or a 3D recess with a click and drag. One rectangle becomes a leg; another, a full mortise.

I don't worry about joints at this stage. I'm only trying to get all the parts defined and connected into an attractive whole. For example, if I'm designing a case with a bracket foot, I'll simply draw in the basic outline of the foot. Later, I'll shape detailed joints.

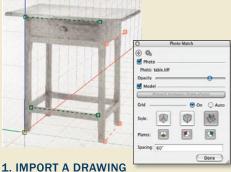
I also make many adjustments to the sizes, thicknesses, and positions of the components. Here, I use the tape-measure and protractor tools to check dimensions and angles, and to create on-screen guidelines showing where to place holes, pegs, mortises, and the like. Again, these elements start as simple shapes and then the push-pull tool pulls them out from a surface or pushes them in to make a hole.

With the joinery completed, I detail the moldings. For this, I use SketchUp's "follow me" tool. It allows you to profile a shape for, say, a turned leg or a cornice. From there, I create separate X-ray views to check the design of each joint, an exploded view of the components, dimensioned drawings, and full-size templates and patterns for the actual construction.

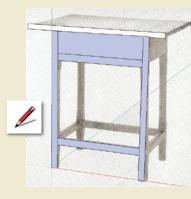
If I need to check a dimension or take a closer look at a detail, I go back to the computer. In some cases I may add dimensions to a file or add detail to the model. I continually update the SketchUp images as

STARTING A PLAN

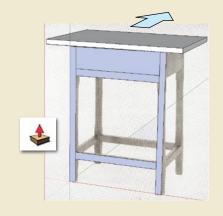
You can bring a photo into SketchUp and use it as the basis for a drawing.
Killen often does this for his period reproductions. For an original piece, you can begin with a shape defining its top or face.



With a photo placed as a starting point, you can use SketchUp's "photo match" tool to keep the lines you draw properly oriented on the different axes and following the edges in the photo.



2. DRAW SIMPLE SHAPES
Draw rectangles to define legs,
aprons, and other elements.
Designate each rectangle as a
component. That lets you modify it
without affecting any other element.



3. GIVE EACH ONE THICKNESS
Select a component, such as the top of
this table, and use the push/pull tool
to give it the proper thickness. Work on
one component at a time. Later, you'll
duplicate identical components.

A SketchUp gallery

FINE WOODWORKING

Professional woodworkers and hobbyists alike now use SketchUp regularly, creating presentation drawings for clients as well as working drawings for the shop. The images on these pages give you a taste of the furniture styles and shapes that you can render.

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Gallery images courtesy of the contributors

MAKING A COMPONENT

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Using SketchUp to create a component like this table leg means using the computer to mimic tasks you'll do later in the shop—make the basic leg the correct height, width, and length; mark and shape mortises, dovetails, and chamfers. But unlike working in a shop, you only have to do things once. When you've drawn one chamfer, just copy and rotate it; the same goes for the completed leg.



1. DRAW A RECTANGLE

This is how most components begin in SketchUp. You can either draw the four sides one at a time using the pencil tool, or create the shape directly using the rectangle tool. SketchUp has similar tools for drawing circles and polygons.



2. ADD DIMENSION

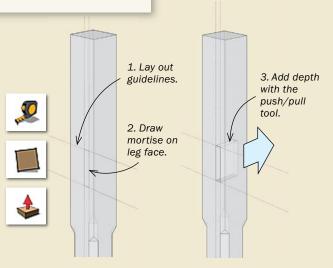
The push/pull tool lets you drag the rectangle along one axis, converting the two-dimensional shape into a 3D solid. The tape-measure tool lets you check the dimensions. You also can type in critical dimensions, entering the numbers in a small on-screen window called the Value Control Box.





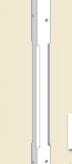
3. CHAMFER ONE CORNER, THEN REPEAT

Using the pencil tool, draw in the shape of the chamfer. Then erase the corners of the leg to create one chamfer. Finally, highlight the chamfer outline and copy it onto the other three corners.





The tape-measure tool lets you add guidelines to outline mortises. Draw a rectangle in the space defined by the guidelines and use the push/pull tool to "cut" the mortise. Working in the X-ray view lets you see what you're doing.



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5. COPY THE FINISHED LEG

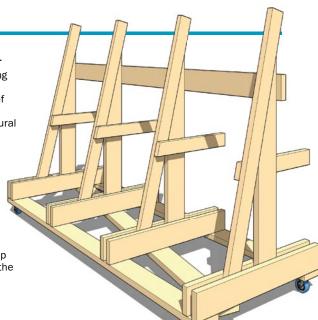
Once you've completed one leg, you can copy it, rotate it, and move it. The arrow keys on the keyboard let you restrict the movement of a component to one direction only—left or right, front to back, up or down—in order to keep similar components aligned.



DAVE RICHARDS, ROCHESTER, MINN.

For the past several years, I've been helping other woodworkers around the world learn to use SketchUp. I've made a wide range of drawings, from tiny parts for medical

equipment to large architectural projects. Sometimes I'll work from a photo, as I did for the front view of the dining table (left), where I worked out construction details. The female figure is a stock image in SketchUp, providing scale. Other times, I'll design from the ground up in SketchUp, as I did for the lumber rack (right).



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ADDING JOINERY

Create other components in a piece as you did the legs. Once you have given rails and stretchers the right width and thickness, you can draw in dovetails, mortises, and tenons.

1. CREATE A **DOVETAIL**

Using the pencil, push/pull, and eraser tools. create the dovetail pins on the front stretcher. Then, as in real life, use the pins to mark the tails on the mating piece.



THE FIT Once you've created the components. you can move them into position, fitting them together and joining them with the legs.



Draw objects only once—With two-dimensional CAD programs, you draw separate front, side, and top views, drawing various pieces over and over. But in SketchUp, you work in a 3D view most of the time. That means you only need to draw something once. You can rotate it, zoom in for close-ups, or zoom out to see the whole. For the legs on the table shown here, for example, I needed to draw only one leg and the chamfers on one corner. I copied the chamfers and attached them to the other corners. Then I copied and rotated the completed leg to place the three other legs.

Make the most of the component tool—If you simply create shapes and bring them together on screen, you'll actually be creating one large, very complex shape. If you try to move or resize one part of it, you'll distort the entire design. So once you create any element, such as a table leg or chair arm, designate it as a component. Then you can change its size and shape without affecting any other element in the design.

Whenever you have identical components—table legs, for example—you can draw one, designate it as

I build the actual piece, so that I have a high-quality document showing the piece as built.

For a piece like the table shown on these pages, where I'm working only from a photo, I might spend 10 hours working out initial design and construction details in SketchUp. Then I can comfortably begin work in the shop. If I need to check a dimension or examine a detail, I'll go back to the computer. I'll save all that SketchUp time and more when I make the piece for real. Plus, I know it will look great.

How to shorten the learning curve

Here are some pointers I've picked up in my two years' experience with SketchUp, which should help you jump in without difficulty.

CREATING TURNINGS

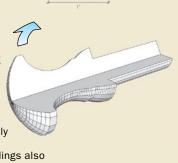
SketchUp's "follow me" tool allows you to precisely render rounded or curved objects like this drawer pull. The tool translates a one-plane shape into a solid.

1. DRAW THE PROFILE

Use the curve and pencil tools to draw the basic outline of the drawer pull.

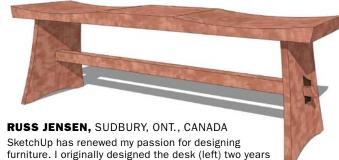
2. DEFINE THE **SOLID SHAPE**

Draw a circle, defining a path to follow. Highlight the circle, then click on the drawerpull shape with the follow-me tool. SketchUp automatically extrudes the shape around the path. Moldings also are created this way.



SketchUp gallery (continued) _





ago, but redrew it when I began using the program. To make my designs look realistic, I import images of different woods and manipulate the size, position, and orientation of the grain. For example, the sofa (right), will have walnut crotch veneer on the end panels. Once I add some shadows, I have a drawing that a potential customer can really sink his or her teeth into.



a component, then copy it. Any changes you make to that component will automatically be made in every copy of the component. Not only does that save you drawing time, it keeps the overall drawing consistent and precise.

Watch the axes—Objects in SketchUp are made up of a number of faces that usually align with two of three axes. Red, green, and blue guidelines define those axes. At first, I was careless about drawing lines on axes and connecting lines properly. SketchUp couldn't create the face or shape I wanted because my lines weren't in the same plane or didn't connect.

There are a number of aids to help you keep your drawing on-axis. For example, when you draw a line, its color changes to the appropriate axis color when it coincides with that axis.

The arrow keys on the keyboard also help keep shapes and components on-axis when you move them. Pressing the right arrow forces the object to move only along the red axis, for example. This is very helpful when you're trying to fit one component precisely against another.

Use SketchUp's tools for precision—I frequently use the tape-measure tool to place guidelines that help me position or connect components.

SketchUp's move tool helps connect components at precise locations. You place the tool at a corner of one component, then drag that component to connect with the corresponding corner of another component. SketchUp recognizes these points and snaps them together precisely. Last, you may want to turn on the X-ray view so you can see how, for example, a tenon fits in its mortise.

Tim Killen makes museum replicas of 18th-century and Shaker furniture in Orinda, Calif.



Pick your style. If you literally want to create a sketch in SketchUp, you can choose from more than a dozen pen and brush styles. If you don't like the way they look, you can always revert to the precise default style.

