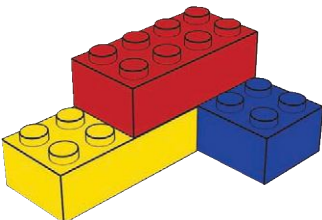
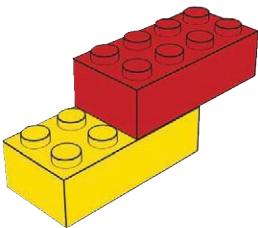
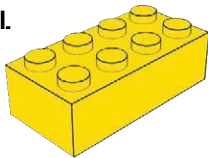


# CAD/CAM Software on a Budget

1.



Most CAD/CAM software is out of reach to the typical hobbyist, costing thousands of dollars, but there are a few inexpensive gems out there.

## 1. Lego CAD with LDraw

Quick, grab three 2x4 Lego bricks. Place the second brick on top of the first, offset by two studs on the long axis. Now, place the third brick under the second brick, at a right angle to the first. Huh?

This kind of tortured description made me wonder about making my own visual Lego instructions. I Googled my way to the free LDraw suite of Lego CAD applications and parts libraries, which are staggeringly complete. Soon after installation, I was using the MLCad application for a marathon 3D brick-building session. It's addictive to drag-and-drop any Lego part ever made from an endless tub of virtual bricks.

Pass the step-inclusive model file to the free LPub program, and you'll soon be printing your own Lego instruction manual and parts

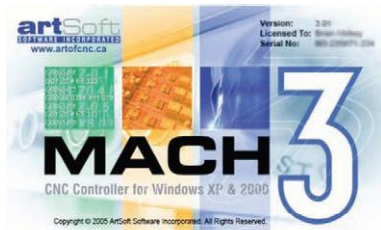
list. Thanks to the bundled POV-Ray renderer, you can choose drawing styles, from simple, flat graphics to shiny, ray-traced works of art. [Free ldraw.org](http://Freeldraw.org)

—JEP

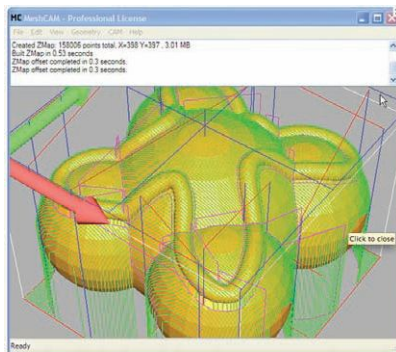
**2. Mach3** Artsoft's Mach3 CNC software turns your PC into a 6-axis CNC controller. It allows direct import of DXF, BMP, JPG, and HPGL files, then it creates the G-code to control your CNC machine. *\$159 (demo available)* [machsupport.com](http://machsupport.com)

**3. MeshCAM** MeshCAM lets you create toolpaths from 3D files in STL and DXF formats, and will even generate 3D objects from flat image files like JPEGs. "No CNC experience is required — you can be cutting parts in minutes." Works with Mach3 and CutViewer. *\$175* [grzsoftware.com](http://grzsoftware.com)

2.



3.

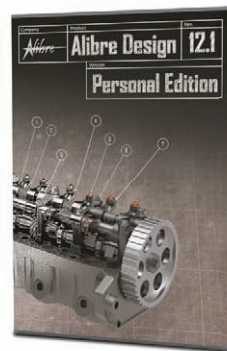


**4. EMC2** The Enhanced Machine Controller (EMC2) is free, Linux-based, open source CNC software that will operate your CNC tools and other robots. [Free linuxcnc.org](http://Freelinuxcnc.org)

**5. G-Simple** G-Simple is a simple CAM for 3-axis machining centers that does metric and English units, and the price is right. *Free* [gsimple.eu](http://gsimple.eu)

**6. GCAM** GCAM is a free, open source CAM package for 3-axis CNC in English and metric units. Use its simple interface to make templates and holes, then export the corresponding G-code to your CNC tool. *Free* [gcam.js.cx](http://gcam.js.cx)

**7. CodeShark Mill** CodeShark Mill is a "hybrid" CNC code editor with built-in DNC communications, full editing, an integrated CAD system, an on-the-fly feed and speed calculator, even multiple-seat discounts for bigger shops. *\$49 (demo available)* [softsquid.com](http://softsquid.com) —MDV



## Alibre Design Personal Edition

Most 3D parts begin life as 2D sketches that are pushed and pulled into 3D models on your computer screen. Some programs use a "wire mesh" frame to create objects (Blender, Google SketchUp, Rhino), and some use actual solid shapes (Alibre Design, SolidWorks, Inventor, Pro/Engineer).

If you plan to actually make the things you design, solid modeling CAD programs talk to fabrication machines (like 3D printers) the best. They're made for part design, unlike other programs. And what really distinguishes them is their ability to create assembly files, with parts that relate to each other just as they relate in real life. Assemblies let you see your final design and make sure everything fits together perfectly, while keeping the part files separate from each other. One part can represent an off-the-shelf motor, another part can be exported for 3D printing, and another can be made into a drawing to send to a laser cutter.

The only remotely affordable solid modeler (not a student license) is Alibre Design Personal Edition at just \$99. It's got all the stuff you need. The only notable drawbacks to PE versus Alibre's Pro and Expert versions is that PE omits sheet metal modeling and some advanced drawing creation tools (like section and detail views), and its import/export file options are limited. But you can still get up and running quickly and export STL files, so unless you're a power user you'll never miss the fancy stuff. *\$99* [alibre.com](http://alibre.com)

—Dustyn Roberts