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Media Factory

# Digital\_Fabrication\_Studio.03

## Software – how to design a project for digital fabrication

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07.05.2012

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Helsinki



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# Today:

- \* Geometries and file formats
- \* Softwares available in the lab



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01.

# Geometries and file formats: modeling techniques and formal representations

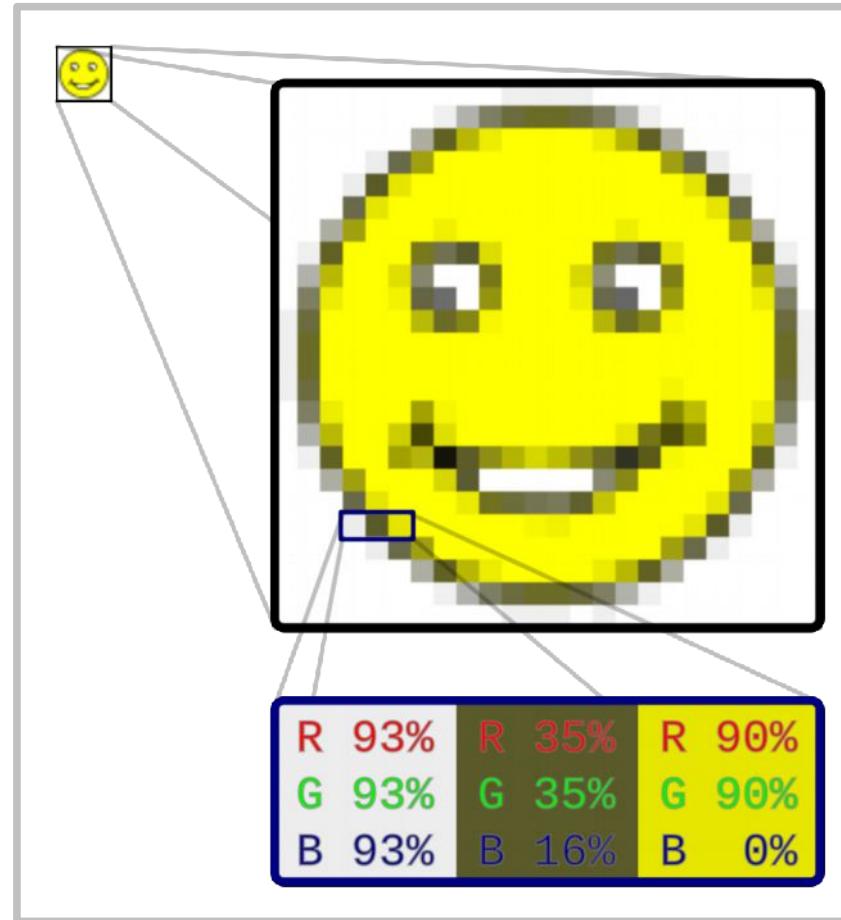
# 2D: Raster graphics

A raster graphics image, or bitmap, is **a dot matrix data structure** representing a generally rectangular grid of pixels, or points of color, viewable via a monitor, paper, or other display medium.

A bitmap corresponds **bit-for-bit** with an image displayed on a screen, generally in the same format used for storage in the display's video memory, or maybe as a device-independent bitmap. A bitmap is technically characterized by the width and height of the image in pixels and by the number of bits per pixel (a color depth, which determines the number of colors it can represent).

---

# 2D: Raster graphics



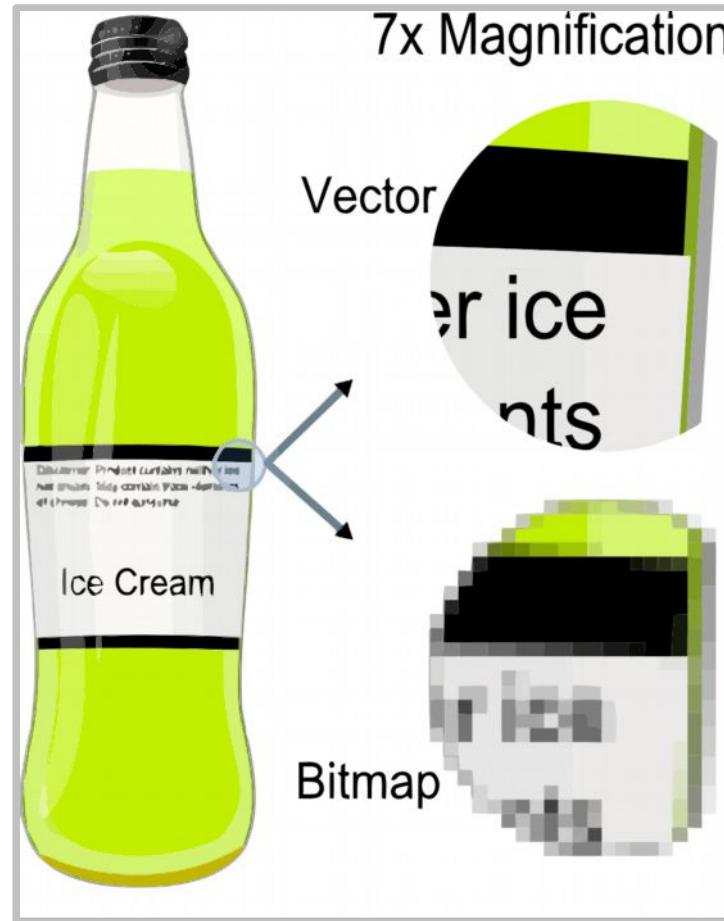
The structure of a bitmap image.

## 2D: Vector graphics

Vector graphics is the use of **geometrical primitives** such as points, lines, curves, and shapes or polygon(s), which are all based on mathematical expressions, to represent images in computer graphics. "Vector", in this context, implies more than a straight line.

Vector graphics is based on images made up of vectors (also called paths, or strokes) which lead through locations called control points. Each of these points has a definite position on the x and y axes of the work plan.

# 2D: Vector graphics



Each track can be assigned a color, a shape, a thickness and also a fill. This does not affect the size of the files in a substantial way..

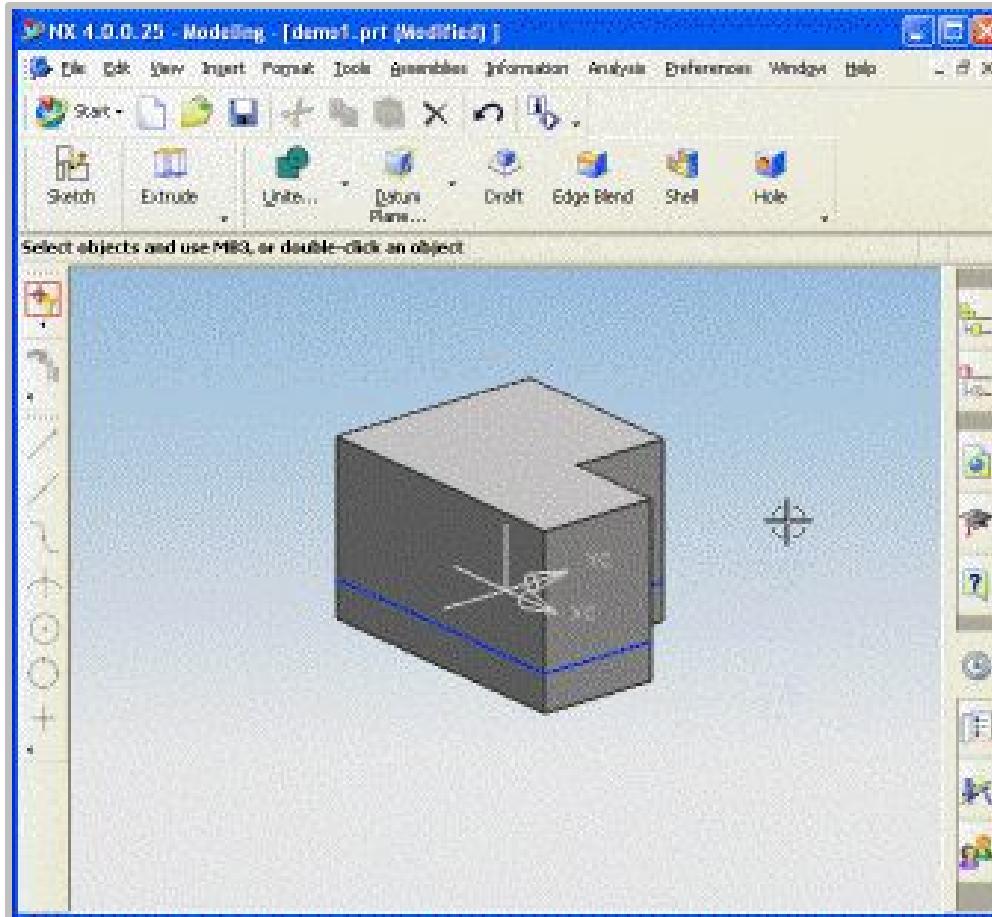
Source: [http://en.wikipedia.org/wiki/Vector\\_graphics](http://en.wikipedia.org/wiki/Vector_graphics)

# 3D: Solid (parametric) modeling

The use of solid modeling techniques allows for the automation of several difficult **engineering calculations** that are carried out as a part of the design process. Simulation, planning, and verification of processes such as machining and assembly were one of the main catalysts for the development of solid modeling.

A central problem in all these applications is the ability to effectively represent and manipulate three-dimensional geometry in a fashion that is **consistent with the physical behavior of real artifacts**.

# 3D: Solid (parametric) modeling



Components have finite size and well behaved boundaries, and their dimensions can be changed through parameters.

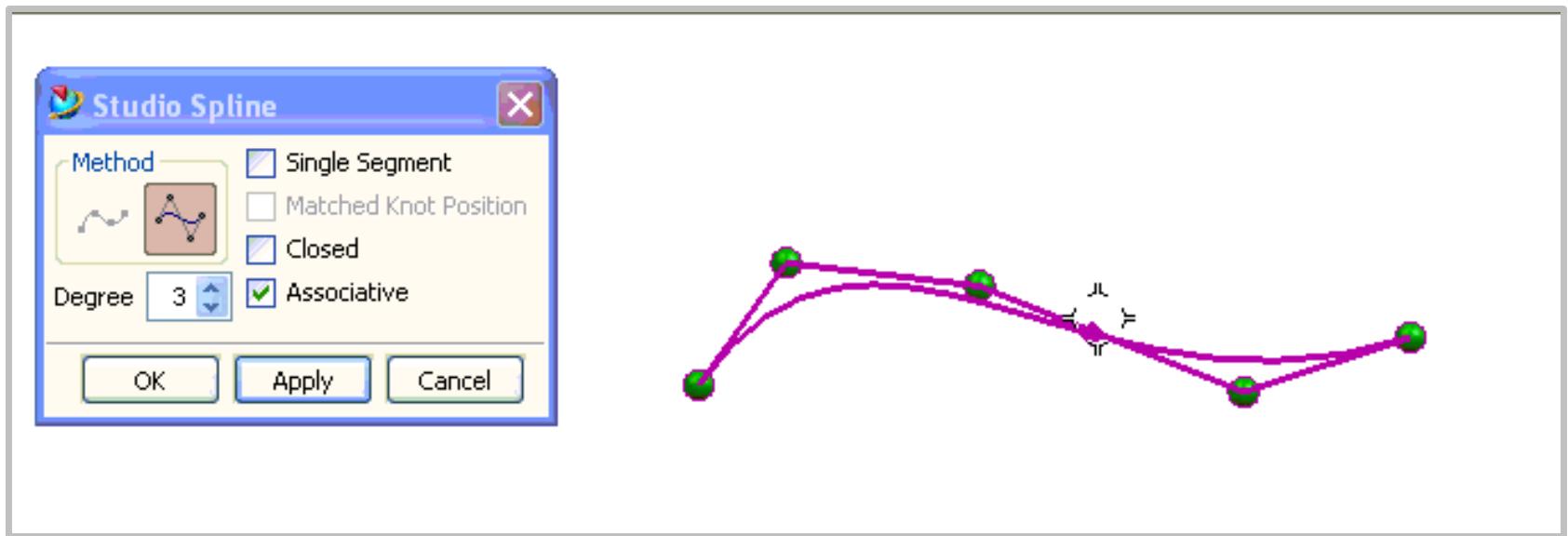
Source: [http://en.wikipedia.org/wiki/Solid\\_modeling](http://en.wikipedia.org/wiki/Solid_modeling)

# 3D: NURBS modeling

Non-uniform rational basis spline (NURBS) is a mathematical model commonly used in computer graphics for generating and representing **curves and surfaces** which offers great flexibility and precision for handling both analytic (surfaces defined by common mathematical formulae) and modeled shapes.

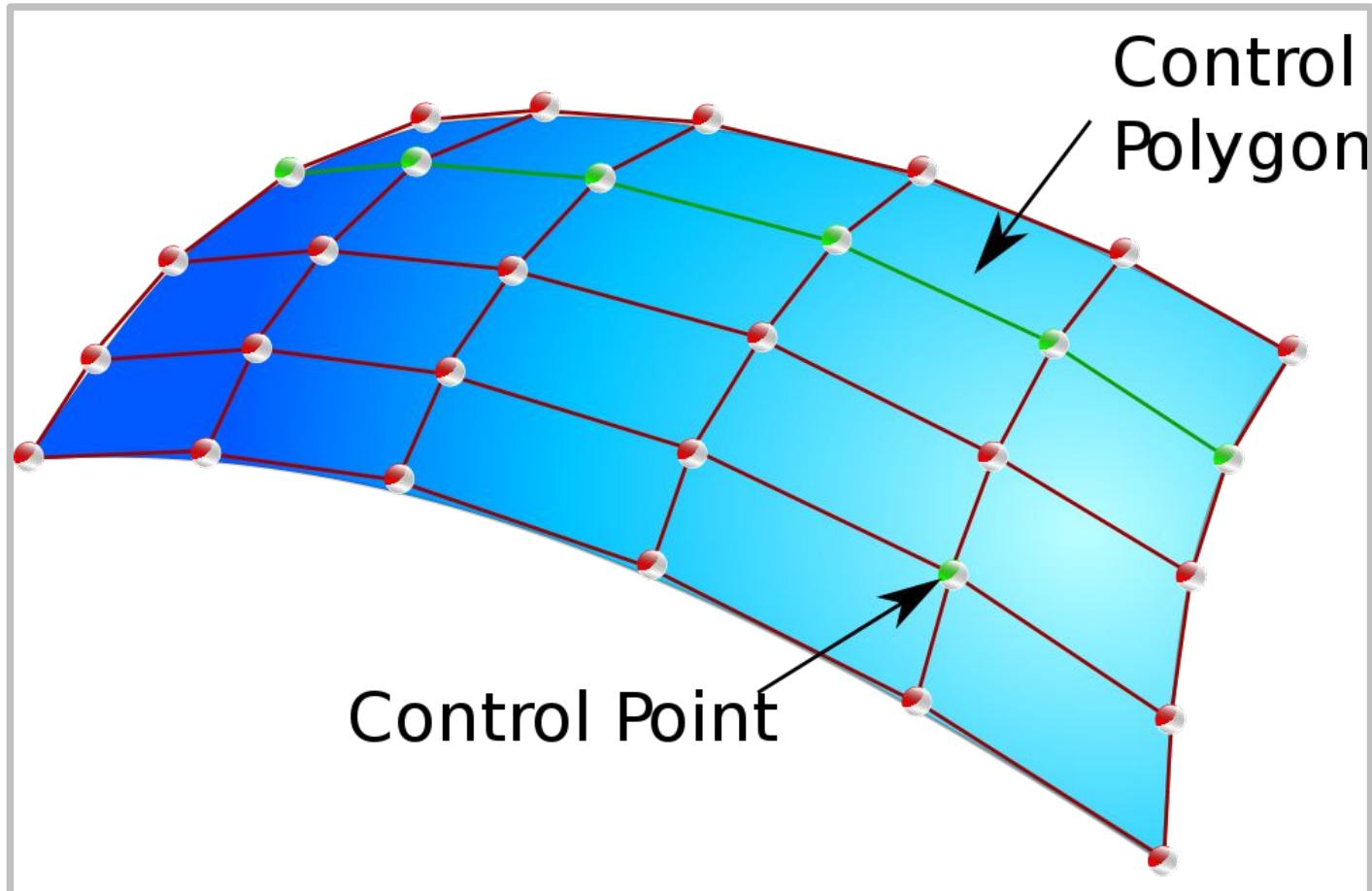
NURBS surfaces are functions of two parameters mapping to a surface in three-dimensional space. The shape of the surface is determined by control points.

# 3D: NURBS modeling



Edit points and control points for NURBS modeling.

# 3D: NURBS modeling

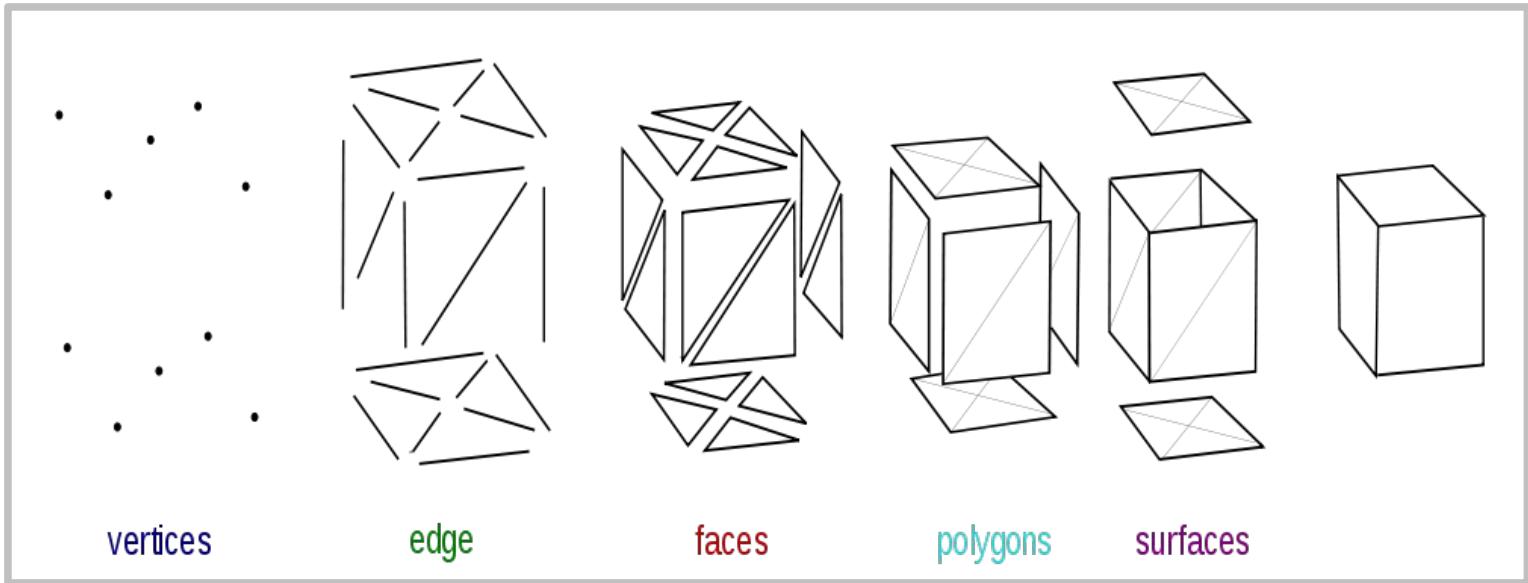


Control points on a NURBS surface.

# 3D: Mesh modeling

A polygon mesh or unstructured grid is **a collection of vertices, edges and faces** that defines the shape of a polyhedral object in 3D computer graphics and solid modeling. The faces usually consist of triangles, quadrilaterals or other simple convex polygons, since this simplifies rendering, but may also be composed of more general concave polygons, or polygons with holes.

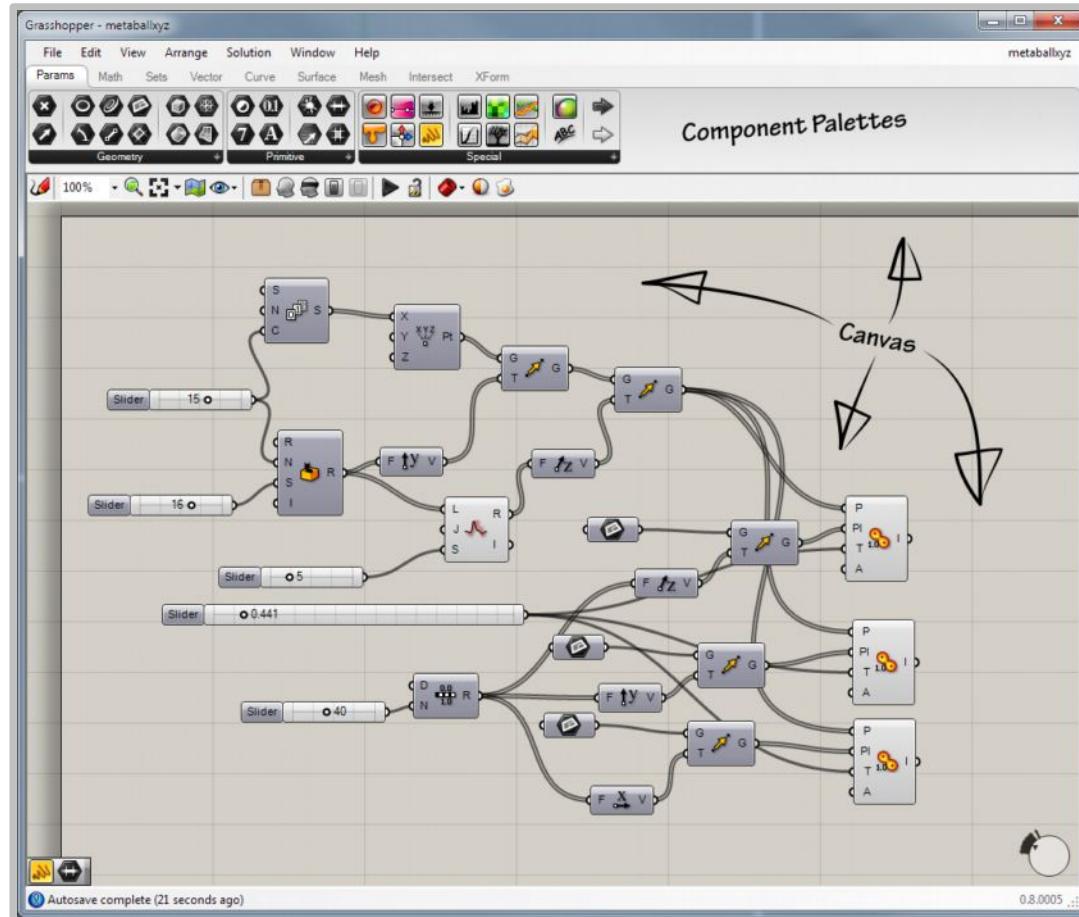
# 3D: Mesh modeling



Objects created with polygon meshes must store different types of elements. These include vertices, edges, faces, polygons and surfaces.

Source: [http://en.wikipedia.org/wiki/Polygon\\_mesh](http://en.wikipedia.org/wiki/Polygon_mesh)

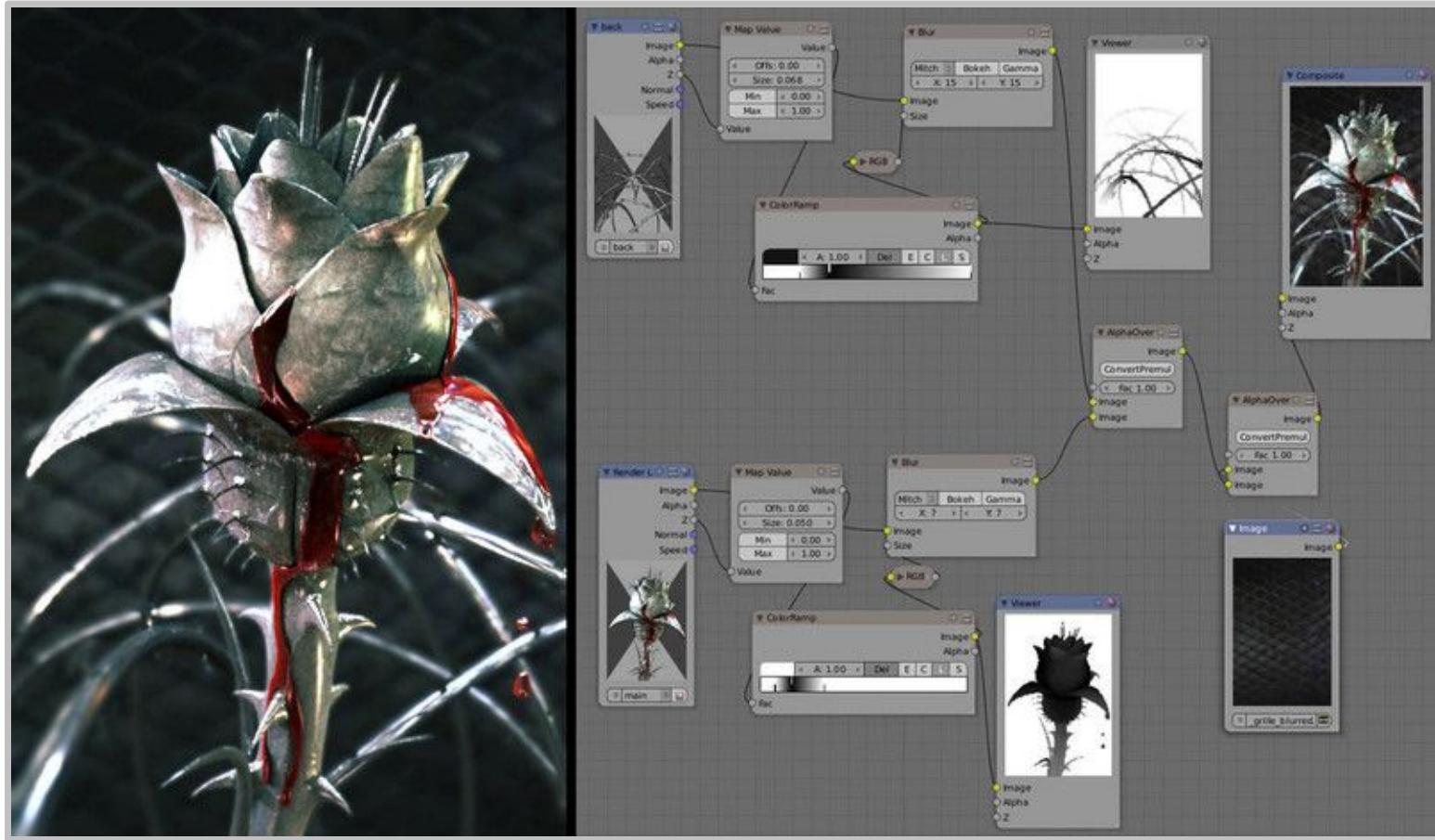
# Node-based modeling



Data is passed from component to component via connecting wires which always connect an output grip with an input grip.

Source: [http://en.wikipedia.org/wiki/Grasshopper\\_3d](http://en.wikipedia.org/wiki/Grasshopper_3d)

# Node-based modeling



Data can be imported and it is always stored in parameters, which can either be free-floating or attached to a component as input/outputs objects.

Source: <http://www.blender.org/development/release-logs/blender-242/blender-composite-nodes/>

# Code

A code is **a rule for converting a piece of information** (for example, a letter, word, phrase, or gesture) into another form or representation (one sign into another sign), not necessarily of the same type.

In computer science, **source code is any collection of computer instructions** (possibly with comments) written using some human-readable computer language, usually as text. The source code is **translated** at some point to machine code that the computer can directly read and execute. An **interpreter** translates to machine code and executes it on the fly when the program is run, while a **compiler** translates the program in advance to machine code that it stores as executable files.

---

# Code

```
/**  
 * Simple HelloButton() method.  
 * @version 1.0  
 * @author john doe <doe.j@example.com>  
 */  
HelloButton()  
{  
    JButton hello = new JButton( "Hello, wor  
hello.addActionListener( new HelloBtnList  
  
    // use the JFrame type until support for t  
    // new component is finished  
    JFrame frame = new JFrame( "Hello Button"  
    Container pane = frame.getContentPane();  
    pane.add( hello );  
    frame.pack();  
    frame.show();           // display the fra  
}
```

---

Human-readable code and comments.

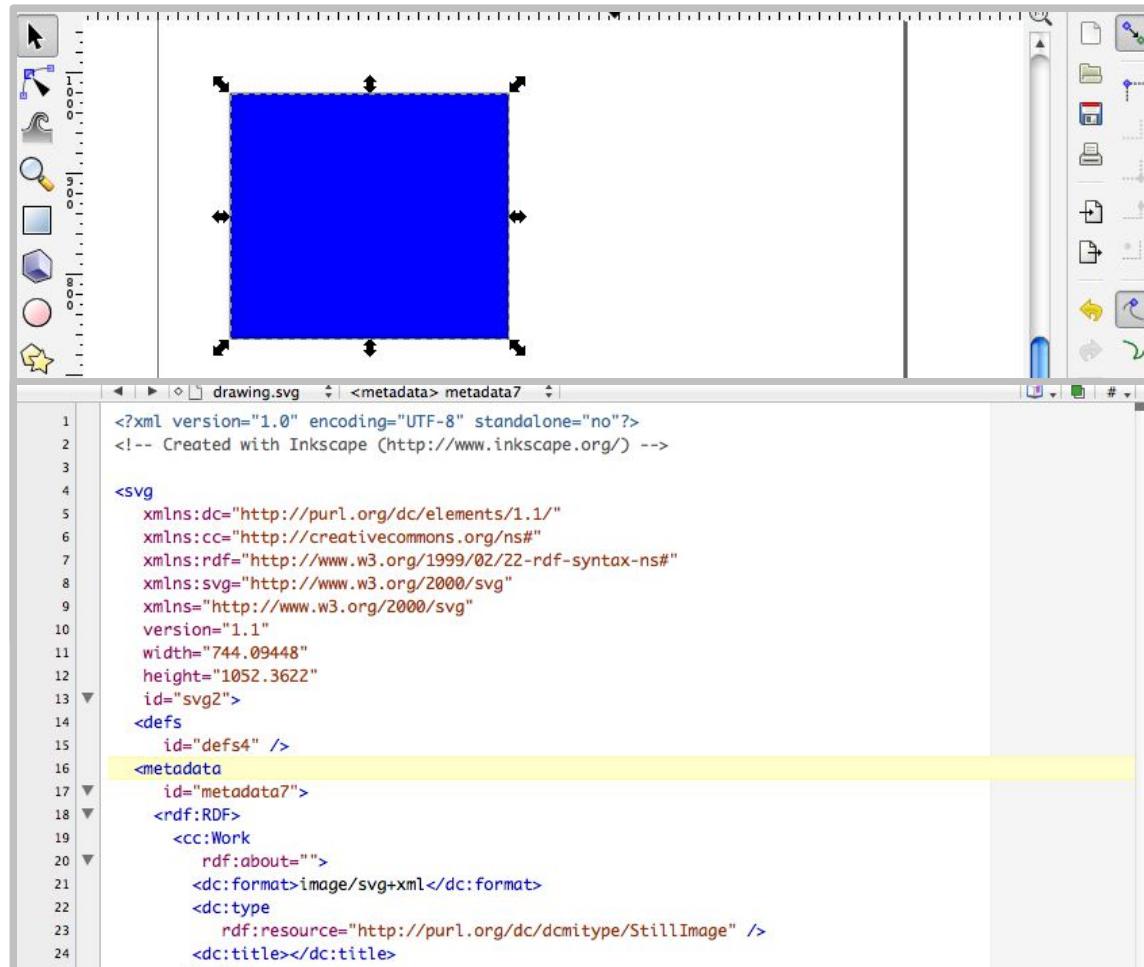
# .SVG

Scalable Vector Graphics (SVG) is a family of specifications of an **XML-based file format** for two-dimensional vector graphics, both static and dynamic (i.e. interactive or animated). The SVG specification is an open standard that has been under development by the **World Wide Web Consortium (W3C)** since 1999.

SVG images and their behaviors are defined in XML text files. This means that they can be searched, indexed, scripted, and, if required, compressed. As XML files, SVG images can be created and edited with any text editor.

All major modern web browsers have at least some degree of support and render SVG markup directly.

# .SVG



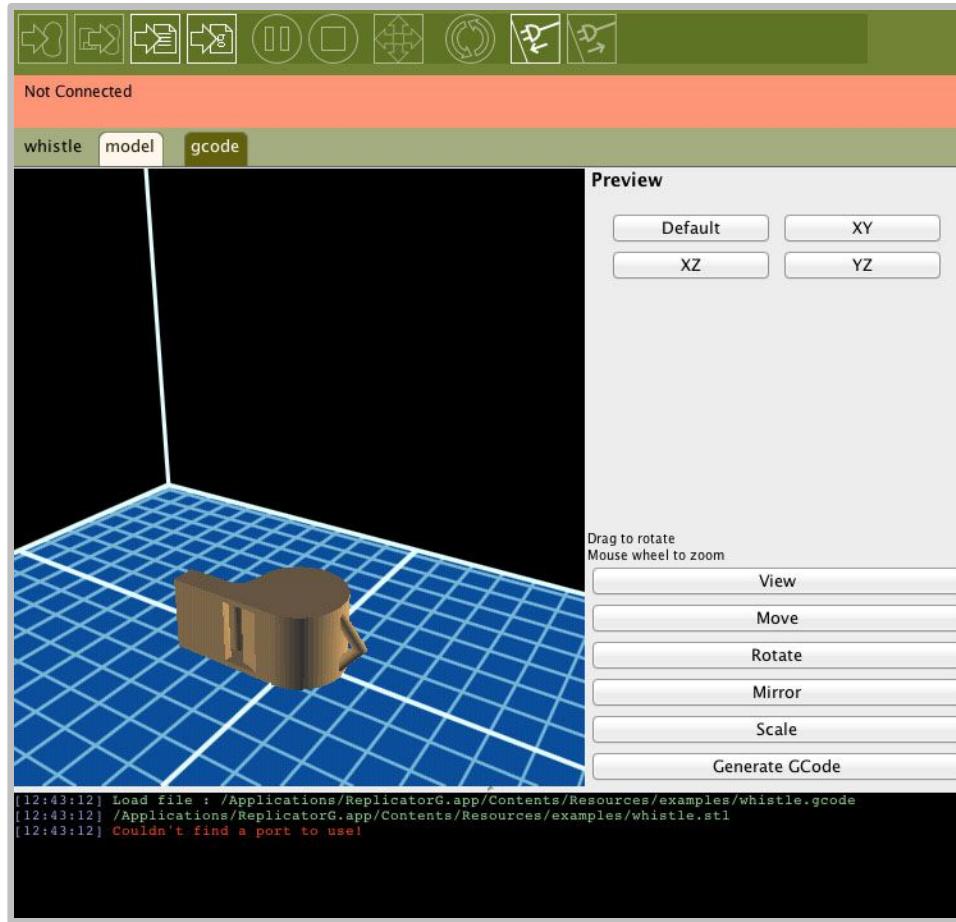
And this is why it is a standard for the web...

# G-code

G-code is the common name for the most widely used **computer numerical control (CNC) programming language**, which has many implementations. Used mainly in automation, it is part of computer-aided engineering. G-code is sometimes called G programming language.

In fundamental terms, G-code is a language in which people tell computerized machine tools what to make and how to make it. The "what" and "how" are mostly defined by instructions on where to move to, how fast to move, and through what path to move.

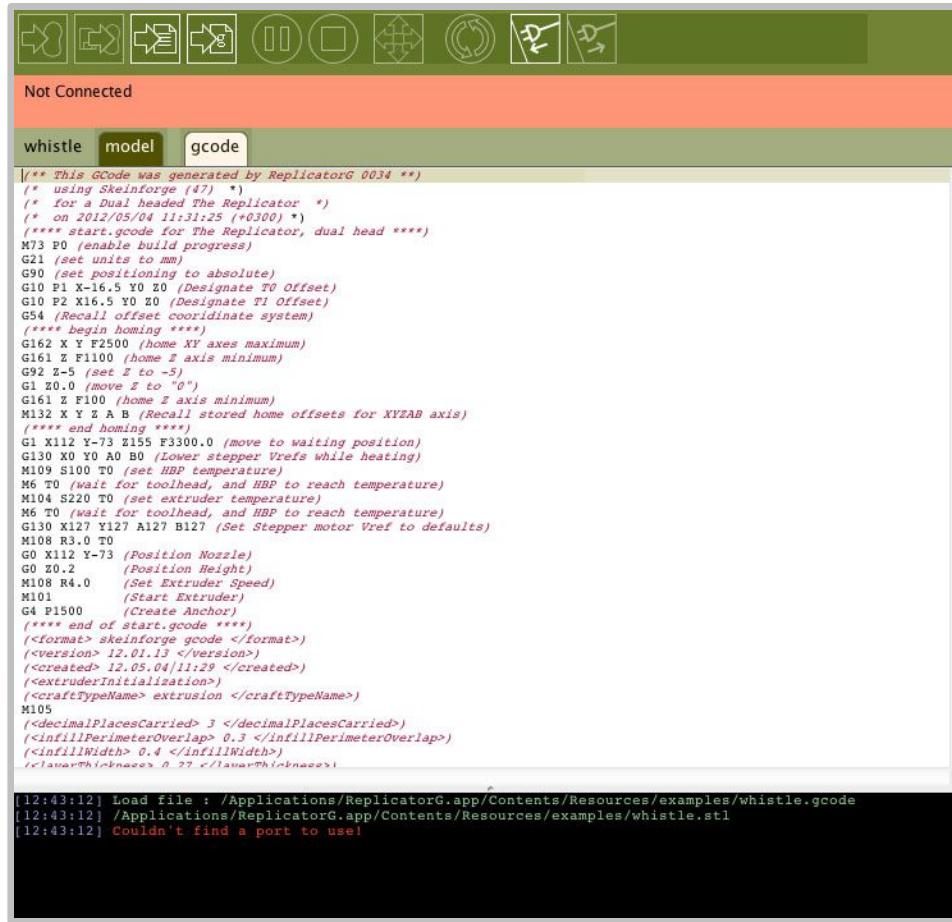
# G-code



G-codes are also called preparatory codes, and are any word in a CNC program that begins with the letter "G".

Source: <http://en.wikipedia.org/wiki/Gcode>

# G-code



G-codes are also called preparatory codes, and are any word in a CNC program that begins with the letter "G".

Source: <http://en.wikipedia.org/wiki/Gcode>

# .OBJ

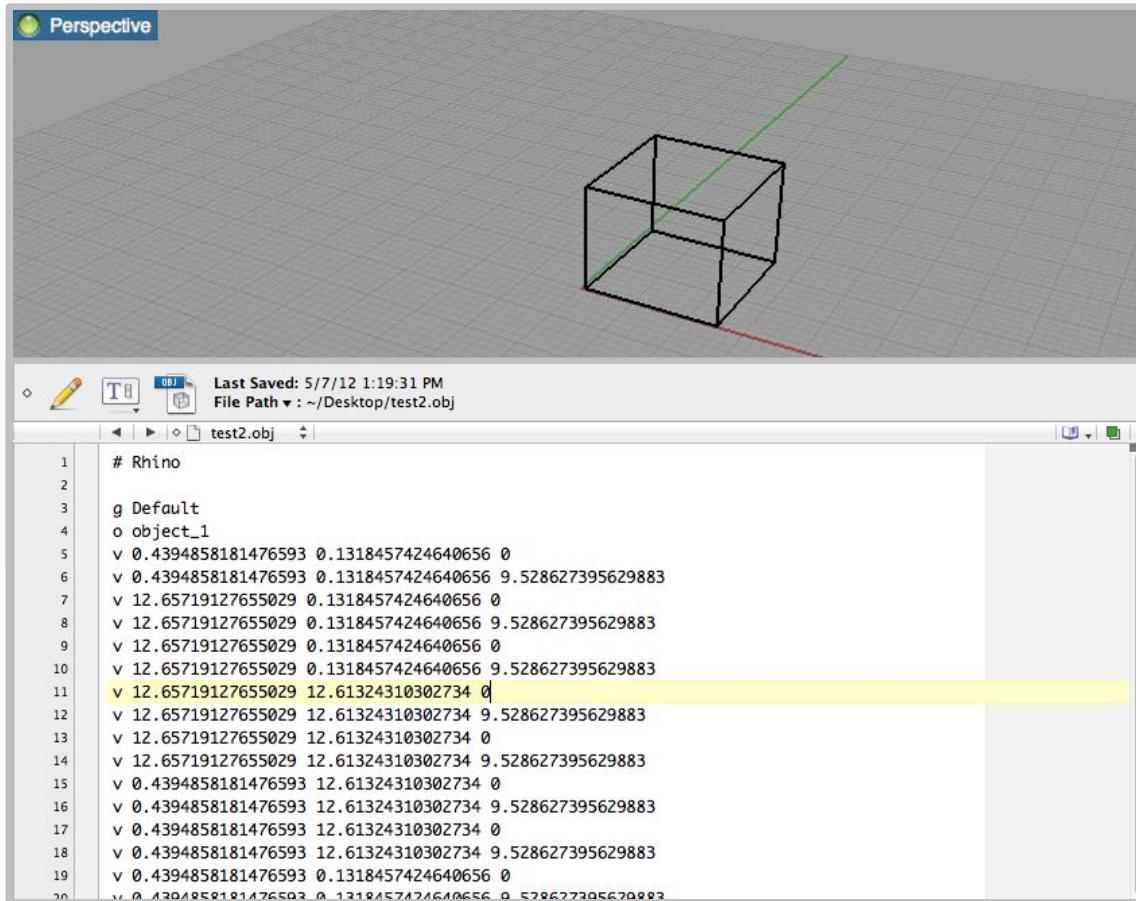
A geometry definition file format first developed by Wavefront Technologies. The file format is **open** and has been adopted by other 3D graphics application vendors.

The OBJ file format is a simple data-format that represents **3D geometry alone** – namely, the position of each vertex, the UV position of each texture coordinate vertex, normals, and the faces that make each polygon defined as a list of vertices, and texture vertices.

**Materials** that describe the visual aspects of the polygons are stored in external .mtl files.

---

# .OBJ



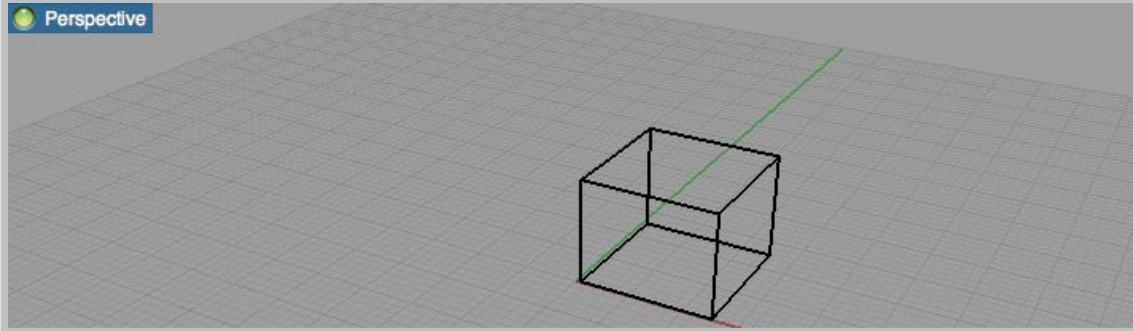
You may probably need to edit it by hand, one day...

## .IGES / .IGS

The Initial Graphics Exchange Specification (IGES) (pronounced eye-jess) is a file format which defines a **vendor neutral data format** that allows the digital exchange of information among Computer-aided design (CAD) systems.

Using IGES, a CAD user can exchange product data models in the form of **circuit diagrams, wireframe, freeform surface or solid modeling** representations. Applications supported by IGES include traditional engineering drawings, models for analysis, and other manufacturing functions.

# .IGES / .IGS



```
1H,,1H;,, S 1
2 G 1
3 31H/Users/massimo/Desktop/test.igs, G 2
4 26HRhinoceros ( Apr 30 2012 ),31HTrout Lake IGES 012 Apr 30 2012, G 3
5 32,38,6,308,15, G 4
6 , G 5
7 1.000,0,,1,0.01D0,13H120507.101315, G 6
8 0.001D0, G 7
9 12.65719151476425D0, G 8
10 , G 9
11 , G 10
12 10,0,13H120507.101315; G 11
13 314 1 0 0 0 0 0 000000200D 1
14 314 0 1 1 0 0 0 COLOR 0D 2
15 406 2 0 0 1 0 0 000000300D 3
16 406 0 -1 1 3 0 0 @LEVELDEF 0D 4
17 128 3 0 0 1 0 0 000000000D 5
18 128 0 -1 8 8 0 0 Shell 1D 6
19 128 11 0 0 1 0 0 000000000D 7
20 128 0 -1 9 8 0 0 Shell 2D 8
21 128 20 0 0 1 0 0 000000000D 9
22 128 0 -1 9 8 0 0 Shell 3D 10
23 128 29 0 0 1 0 0 000000000D 11
24 128 0 -1 9 8 0 0 Shell 4D 12
```

You may probably need to edit it by hand, one day...

# .DXF

AutoCAD DXF (Drawing Interchange Format, or Drawing Exchange Format) is a CAD data file format developed by Autodesk for enabling **data interoperability** between **AutoCAD** and other programs.

Versions of AutoCAD from Release 10 (October 1988) and up support **both ASCII and binary forms** of DXF. Earlier versions support only ASCII.

As AutoCAD has become more powerful, supporting more complex object types, DXF has become less useful. Certain object types, including ACIS solids and regions, are not documented.

# .STL

STL (Standard Tessellation Language) is a file format native to the **stereolithography CAD** software created by 3D Systems. This file format is supported by many other software packages; it is widely used for rapid prototyping and computer-aided manufacturing. STL files describe only the surface geometry of a three dimensional object without any representation of color, texture or other common CAD model attributes.

The STL format specifies **both ASCII and binary** representations. Binary files are more common, since they are more compact.

**... and much more file formats!**

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02.

## Softwares: what tools are available in this FabLab

# Mac and Win, but also... VirtualBox



# VirtualBox

Welcome to VirtualBox.org!

VirtualBox is a powerful x86 and AMD64/Intel64 [virtualization](#) product for enterprise as well as home use. Not only is VirtualBox an extremely feature rich, high performance product for enterprise customers, it is also the only professional solution that is freely available as Open Source Software under the terms of the GNU General Public License (GPL) version 2. See "[About VirtualBox](#)" for an introduction.

Presently, VirtualBox runs on Windows, Linux, Macintosh, and Solaris hosts and supports a large number of [guest operating systems](#) including but not limited to Windows (NT 4.0, 2000, XP, Server 2003, Vista, Windows 7), DOS/Windows 3.x, Linux (2.4 and 2.6), Solaris and OpenSolaris, OS/2, and OpenBSD.

VirtualBox is being actively developed with frequent releases and has an ever growing list of features, supported guest operating systems and platforms it runs on. VirtualBox is a community effort backed by a dedicated company: everyone is encouraged to contribute while Oracle ensures the product always meets professional quality criteria.

**Hot picks:**

- Pre-built virtual machines for developers over at [Oracle Tech Network](#)
- [phpVirtualBox](#) AJAX web interface [project site](#)
- [IQEmu](#) automated Windows VM creation, application integration [project site](#)

[ORACLE](#)

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**News Flash**

- New April 26th, 2012**  
**VirtualBox 4.1.14 released!**  
Oracle today released VirtualBox 4.1.14, a maintenance release of VirtualBox 4.1 which improves stability and fixes regressions. See the [ChangeLog](#) for details.
- Attention January 20th, 2012**  
**This site has switched to Oracle single-sign-on authentication.**  
Get your account at [myprofile.oracle.com](#) and on first login on this site associate it with a new or existing nick name.
- New January 11th, 2012**  
**VirtualBox 4.0.16 released!**  
Oracle today released VirtualBox 4.0.16, a maintenance release of VirtualBox 4.0 which improves stability and fixes regressions. See the [ChangeLog](#) for details.
- New Dec 22, 2011**  
**VirtualBox 3.2.14 released!**  
Oracle today released VirtualBox 3.2.14, a maintenance release of VirtualBox 3.2 which improves stability and fixes regressions. See the [ChangeLog](#) for details.
- Important October 2011**  
**We're hiring!**  
Looking for a new challenge? We're looking for engineers in [Russia](#) and [Ireland](#). Click on the countries to get details. More to come...

[More information...](#)

VirtualBox is a powerful x86 and AMD64/Intel64 virtualization product for enterprise as well as home use and it is open source.

Source: <https://www.virtualbox.org/>

# Ubuntu, with a virtual machine

The screenshot shows the official Ubuntu website. At the top, there's a navigation bar with links for Home, Ubuntu, Business, Devices, Cloud, Download, Support, Project, Community, Partners, and Shop. To the right of the navigation is the "ubuntu®" logo and a search bar labeled "Type to search". The main content area features a large headline "Proven. Practical. Precise." followed by a subtext "Choose Ubuntu 12.04 LTS for long-term deployments." Below this are two buttons: "Get Ubuntu now" and "Take the tour >". To the right of the text is a photograph of a laptop displaying the BBC news website. At the bottom left, there's a section about the operating system's popularity and a link to "Find out what's new". Another section highlights compatibility with various apps like Google Chrome, Mozilla Firefox, and others. On the right, there's a section about cloud computing with a "Ready to reach for the cloud?" heading and a "Learn more about Ubuntu Cloud >" link.

Home Ubuntu Business Devices Cloud Download Support Project Community Partners Shop

ubuntu®

Type to search

## Proven. Practical. Precise.

Choose Ubuntu 12.04 LTS for long-term deployments.

[Get Ubuntu now](#)

[Take the tour >](#)

Fast, secure and stylishly simple, the Ubuntu operating system is used by 20 million people worldwide every day.

[Find out what's new](#)

It works with your favourite apps:

Google Chrome Mozilla Firefox Mozilla Thunderbird LibreOffice

Ready to reach for the cloud?

Whether you're thinking public or private, there's an Ubuntu Cloud solution to answer your business needs.

[Learn more about Ubuntu Cloud >](#)

Ubuntu is a computer operating system based on the Debian Linux distribution and distributed as free and open source software.

Source: <http://www.ubuntu.com/>

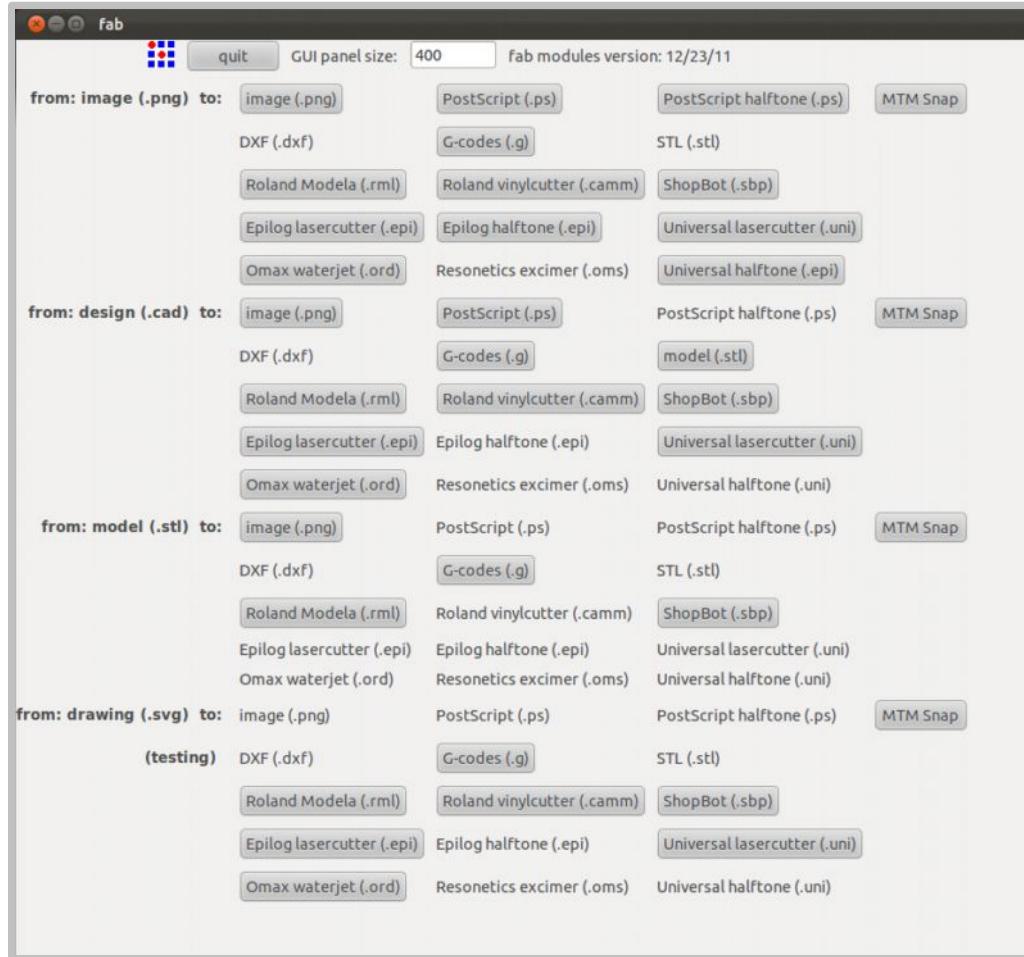
# Ubuntu Unity: the new desktop environment



Founded in 2010, the Unity project has gone on to deliver a consistent user experience for desktop and netbook users alike.

Source: <http://www.youtube.com/watch?v=fAcdFd0MmH0>  
<http://unity.ubuntu.com/>

# Fab Modules



Fab Modules are developed by the MIT CBA with the Fab Network. Available for experimental / personal use; commercial licenses are available from MIT.

Source: <http://kokompe.cba.mit.edu/dist/index.html>

# Rhinoceros 3D

www.rhino3d.com

## Rhinoceros® NURBS modeling for Windows

### Modeling tools for designers

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To be an effective designer today, you need tools to quickly develop your designs and accurately communicate them to everyone in the product research, development, marketing, and manufacturing or construction process.



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• School lab kit €975

**Flamingo €495**  
• Students and teachers €195  
• School lab kit €675

**Penguin €295**  
• Students and teachers €95  
• School lab kit €375

**Brazil €895**  
• Students and teachers €195  
• School lab kit €875

**Bongo €495**  
• Students and teachers €195  
• School lab kit €675

**Try Rhino** [Download now](#)

- Features
- What is new in 4.0
- Products designed in Rhino
- Who uses Rhino
- What users say about Rhino
- System requirements
- Flamingo rendering option
- Brazil rendering option
- Penguin rendering option
- Bongo animation option
- Rhino 4.0 - service release
- iRhino 3D - iPad, iPhone, & iPod viewer
- Rhino 5.0 - beta
- Rhino OS X - work in progress
- Grasshopper - work in progress
- Rhino Labs - work in progress

Rhinoceros (Rhino) is a stand-alone, commercial NURBS-based 3-D modeling tool, developed by Robert McNeel & Associates.

Source: <http://www.rhino3d.com/>

# Rhinoceros 3D for Mac

The screenshot shows the homepage of the Rhino OSX website. At the top, the logo "Rhino OSX" is displayed with "design, model, present, realize..." below it. A navigation bar includes "Home", "Sign in", and "Join". A search bar with a "SEARCH" button is also present.

**Rhino for OS X is in development**

The major technical challenges have been overcome, but there are still many months of work left to do.

**Please note** that Rhino OS X **requires OS X 10.6 or later and does not run on 10.5**. Also, plug-ins for Windows Rhino will **NOT** work with Rhino OS X. [Details...](#)

**Getting involved**

We need feedback from both expert and new Rhino users.

We are willing to spend whatever time and effort it takes to get this right, but we need you to tell us what is wrong. During development, pre-release Rhino OS X is **free** to anyone willing to provide feedback.

*If you are interested, please fill out this [application](#).*

**The development process**

The development process is expected to take more than a year. The development **phases** are:

- **Wenatchee** (work-in-progress) builds are available to everyone that can provide feedback on the early builds. [To get started, fill out an application.](#)
- **Cashmere** (beta) builds are work in progress. Once the hard work is done and Rhino is ready for polishing. We will invite a larger group of users to get involved.
- **Yakima** (release candidate) builds will be available to everyone while we finish up the final bug fixes, documentation, and localization.
- **Release** will be some time after Rhino 5.0 for Windows is released.

**License**

Currently we have not worked out the cross platform licensing details, but in any case, we will make it as painless as possible for everyone.

**Select Language**  
Powered by Google™ Translate

**New User?**

- Fill out an application
- Setup an account.
- You will get an e-mail confirmation
- You must log in to your new account to [download the software](#).
- [Frequent Questions](#)

**Spinning Gears**

If you want to design great bikes, ride them. The Trek design team is full of avid cyclists and many ride into work, despite Wisconsin's harsh weather. "There are very many of us here who commute when the weather is descent," says Lynn. "I do a

Under development, but still available for free (registration required).

Source: <http://mac.rhino3d.com/>

# Rhinoceros 3D: Tutorials

plethora-project @jomasan

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## RHINO MODELLING

RHINO MODELLING THE LF-ONE BY ZAHA HADID

TUTORIAL 01 – LOADING THE PLANS  
TUTORIAL 02 – CURVES AND VOLUMES  
TUTORIAL 03 – TRIM AND SPLIT  
TUTORIAL 04 – CURVATURE AND DETAIL  
TUTORIAL 05 – DETAILING FAÇADE  
TUTORIAL 06 – DETAILING THE FLOOR  
TUTORIAL 07 – INTERIOR  
TUTORIAL 08 – DETAILING FAÇADE – 2  
TUTORIAL 09 – CREATING A 2D DRAWING FILE FOR ILLUSTRATOR  
TUTORIAL 10 – ADDITIONAL GEOMETRY  
TUTORIAL 11 – EXTERIOR/INTERIOR TRANSITION  
TUTORIAL 12 – INTERIOR BRIDGE  
TUTORIAL 13 – DETAILING FOR THE SECTION  
TUTORIAL 14 – MISSING BITS OF GEOMETRY

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This entry was posted on Wednesday, January 18th, 2012 at 11:16 am. It is filed under All, Featured, MAIN, Modelling, Thumb, Tutorials. You can follow any responses to this entry through the [RSS 2.0](#) feed.

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**ABOUT**

Plethora-Project.com is an initiative to accelerate computational literacy in the frame of architecture and design. It aligns with the "show me your screens" motto of the TopLap live-coding group attempting to get rid of Obscurantism in digital design.

Directed by Jose Sanchez  
Contact me at : [jomasan@gmail.com](mailto:jomasan@gmail.com)

**Bio:**  
Jose Sanchez is an Architect / Programmer based in London. He is a Course Tutor and programming teacher of the Design Research Lab (DRL) at the Architectural Association. In 2009 he joined Biothing building up on the research of generative design. He is the founder of plethora-project and a co-founder of Probotics, an architecture/robotics practice based in London.

**SEARCH**

## Video Tutorials about Rhinoceros

Source: <http://www.plethora-project.com/2012/01/18/rhino-modeling-the-lf-one-by-zaha-hadid/>

# Grasshopper for Rhinoceros 3D (Win)

## Grasshopper

GENERATIVE MODELING FOR RHINO



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**About Grasshopper...**

For designers who are exploring new shapes using generative algorithms, **Grasshopper®** is a graphical algorithm editor tightly integrated with Rhino's 3-D modeling tools. Unlike RhinoScript, Grasshopper requires no knowledge of programming or scripting, but still allows designers to build form generators from the simple to the awe-inspiring.

[... download build 0.8](#)

**News**

[RoboFold Summer Workshop in London](#)

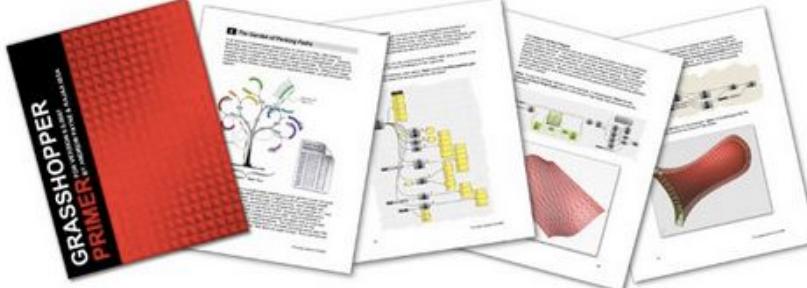
[MCDC // Master Computational Design and Construction](#)

[Grasshopper + CNC workshop](#)

[Advances in Architectural Geometry 2012 - Paris](#)

**Start Here:**

There are many resources available to learn more about Grasshopper.



Andy Payne, LIFT architects, has published a 150-page manual to help people get a basic understanding of Grasshopper. This primer and other tutorials are available on our [Tutorials page...](#)

Here is a recording of the [Into to Grasshopper Webinar](#) by David Rutten and the [supporting files](#). (If you have a Mac, you will need the [Windows Media Components](#) for QuickTime.)

*Also, check out these [tutorial videos...](#)*

**Forum**

Welcome to Grasshopper

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**Search Grasshopper**

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Search

**Members**



Grasshopper is a graphical algorithm editor tightly integrated with Rhino's 3-D and it requires no knowledge of programming or scripting.

Source: <http://www.grasshopper3d.com/>

# TopMod



## Topological Mesh Modeling

[Home](#)   [Download TopMod](#)   [Instructional Videos](#)   [Papers and Manuscripts](#)   [Images and Videos](#)

**Topological Mesh Modeling** is my main research direction and **TopMod** is a manifold mesh modeling system that includes all the work presented in our Topological Mesh Modeling papers. Using TopMod, you can find a wide variety of ways to create high genus shapes; almost all subdivision algorithms, wide variety of ways to remesh shapes, new extrusions and more. TopMod reads and writes .obj files. Therefore, it is compatible with Maya and other software that accept obj files. The figures here show 3D shapes modelled with TopMod and printed with a rapid prototyping machine.



TopMod is based on a new paradigm that allows dynamically changing the topology of 2-manifold polygonal meshes. The new paradigm always guarantees topological consistency of polygonal meshes. Based on our paradigm, by simply adding and deleting edges, handles can be created and deleted, holes can be opened or closed, polygonal meshes can be connected or disconnected. These edge insertion and edge deletion operations are highly consistent with subdivision algorithms. In particular, these operations can easily be included into a subdivision modeling system such that the topological changes and subdivision operations can be performed alternatively during model construction. TopMod demonstrates practical examples of topology changes based on this new paradigm and show that the new paradigm is convenient, effective, efficient, and friendly to subdivision surfaces.



TopMod has been used and tested by Visualization Science students extensively since 2000. We have released as a free software for non-commercial applications since October 2005. After the release, sculptors and architects discovered the software and created unusual shapes. *The latest version of Topmod is available freely at [www.topmod3d.org](http://www.topmod3d.org).* In the same site, you can also see gallery of models created by using TopMod.

**Acknowledgment**

We are also grateful to all Visualization Sciences and Computer Science graduate students who added modules to TopMod. We are also thankful to students who used TopMod in their projects and give us input. We are also very thankful to Shape Modeling community. Without the collective support and motivation from the community, TopMod would have not been successful.

---

Open Source software for modeling very complex geometries.

Source: <http://www.viz.tamu.edu/faculty/ergun/research/topology/>

# RhinoCAM (Not available now)



... not the center for rapid prototyping: “investigating the interface between computer science and physical science”

Source: <http://www.rhinocam.com/>

# Blender

The screenshot shows the official Blender website. At the top, there's a navigation bar with links for 'Features & Gallery', 'Download', 'Education & Help', 'Community', 'Development', and 'e-Shop'. Below the navigation is a large orange header section with the word 'Blender' in white. To the right of the word are five small images: a hand holding a model, a woman's face, a mechanical arm, gears, and a rabbit's face. Underneath this is a dark blue banner with the text 'model - shade - animate - render - composite - interactive 3d'. Below the banner, it says 'Blender is the free open source 3D content creation suite, available for all major operating systems under the GNU General Public License.' To the right of this text is a video thumbnail for 'Blender 2011 Showreel' with a play button icon. Next to the thumbnail is a 'Download Blender' button with an orange cube icon. On the left side, there's a 'News Headlines' section from 'BlenderNation' with a list of recent news items. On the right side, there's an 'Announcements' section with a list of updates and news items, including the release of Blender 2.63. There are also links to various resources like 'HUMANE RIGGING', 'Track, Match, Blend!', 'mango', and 'Elephants Dream – Big Buck Bunny – YoFrankie! – Sintel'.

## News Headlines ■

from [BlenderNation](#)

- Finally...  
May 4, 2012
- Facade Projections at ETH Zurich  
May 3, 2012
- CryBlend 3.1 Released  
May 3, 2012
- Steampunk Goggles  
May 3, 2012
- Low Poly Rocks  
May 2, 2012
- MassiveBlendWorks Contest  
May 2, 2012
- Appleseed Renderer  
May 2, 2012
- Exporting from Blender to PlayStation Suite: Blender to Vita  
May 2, 2012
- Haunted Tower  
May 2, 2012
- More...

## Announcements ■

[Blender Foundation Official Updates](#)

- Blender 2.63 released  
April 27, 2012

After years of work, the blender.org team is proud to present a completely modernized Mesh system!
- Blender testbuild for next release available  
April 3, 2012

The next 2.63 release is probably in 2 weeks. Help us getting it stable by testing the official binaries!
- Google Summer of Code 2012  
March 26, 2012

Students can again apply for a summer coding job on Blender! Ever wanted to work in CG, animation, games or VFX? Here's your chance!
- Project Mango: kick-off week  
March 6, 2012

Check the blog for daily updates on the kick-off week of the Mango open movie team!
- More...

[HUMANE RIGGING](#)  
Rigging fundamentals in Blender

[Track, Match, Blend!](#)  
VFX Basics with Blender

[mango](#)  
Buy the DVD!

[Elephants Dream – Big Buck Bunny – YoFrankie! – Sintel](#)

[Wiki Documentation](#)

[Forums](#)

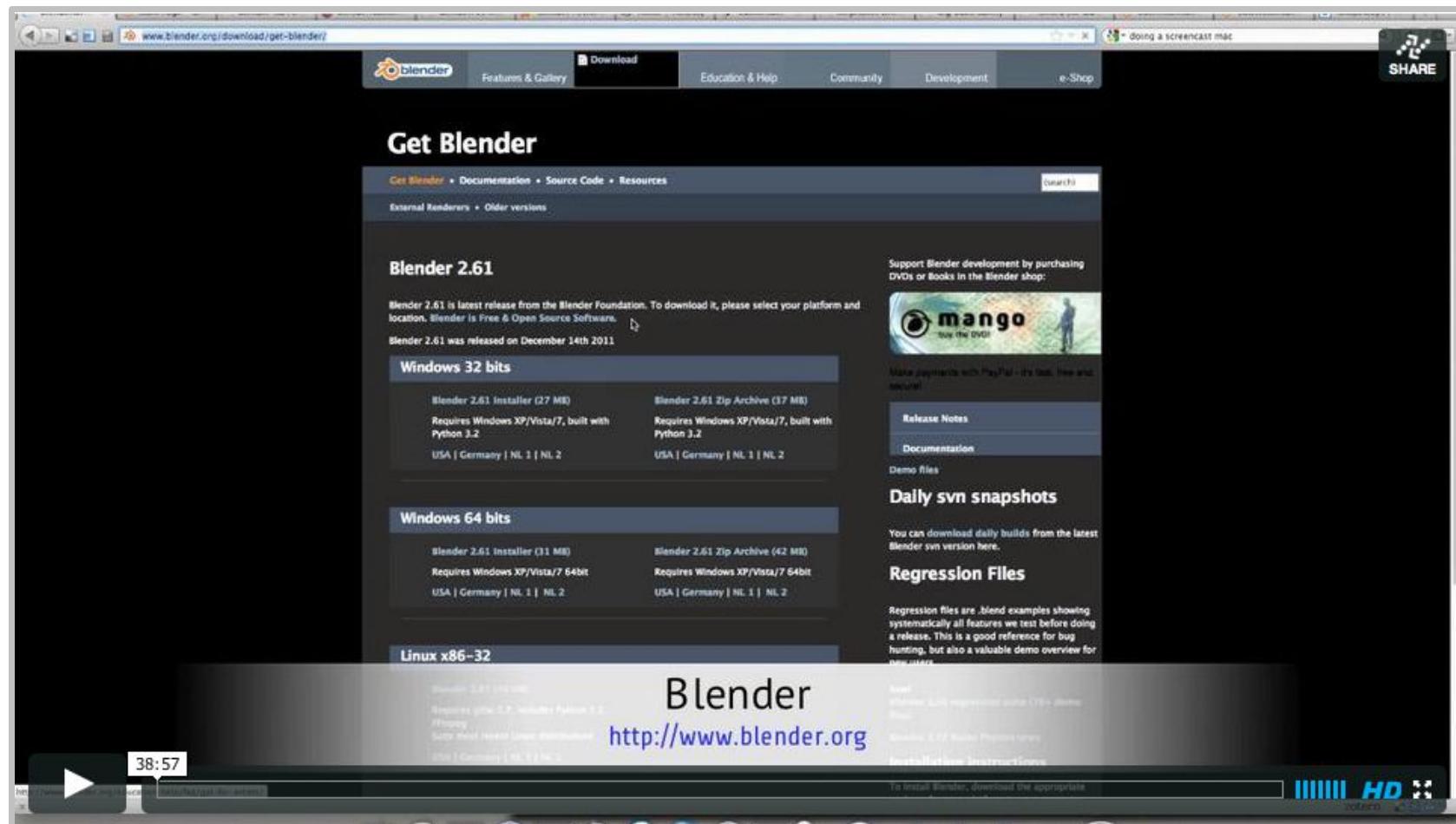
[Get Involved](#)

[Foundation / Institute](#)

3D modeling, UV unwrapping, texturing, rigging/ skinning, fluid / smoke / particle simulation, animating, rendering, video editing / compositing, game engine.

Source: <http://www.blender.org/>

# Blender: there's a video introduction available



3D modeling, UV unwrapping, texturing, rigging/ skinning, fluid / smoke / particle simulation, animating, rendering, video editing / compositing, game engine.

Source: <https://vimeo.com/41312301>

# Meshlab

# MeshLab

MeshLab is an open source, portable, and extensible system for the processing and editing of unstructured 3D triangular meshes. The system is aimed to help the processing of the typical not-so-small unstructured models arising in 3D scanning, providing a set of tools for editing, cleaning, healing, inspecting, rendering and converting this kind of meshes. The system is heavily based on the [VCG library](#) developed at the [Visual Computing Lab of ISTI - CNR](#), for all the core mesh processing tasks and it is available for Windows, Mac OSX, and Linux. . The MeshLab system started in late 2005 as a part of the [FGT](#) course of the [Computer Science](#) department of University of Pisa and most of the code (~15k lines) of the first versions was written by a handful of willing students. The following years [FGT](#) students have continued to work to this project implementing more and more features. The proud MeshLab developers are listed [here](#).

This project is actively supported by the [3D-CoForm](#) project.

Other projects that have previously supported MeshLab are listed [here](#).

[Download Latest Version \(16 February 2011\) V1.3.0a \(changes\)](#)

Remember that, whenever you use MeshLab in a official/commercial project or in any kind of research, you should:

- Explicitly cite in your work that you have used MeshLab, a tool developed with the support of the [3D-CoForm](#) project,
- Post a couple of lines in the [users' forum](#) describing the project where MeshLab was used.

Adopted License, acknowledgments and other legal issues are detailed [here](#).

## Features

- Interactive selection and deletion of portion of the mesh. Even for large models.
- Painting interface for selecting, smoothing and coloring meshes.
- **Input/output** in many formats:
  - import:[PLY](#), [STL](#), [OFF](#), [OBJ](#), [3DS](#), [COLLADA](#), [PTX](#), [V3D](#), [PTS](#), [APTS](#), [XYZ](#), [GTS](#), [TRI](#), [ASC](#), [X3D](#), [X3DV](#), [VRML](#), [ALN](#)
  - export:[PLY](#), [STL](#), [OFF](#), [OBJ](#), [3DS](#), [COLLADA](#), [VRML](#), [DXF](#), [GTS](#), [U3D](#), [IDTF](#), [X3D](#)
  - Point Clouds support. Now 3D files that are composed only by points are well supported in PLY and OBJ format.
  - **U3D** support; MeshLab is the first open source tool to provide direct conversion of 3D meshes into the U3D format. Now you can create pdf, like [this](#) with 3D objects with just MeshLab and LaTeX.
- Mesh **Cleaning** Filters:
  - removal of duplicated, unreferenced vertices, null faces
  - removal of small isolated components
  - coherent normal unification and flipping
  - erasing of non manifold faces
  - automatic filling of holes



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Like!

 Juanma Sarrió,  
Giovanni Re  
and 1,369  
others like  
this.



[MeshLab's Blog](#)

[Documentation](#)

- [Compiling](#)

[Download V1.3.0a](#)

- [Windows](#)

- [Windows \(x64\)](#)

- [Linux \(src\)](#)

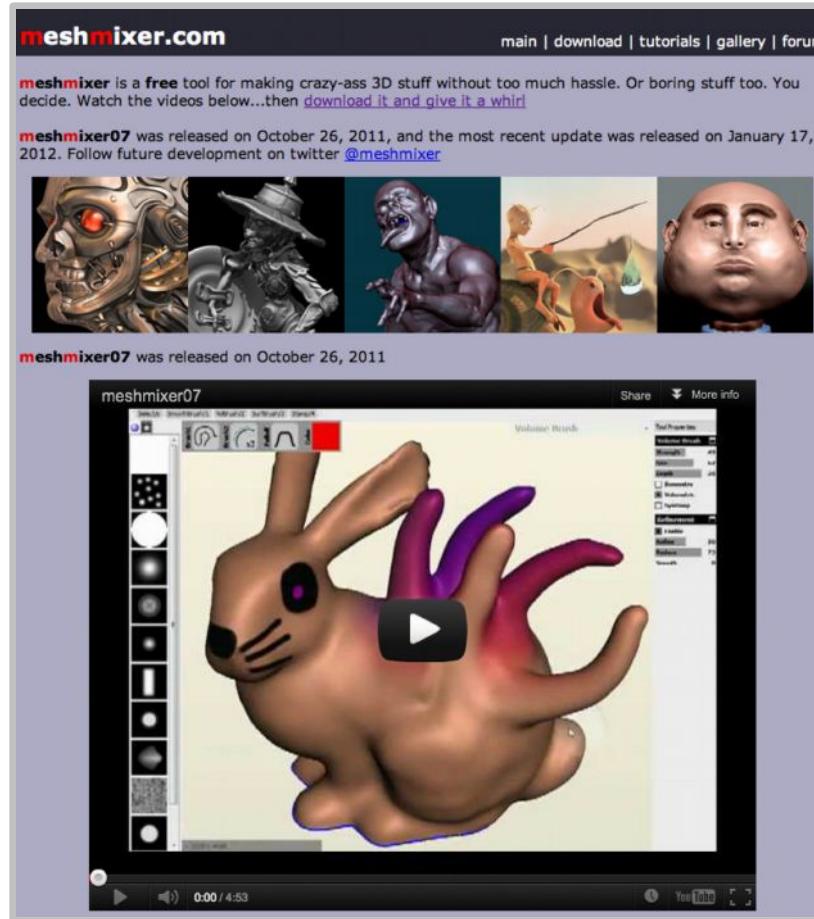
- [MacOSX \(intel only\)](#)

[Developers List](#)

MeshLab is an open source system for the processing and editing of unstructured 3D triangular meshes with tools for editing, cleaning, healing, inspecting.

Source: <http://meshlab.sourceforge.net/>

# Meshmixer



Meshmixer is a free tool for making crazy-ass 3D stuff without too much hassle.

Source: <http://www.meshmixer.com/>

# Netfabb Studio Basic

The screenshot shows the homepage of the Netfabb Studio Basic website. At the top, there's a navigation bar with links for Purchase, Applications, Products, Services, Support, Community, Media, and Contact. The main header features the Netfabb logo and the tagline "new age fabbing software". Below the header is a large image of a 3D printed branching structure. The main content area is titled "netfabb Studio Basic" and contains the following sections:

- Free 3D Printing software for everyone**: A brief description stating that netfabb Studio Basic is available to anybody, is free, and runs on Windows, Linux or Mac. It highlights its use in Additive Manufacturing, Rapid Prototyping, and 3D Printing.
- Related Products**: A list including netfabb Studio Basic for Mac, netfabb Studio Basic for Linux, netfabb Studio Professional, netfabb Mobile, and netfabb Cloud Service.
- More information**: Links to "Top 5 reasons to upgrade" and "Comparison chart".
- Download now**: A blue button.

On the left side, there's a diagram illustrating the software's integration across different departments: R&D, Production, CEO, Sales, and Customer. Each department is represented by a person icon interacting with a computer monitor displaying the Netfabb interface. A double-headed arrow connects the Production and Customer circles.

At the bottom of the main content area, there's a note about the software's availability and compact size.

Netfabb Studio Basic is freeware and runs on Windows, Linux or Mac. It is not just a viewer, it provides mesh edit, repair and analysis.

Source: <http://www.netfabb.com/basic.php>

# Replicator G

[Create account or Sign in](#)

**ReplicatorG**  
lowering the barrier to 3D printing.

**Main**  
[About](#)  
[Download](#)  
[Installation](#)  
[Usage](#)  
[Drivers](#)

**Reference**  
[Primer](#)  
[G Codes](#)  
[M Codes](#)  
[Generators](#)

**Development**  
[Development Mailing List](#)  
[Building ReplicatorG](#)  
[Reporting Bugs](#)

**Friends**  
[RepRap](#)  
[Arduino](#)  
[Processing](#)  
[NYC Resistor](#)  
[Thingiverse](#)  
[MakerBot Industries](#)

**Coded by:**  
[Zach Hoeken](#)  
[Marius Kintel](#)  
[Adam Mayer](#)  
[Matt Mets](#)

**ReplicatorG is a simple, open source 3D printing program**

This is the software that will drive your [MakerBot Thing-O-Matic](#), [CupCake CNC](#), [RepRap machine](#), or generic CNC machine. You can give it a GCode or STL file to process, and it takes it from there. It's cross platform, easily installed, and is based on the familiar Arduino / Processing environments. ReplicatorG is used by thousands of MakerBot Operators, and has printed tens of thousands of objects and counting.

**ReplicatorG 0034 Released March 13, 2012**

(This version is not working with RepRap5D, please use [ReplicatorG 34 for 5D](#) when using 5D)

New Features:

- \* Updated toolhead offset t0 to t1 code to store offset of out of tolerance
- \* Tools directory location sourcing updated to fix avr-dude on mac problems.
- \* Toolhead start heating gcode updates for faster heating-up on slow HBP's
- \* Fixes and updates to alternative preferences system.
- \* Ant run command line commands support
- \* Expected Toolhead offset stored as part of machine settings
- \* Spelling mistake fixes
- \* Updated print anchor code

**ReplicatorG 0033 Released Feb. 27, 2012**

New Features:

- Added a Windows and Mac installer.
- Added initial support for The Replicator (from MakerBot Industries)
- Updated start and end gcode
- Fixed dual extrusion bugs
- Support for skeinforge 47 with The Replicator.
- Updated Support for skeinforge 35 for Cupcake CNC and Thing-O-Matic
- Extensive Rewrite of RepG to support The Replicator
- Post Processing of Skeinforge changes added
- Start and end gcode can now be specified from machines/\*.xml
- Dualstrusion refactored, Wipes are not currently supported
- Estimator and safety checks pulled into different thread
- Improved UI for safety checker
- Machine Onboard Parameters and Toolhead Onboard Parameters merged
- New GCode for new Replicator FUNctionality! M70-M73
- Improved temperature polling
- GCode now prepended with some meta-info

This is the software that will drive your MakerBot Thing-O-Matic, CupCake CNC, RepRap machine, or generic CNC machine.

Source: <http://replicat.org/>

# Inkscape

INKSCAPE

General

- Current News
- FAQ
- Download
- Clip Art
- Documentation
- Books
- Screenshots
- Showcase
- Articles
- Tutorials
- Galleries

Community

- Discussion
- Mailing Lists
- Forums
- Planet Inkscape
- Wiki
- Report Bugs
- Request Features
- Donate

Developers

- Project Summary
- Documentation
- Roadmap
- Write a specification

Draw Freely.

Latest stable version: 0.48.2  Download Now!



Open Source Scalable Vector Graphics Editor

### About Inkscape

An Open Source vector graphics editor, with capabilities similar to Illustrator, CorelDraw, or Xara X, using the W3C standard Scalable Vector Graphics (SVG) file format.

Inkscape supports many advanced SVG features (markers, clones, alpha blending, etc.) and great care is taken in designing a streamlined interface. It is very easy to edit nodes, perform complex path operations, trace bitmaps and much more. We also aim to maintain a thriving user and developer community by using open, community-oriented development.

### News

#### Inkscape at Google Summer of Code 2012

April 24, 2012

We are happy to announce that five Inkscape students will be participating in the Google Summer of Code 2012 program.

- Jan Pulmann will create Python bindings for lib2Geom, the computational geometry library we use.
- Samuel Chase will improve guides management in Inkscape.
- Veronika Irvine will create a new tool for **on-canvas tessellation**.
- Eugene Lezhniuk will improve the way Inkscape works with text and implement some much desired features such as indentation and underlines.
- Cheng Zhang will convert more code to C++, namely SP Event Context.

We wish our students happy coding!

An Open Source vector graphics editor, with capabilities similar to Illustrator, CorelDraw, using the W3C standard Scalable Vector Graphics (SVG) file format.

Source: <http://inkscape.org/>

# Corel Draw Graphics Suite X5

The screenshot shows the Corel website's product page for the CorelDRAW Graphics Suite X5 Limited Edition. At the top, there's a navigation bar with links for Products, Special Offers, Free Trials, Solutions, Support, and About Corel. A shopping cart icon indicates 'Cart: 0'. Below the navigation, a banner highlights the 'CorelDRAW Graphics Suite X5 Limited Edition' and includes an 'Upgrade' button. The main content area features a large image of the software's retail box, which has a colorful design with a hot air balloon and the text 'CorelDRAW GRAPHICS SUITE X5 LIMITED EDITION'. To the right of the box, the product name is displayed in large, bold letters: 'CorelDRAW Graphics Suite X5 Limited Edition'. Below the name is a descriptive sentence: 'Introducing the ultimate graphics software collection!'. Underneath this, a section titled 'Includes:' lists several items: 'CorelDRAW® Graphics Suite X5 – complete graphics software package', 'Corel® Painter™ 11 – the world's leading digital art studio', 'Wacom® Intuos®4 smallII – professional pen tablet', and 'Fotolia images – 21 royalty-free, high-resolution photos or vector images'.

CorelDRAW Graphics Suite X5 is a fully integrated graphic design software suite that helps you creatively express ideas for any media.

Source: <http://www.corel.com/corel/product/index.jsp?pid=prod4130071>

# GIMP

The screenshot shows the official GIMP website homepage. At the top, there's a navigation bar with the GIMP logo and the text "GNU Image Manipulation Program". Below the header, a banner features a close-up image of several paintbrushes and the text "gimp 2.8". A large "Release Notes" button is next to a "Download" button with a download icon. To the right, a sidebar lists links: News, Screenshots, Features, Downloads, Documentation, Get Involved, Plug-In Registry, and GIMP Development. A "Make a Donation" button is also present. The main content area contains a paragraph about the GIMP program and its capabilities, followed by a section about the 2.8 release.

**GIMP 2.8 RELEASED** **2012-05-03**

We are happy to announce immediate availability of GIMP 2.8 — a new stable version of GNU Image Manipulation Program that culminates 3.5 years of exciting work.

With this version we are introducing some long-anticipated features such as layer groups, on-canvas text editing, advanced brush dynamics and the much desired optional single-window mode. We also started applying other important changes to the user interface that bring us closer to matching the [product vision](#).

For detailed information about changes since 2.6 please read the [release notes](#). Source code is [available for](#)

GIMP (GNU Image Manipulation Program) is a free and open source software image retouching and editing tool and is freely available for Win, Mac, Linux.

Source: <http://www.gimp.org/>

# DraftSight

The screenshot shows the 'Overview' page for DraftSight. At the top, the Dassault Systems logo is visible, along with a search bar, sign-in links, and language selection (English). A 3D navigation button is also present. The main content area features a large banner with the text 'DraftSight: Professional-grade, free\* CAD software'. Below the banner, there's a description of what DraftSight can do and its compatibility with Windows, Mac, and Linux. To the left, a screenshot of the DraftSight interface showing a complex mechanical drawing is displayed. To the right, there's a large graphic of a green triangle and a blue triangle forming the letters 'VS'. Below this graphic, text encourages users to 'Discover a better way to create, edit and view DWG files.' A prominent 'Download for FREE\*' button is shown, with a note that it's a 'General Release for Windows now available!'. Other links on the page include 'Learn About DraftSight', 'Discover DraftSight Premium Pack', and 'View DraftSight Online Learning Resources'. At the bottom, news and training links are listed.

DraftSight lets professional CAD user create, edit and view DWG files. DraftSight runs on Windows, Mac and Linux.

Source: <http://www.3ds.com/products/draftsight/overview/>

# SketchUp

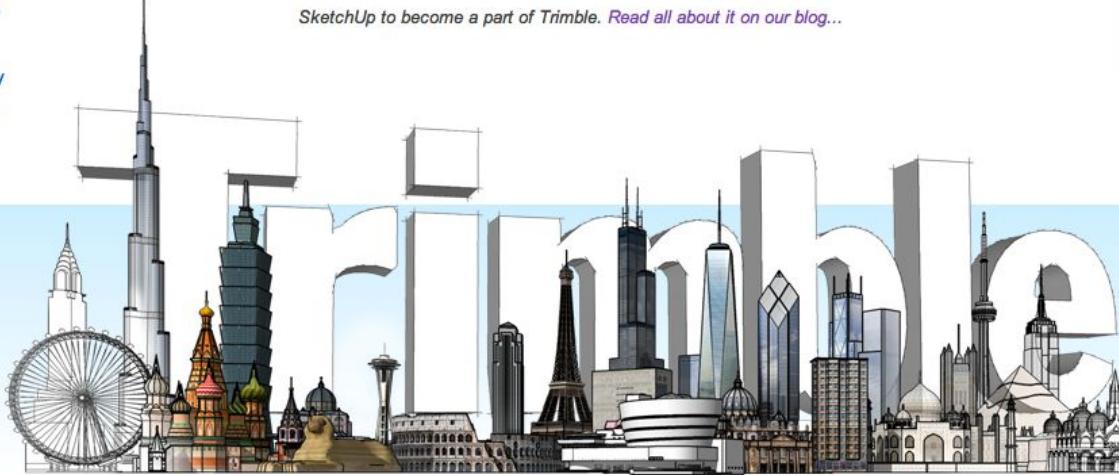
Google SketchUp

Change Language: English (US)

Home Products Downloads Buy Community Education Training Help

## A new home for SketchUp

*SketchUp to become a part of Trimble. Read all about it on our blog...*



Not the usual yada yada, please read - [Transfer of licenses and personal data to Trimble](#)

**Download Google SketchUp**

New! Enter the [Model Your Town Competition](#)

- SketchUp is fun and easy to use
- Picture anything in 3D
- Share models with friends

[Learn more about SketchUp »](#)

 [View our gallery](#)

 [Read our blog](#)

 [Build models for Google Earth](#)

**Google SketchUp Pro** +1

Add powerful modeling, presentation and file exchange tools you can't work without.

[Learn more about SketchUp Pro »](#)

SketchUp is a 3D modeling program marketed by Trimble Navigation and designed for ease of use.

Source: <http://sketchup.google.com/>

# LibreCad

## LibreCAD

LibreCAD, Open Source 2D-CAD

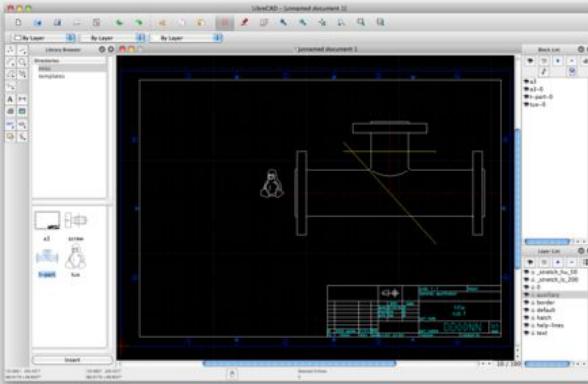
Home   Features   Get Help   Get Involved   News   WIKI   About   Installation   From Source

### What is LibreCAD

LibreCAD is a free Open Source CAD application for Windows, Apple and Linux. Support and documentation is free from our large, dedicated community of users, contributors and developers. You, too, can also get involved!!

### Quick Links:

Our Wiki : <http://wiki.librecad.org>  
Our Forum : <http://librecad.org/cms/home/get-help/forum.html>  
Our Blog : <http://blog.librecad.org/>  
Our Code Repository : <https://github.com/LibreCAD/LibreCAD>

The screenshot shows the LibreCAD interface with a drawing of a mechanical part, likely a gear or sprocket, on the canvas. The interface includes toolbars, a status bar at the bottom, and a sidebar on the left.

 [Download LibreCAD for OSX](#)

 [Download LibreCAD for Windows](#)

 [Linux Installation](#)

LibreCAD is a free Open Source CAD application for Windows, Apple and Linux.

Source: <http://librecad.org/cms/home.html>

# Free CAD

The screenshot shows the SourceForge project page for FreeCAD. At the top, there's a navigation bar with links for Summary, Files, Support, and Report Spam. On the right, there are Log In and Create account buttons. The main header features the FreeCAD logo (a stylized 'F' with a gear) and the text "Free CAD". Below the header, it says "A parametric 3D CAD modeler". To the right of the header are several small flags representing different languages. The left sidebar contains a navigation menu with sections like Home, Features, Screenshots, Downloads, Getting Started, FAQ, Forum, Tracker, and Tutorials. Below this is a "DOCUMENTATION" section with "USING FREECAD" and "PYTHON SCRIPTING" subsections. The main content area has a large heading "Key features" followed by five detailed sections with icons: 1. A complete Open CASCADE Technology-based geometry kernel allowing complex 3D operations on complex shape types, with native support for concepts like brep, nurbs, boolean operations and fillets. 2. A modular architecture that allow plugins (modules) to add functionality to the core application. These extensions can be as complex as whole new applications or as simple as Python scripts or self-recorded macros. 3. A full parametric model allowing any type of parameter-driven custom objects, that can even be fully programmed in Python. 4. Complete access from Python built-in interpreter, macros or external scripts to almost any part of FreeCAD, being geometry creation and transformation, the 2D or 3D representation of that geometry (scenegraph) or even the FreeCAD interface. 5. Import/export to standard formats such as STEP, IGES, OBJ, DXF, SVG, STL, DAE, IFC, or OFF, in addition to FreeCAD's native Fcad file format. To the right of the features, there's a download section for "FreeCAD 0.12" with links for Windows 32-bit, Ubuntu 32/64bit, and Mac OS X Lion 64-bit. Below this is a screenshot of the FreeCAD interface showing a 3D model. Further down are sections for "Latest activity" (listing recent commits from users like yorkvanhavre and wimayer) and a "Fetching news feed..." section.

FreeCAD is a general purpose feature-based, parametric 3D modeler for CAD, MCAD, CAx, CAE and PLM, aimed at mechanical engineering and product design.

Source: [http://sourceforge.net/apps/mediawiki/free-cad/index.php?title=Main\\_Page](http://sourceforge.net/apps/mediawiki/free-cad/index.php?title=Main_Page)

# Eagle CAD

The screenshot shows the homepage of the Eagle CAD website. At the top is a red navigation bar with the logo on the left and menu items: Home, EAGLE PCB Software, Training, Downloads, Forums, Services, Shop, and Contact Us. Below the navigation bar is a banner for the "EAGLE DESIGN COMPETITION". It features two promotional links: "Get your PCB Production voucher for Americas!" and "Get your PCB Production voucher from Eurocircuits!". A section titled "EAGLE PCB DESIGN SOFTWARE" explains the acronym and highlights the software's features like Schematic Capture, Board Layout, and Autorouter. It includes "LEARN MORE" and "BUY NOW" buttons. To the right is a video player showing a man speaking about "EAGLE values". The video has a play button and a timestamp of 0:00 / 1:22. The YouTube logo is visible in the bottom right corner of the video frame.

This software offers user friendly, powerful and affordable solutions for PCB design, including Schematic Capture, Board Layout and Autorouter.

Source: <http://www.cadsoftusa.com/>

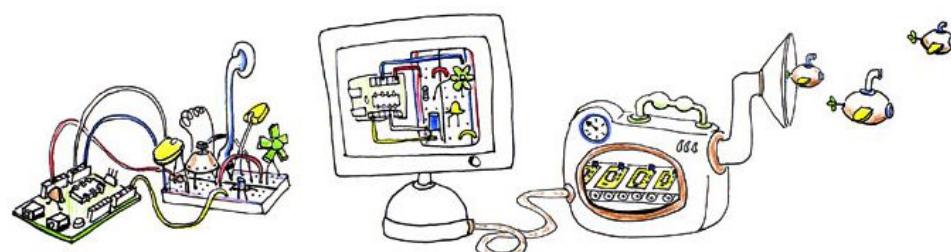
# Fritzing

**FRITZING** BETA  2k  1,250 followers

Members Sign up Login 

Welcome \ About \ Learning \ Projects \ Parts \ Shop \ Services \ Support us \ Developers \ Download \ Forum [FAQ](#) [BLOG](#)

**WELCOME**  
From prototype to product



**ABOUT FRITZING**

Fritzing is an open-source initiative to support designers, artists, researchers and hobbyists to work creatively with interactive electronics. We are creating a software and website in the spirit of [Processing](#) and [Arduino](#), developing a tool that allows users to **document** their prototypes, **share** them with others, **teach** electronics in a classroom, and to create a **pcb layout** for professional **manufacturing**.



**DOWNLOAD AND START!**

[Download our latest version](#) (0.7.4b was released April 10th) and start right away.

Just got into interactive electronics and still need the basic tools? We created an "all-you-need-to-get-going" [Fritzing Starter Kit](#).



**PRODUCE YOUR BOARD**

With the new [Fritzing Fab](#) service you can easily and inexpensively turn your sketch into a real, custom PCB. Try it out now!



**BLOG**

New Fritzing/Arduino Workshop Series in Berlin! April 04, 2012  
0.7.0 released! Feb. 04, 2012  
CNC'ing your Fritzing circuit Jan. 14, 2012  
[More posts...](#)

**TALKS & WORKSHOPS**

[Arduino Newbie Workshop](#) Fritzing HQ, Berlin - Apr 11  
[Designing Interactive Experiences](#) IUAV, Venice - Apr 16  
[Arduino Newbie Workshop](#) Fritzing HQ, Berlin - May 09  
[All events...](#)

**ON THE FORUM**

usbasp please Community  
how do i delete customshape How do I...  
Need help with custom pcb and illustrator How do I...  
[More discussions...](#)

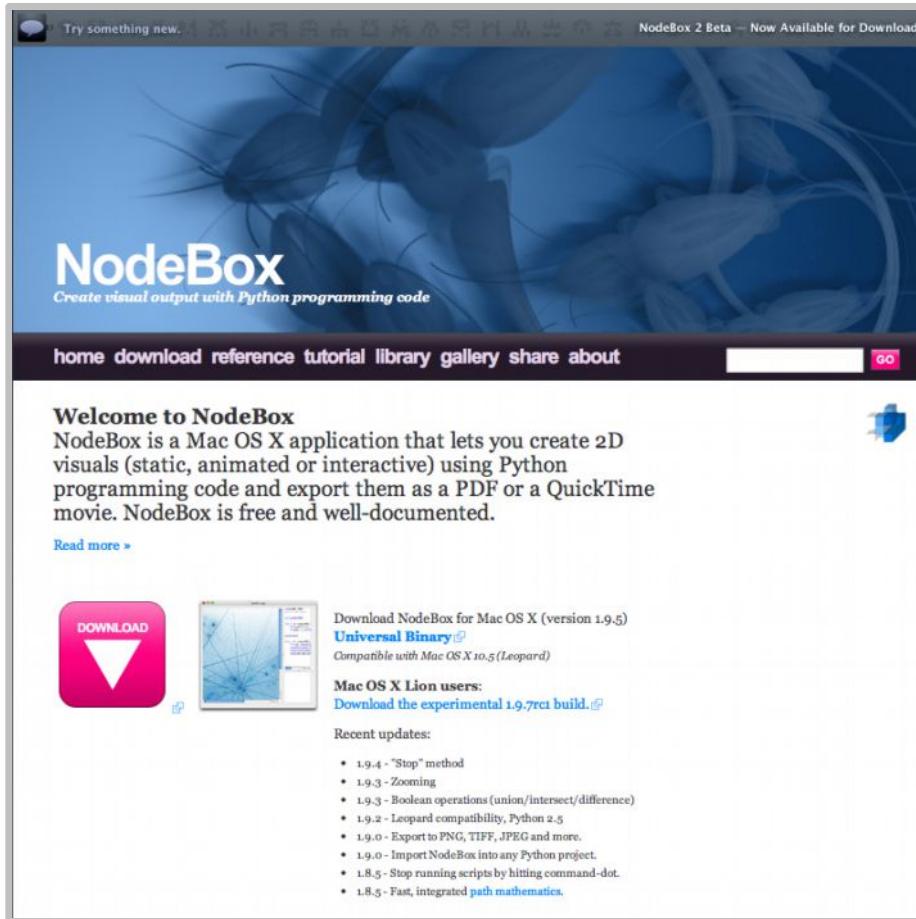
**NEW PROJECTS**

L293 cd stepper driver. Forvellos  
Infrared based digital object counter sagarsapkota  
Infrared based music transmitter and receiver

Fritzing is an open-source initiative to support designers, artists, researchers and hobbyists to work creatively with interactive electronics.

Source: <http://fritzing.org/>

# Nodebox



NodeBox lets you create 2D visuals (static, animated or interactive) using Python programming code and export them as a PDF / QuickTime movie.

Source: <http://www.nodebox.net/code/index.php/Home>

# NodeBox 2

The screenshot shows the NodeBox 2 website. At the top, there's a navigation bar with 'Home' (highlighted), 'Documentation', and 'Download'. Below the navigation is a banner featuring a colorful, abstract generative artwork. The main content area has several sections: 'Meet NodeBox.' with a sub-section about procedural graphics; 'A Friendly Face' showing a node-based interface for creating faces; 'An Animated Partner' showing a grid of animated shapes; 'Visualize Your Data' showing a bar chart; and 'Peek Under The Hood' showing a snippet of Python code for a 'cook' function.

**Meet NodeBox.**

NODEBOX CREATES GENERATIVE ART USING PROCEDURAL GRAPHICS. IT'S A NEW WAY TO APPROACH GRAPHIC DESIGN.

**A Friendly Face**

You want to explore generative design without learning the ins and outs of programming? Using its node-based interface, NodeBox makes generative design easy and fast.

**An Animated Partner**

Every parameter in NodeBox can be animated. Animations can be exported as common movie formats or as a sequence of images.

**Visualize Your Data**

Because of its unique approach, NodeBox is ideal for rapid data visualization. NodeBox takes in data from Excel. Because it's open, you can write your own data importers and exporters.

```
from nodebox.graphics import *
from nodebox.util.Geometry import *

def cook(self):
    if self.shape is None: return
    t = self.position / 100
    pt1 = self.template.pointAt(t)
    pt2 = self.template.pointAt(1 - t)
    a = angle(pt2.x, pt2.y, pt1.x, pt1.y)
    t = Transform()
    t.translate(pt1.x, pt1.y)
    t.rotate(a - 180)
    return t.map(self.shape)
```

**Peek Under The Hood**

NodeBox 2 creates generative art and design through a node-based system.

Source: <http://beta.nodebox.net/>

# Processing

The screenshot shows the official Processing website. At the top, there's a dark header with the word "Processing" in large white letters. Below it is a navigation bar with links to "Cover", "Exhibition", "Reference", "Learning", "Download", "Shop", and "About". To the right of the navigation bar are links for "Feed", "Forum", "Wiki", and "Code". A search bar is also present. The main content area features three exhibition examples: "unnamed soundsculpture" by Daniel Franke & Cedric Kiefer, "Soundmachines" by The Product, and "Composition No. 1" by Visual Editions. Each example has a thumbnail image and a title with the artist's name. To the right of these examples is a summary of Processing's features, starting with a paragraph about its history and purpose, followed by a list of bullet points, and finally a note about external resources.

» [Exhibition](#)

  
[unnamed soundsculpture](#)  
by Daniel Franke & Cedric Kiefer

  
[Soundmachines](#)  
by The Product

  
[Composition No. 1](#)  
by Visual Editions

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Processing is an open source programming language and environment for people who want to create images, animations, and interactions. Initially developed to serve as a software sketchbook and to teach fundamentals of computer programming within a visual context, Processing also has evolved into a tool for generating finished professional work. Today, there are tens of thousands of students, artists, designers, researchers, and hobbyists who use Processing for learning, prototyping, and production.

- » Free to download and open source
- » Interactive programs using 2D, 3D or PDF output
- » OpenGL integration for accelerated 3D
- » For GNU/Linux, Mac OS X, and Windows
- » Projects run online or as double-clickable applications
- » Over 100 libraries extend the software into sound, video, computer vision, and more...
- » Well [documented](#), with many [books](#) available

To see more of what people are doing with Processing, check out these sites:

Processing is an open source programming language and environment for people who want to create images, animations, and interactions.

Source: <http://www.processing.org/>

# Processing: Tutorials

plethora-project @jomasan

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## Processing Tutorials

List of Processing Tutorials:

SEASON 1:

- Tutorial 01: INTRO
- Tutorial 02: VARIABLES
- Tutorial 03: FUNCTIONS
- Tutorial 04: REFERENCE
- Tutorial 05: FOR LOOPS
- Tutorial 06: CONDITIONALS
- Tutorial 07: CLASSES
- Tutorial 08: ARRAYS
- Tutorial 09: ARRAYLIST
- Tutorial 10: EXTERNAL LIBRARIES
- Tutorial 11: VECTOR CLASS
- Tutorial 12: VECTOR MATH
- Tutorial 13: STEERING BEHAVIORS
- Tutorial 14: 3D
- Tutorial 15: USER INTERFACE
- Tutorial 16: FOLLOW TARGET
- Tutorial 17: EXPORT DATA
- Tutorial 18: IMPORT DATA
- Tutorial 19: RECURSION
- Tutorial 20: FRACTALS
- Tutorial 21: CELLULAR AUTOMATA
- Tutorial 22: PHYSICS / SPRINGS 1D
- Tutorial 23: PHYSICS / SPRINGS 2D
- Tutorial 24: ECLIPSE IDE

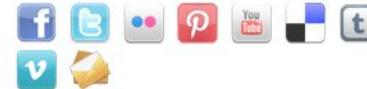
BONUS TRACK:

ANIMATIONS WITH AFTER EFFECTS

SEASON 2:

TUTORIAL 01: INHERITANCE

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ABOUT

Plethora-Project.com is an initiative to accelerate computational literacy in the frame of architecture and design. It aligns with the "show me your screens" motto of the TopLap live-coding group attempting to get rid of Obscurantism in digital design.

Directed by Jose Sanchez

Contact me at : jomasan@gmail.com

Bio:

Jose Sanchez is an Architect / Programmer based in London. He is a Course Tutor and programming teacher of the Design Research Lab (DRL) at the Architectural Association. In 2009 he joined Blothing building up on the research of generative design. He is the founder of plethora-project and a co-founder of Probotics, an architecture/robotics practice based in London.

SEARCH

CODING

- > Creative Applications
- > Design Playgrounds
- > Gary Edwards
- > hemesh

## Video Tutorials about Processing

Source: <http://www.plethora-project.com/2011/09/12/processing-tutorials/>

# Arduino IDE



The screenshot shows the Arduino Software download page. At the top is the Arduino logo (a stylized infinity symbol with a minus and plus sign) and a search bar. Below the logo is a navigation bar with links: Buy, Download, Getting Started, Learning, Reference, Hardware, and FAQ. The main heading is "Download the Arduino Software". A paragraph explains that the open-source environment runs on Windows, Mac OS X, and Linux, using Java and Processing, avr-gcc, and other open source software. To the right is a teal square containing a white heart outline. Below the main heading is a legal disclaimer about the software's "AS IS" nature and lack of warranties. A note states that by downloading, you agree to the terms. The "Download" section provides links for Arduino 1.0 (release notes) on Google Code for Windows, Mac OS X, Linux (32-bit, 64-bit), and source code. The "Next steps" section links to Getting Started, Reference, Environment, Examples, Foundations, and FAQ.

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**Download**

Arduino 1.0 ([release notes](#)), hosted by Google Code:

- + Windows
- + Mac OS X
- + Linux: [32 bit](#), [64 bit](#)
- + [source](#)

**Next steps**

[Getting Started](#)  
[Reference](#)  
[Environment](#)  
[Examples](#)  
[Foundations](#)  
[FAQ](#)

*Also available from Arduino.cc: Windows, Mac OS X, Linux (32-bit, 64-bit), [source](#)*

The open-source Arduino environment makes it easy to write code and upload it to the i/o board. It runs on Windows, Mac OS X, and Linux.

Source: <http://arduino.cc/en/Main/Software>

# Adobe Creative Suite 5

The screenshot shows the Adobe Creative Suite 5 website. At the top is a navigation bar with links for Products, Solutions, Learning, Help, Downloads, Company, and Buy, along with a search bar. Below the navigation is a secondary row with links for My Adobe, My orders, My cart, and Sign in. The main content area features a large banner for 'CS6: The new face of creativity' with a subtext 'Bring your most innovative work to life. Beat every deadline. Reach audiences everywhere.' and a 'Compare products' link. The background of the banner is a collage of various Adobe creative projects, including a woman's face, abstract designs, and architectural renderings. A large, stylized 'CS6' logo is overlaid on the right side of the banner.

Adobe Creative Suite (CS) is a collection of graphic design, video editing, and web development applications made by Adobe Systems.

Source: <http://www.adobe.com/en/products/creativesuite.html>

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# A”

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# Thank you!!

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