

# Introduction to LDraw Tools

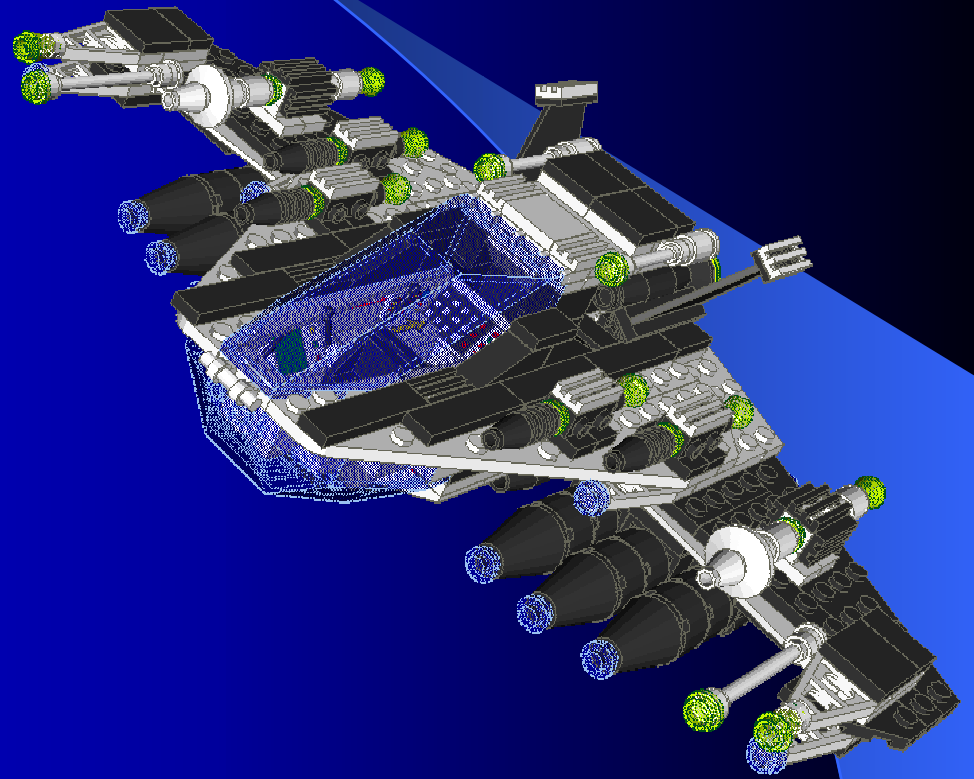
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# what is LDraw?

LDraw is a system of tools  
And a parts library for  
creating virtual LEGO  
Models

- Create your own building instructions
- Render your models in 3D
- Document your creations for future reference
- Interactive graphical/text editing



# Brief History

- Created by James Jessiman 1996
- LDraw catches on – Minifig World Tour
- After James died (July 97) LDraw has been community led
  - Terry Keller – James Jessiman Memorial
  - Tim Courtney – LDraw.org Website
  - Steve Bliss – Parts Library
- LDraw.org as official standard

# LDraw Today

- MLCad is the most popular editor, by Michael Lachmann.
  - Pushes the envelope in file format features.
- New versions of POV-Ray and MegaPOV have allowed for stunning photo-realistic renderings
- LPub, Kevin Clague's new batch automation tool, makes creating instruction images painless



Super Car rendering by Jeroen de Haan  
POV-Ray 3.5 and Radiosity

# Understanding the System

Think of it as many programs which each perform different functions on the same type of file.

These programs each have different purposes. Some are used to actually create the 3D LEGO models, while others perform special actions. Some special actions include:

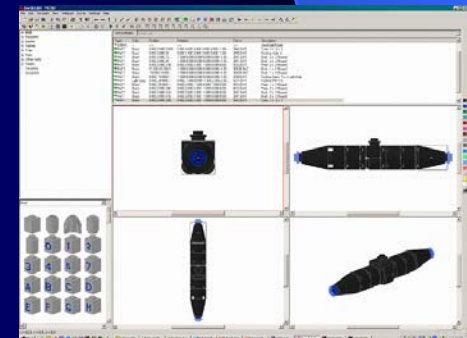
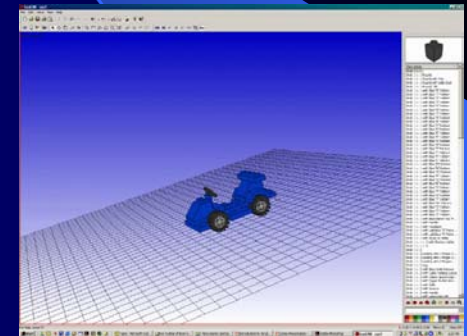
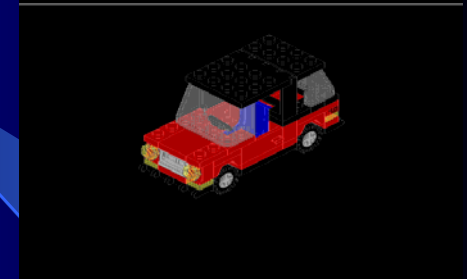
- Generating flexible and dynamic elements
  - Hoses, wires, treads, springs, etc...
  - The LDraw language only supports static objects
- Converting to an advanced 3D file format
  - High quality renderings you have seen
- Editing raw LDraw files (text)

# System of Tools Breakdown

The LDraw System of Tools is composed of several types of programs:

- **Editors** – You can use any of these programs to create your virtual LEGO models:
  - MLCAD – Most popular current editor, for Windows, by Michael Lachmann.
  - LEdit – original DOS editor by James Jessiman
  - LeoCAD – Windows and Linux editor by Leonardo Zide
- **Viewers** – Quickly view files
  - LDLite (Gyugyi), LDView (Cobbs), LDGLite (Heyse – OpenGL LDLite)
  - L3Lab (Hassing) – diagnostic tools for parts authors
  - Interactivity with LUGNET's DAT newsgroups
    - Windows file associations

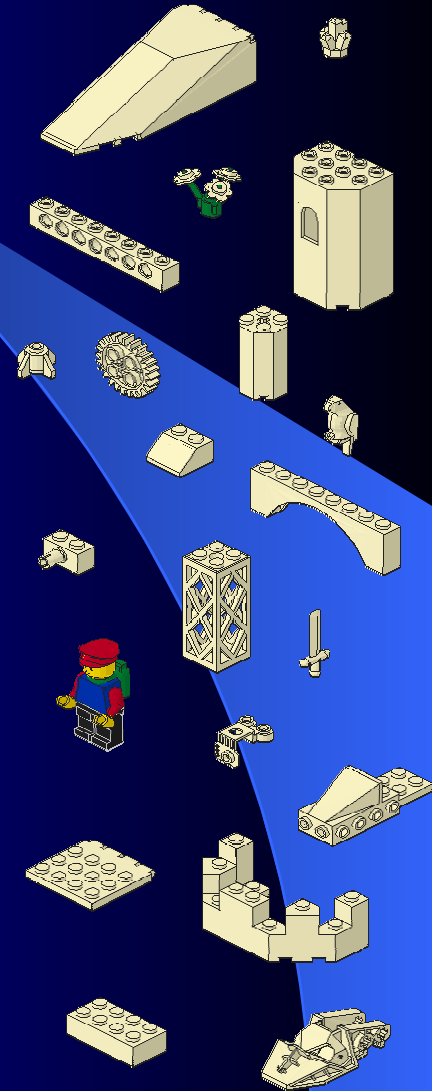
```
Line: 74 View: Three-D Zoom: x1.000 Move: Normal  
1 0 30.0 6.0 -60.0 0.0 0.0 -1.0 0.0 1.0 0.0 1.0 0.0 0.0 123.dat  
---END---
```





# The LDraw Parts Library

- Fundamental to the LDraw modeling system – the system would be nothing without the parts library
- About 2000 parts created to date
- Community maintained and updated
- Official parts are certified by multiple parts authors and a Parts Tracker Admin



# File Format:

How do the tools work together?

- Common LDraw file format
  - .LDR is the default extension for Models
  - .MPD is the default extension for Multi-Part Models
  - .DAT is the default extension for Parts
- Text-based
  - Files are light and portable – permitting the system to thrive online
  - You can edit raw files by hand
- Simplicity
  - File format built on referencing other files
    - Models reference submodels and parts
    - Parts reference primitives and subparts
  - Only necessary information is included – the system is strong partly due to its simplicity

# Line Breakdown

Part Location in 3D Coordinate Plane

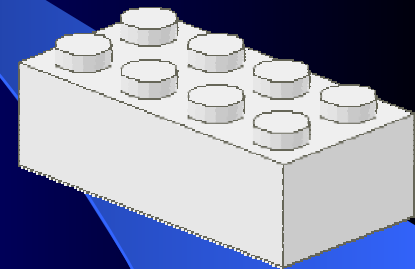
Part Number

Line Type



Color Number

Rotation Matrix



- Line Type (Part, Meta Command, Comment)
  - Popular Meta Commands: STEP, CLEAR, SAVE
  - New MLCad (non-standard) Meta Commands: ROTSTEP, BUFFEX
- Color Number – numerical value associated with part color
  - 16 available LDraw colors, plus dithered colors
- Part Location in 3D Coordinate Plane (x,y,z)
- Rotation Matrix (a1, a2, a3, a4, a5, a6, a7, a8, a9)
  - defines part orientation
- Part Number
  - references a part file (ie: 3001.DAT = 2x4 Brick)

```
| a d g 0 |
| b e h 0 |
| c f i 0 |
| x y z 1 |
```

Rotation Matrix

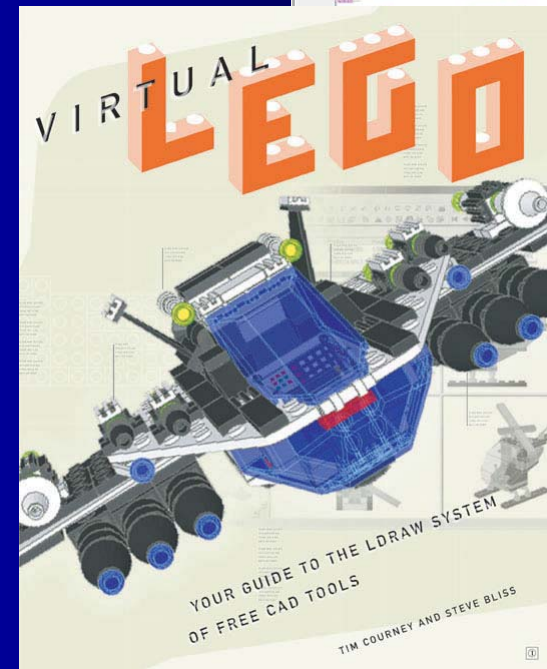
# How do I get LDraw?

- LDraw tools are FREE online!

- [www.LDraw.org](http://www.LDraw.org) - Official Website
- Low system requirements – the various LDraw tools run on almost all computers
- Mac and Linux
  - Limited availability of tools
  - BrickDraw3D for the Mac near a version 1.0
  - Instructions for Linux LDraw setup at [www.ldraw.org/download/start/linux/](http://www.ldraw.org/download/start/linux/)

- Buy a book! Virtual LEGO

- By Tim Courtney, Steve Bliss, Ahui Herrera
- Available THIS SPRING via No Starch Press, Amazon.com (etc), select bookstores
- Contains CD-ROM with the free software, plus easy installer
- Official LDraw.org guide to Windows LDraw Tools, written by two LDraw.org founders and one major contributor



# Sample Models and Construction

Questions?