

3DLDF 2.0.4 User Manual

3-dimensional drawing with MetaPost output.
Last updated March 22, 2021

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3DLDF User Manual, edition 2.0.4.

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1 Introduction

This manual documents GNU 3DLDF 2.0.4 (in the following mostly simply referred to as “3DLDF”). The most important difference between release 2.0.4 and previous releases is that 3DLDF 2.0.4 is an *interactive* program, whereas in previous releases, it was more like a *library* of C++ classes, functions, etc. that users could use in their own programs to make drawings.

Now, 3DLDF implements a *language* similar to the METAFONT language, and in particular the MetaPost language derived from it.

For several years, interactive versions of 3DLDF have been available for downloading from the Savannah website: <https://savannah.gnu.org/projects/3dldf/>. Release 2.0.3 was the first one that included this feature. However, Release 2.0.4 is the first one which contains the updated documentation (this document).

One result of this is that the old manual for releases through 2.0.3 is largely obsolete, as far as the usage of 3DLDF is concerned. The reference sections, documenting the classes, functions, etc., are still usable for those who want to know the details of how the program works, although many descriptions may be out-of-date because of changes made in the meantime. On the other hand, the reference sections are longer needed for just using the program. The old manual is included in the distribution in the directory 3DLDF-2.0.4/doc/old_doc/.

The code for *scanning* and *parsing*, i.e., that which implements the *interpreter* that makes the program interactive, is of course not documented in the old manual at all.

2 Installation

3 Invoking

3dldf [*options*] [*filenames*]

Example:

```
3dldf --bison-trace --verbose sample1.ldf sample2
```

Filename arguments may be specified completely, e.g., **sample1.ldf**. However, if the suffix is **ldf**, it may be left off, e.g., **sample2**.

If no filename arguments are specified, **3dldf** reads from standard input.

Command-line options:

- help** Prints a help message and exits.
- version**
 Prints the version number of GNU 3DLDF to standard output and exits with return value 0.
- quiet** Suppresses some output to standard output and standard error when ‘3dldf’ is run.
- silent** Suppresses almost all output to standard output and standard error when ‘3dldf’ is run.
- verbose**
 Causes status information to be printed to standard output when ‘3dldf’ is run.
- bison-trace**
 Prints information generated by GNU Bison for tracing which parser rules are reduced and the state of the Bison stack.
- multithread-input**
 Enables the use of multiple threads for input.
- multithread-output**
 Enables the use of multiple threads for output.
- multithread-include**
 Enables the use of multiple threads for input files included in other input files.

4 Getting Started

The syntax of the 3DLDF language is based on that of METAFONT and MetaPost. The code for a *figure* is enclosed between calls to `beginfig` and `endfig`, as in MetaPost:

```
beginfig(1);
  (drawing commands)
endfig;
```

3DLDF, among other things, defines numerous data types corresponding to different *shapes* that can be drawn. The simplest of these, and the basis for all other shape-types is `point`.

A `point` is like a `pair` in METAFONT and MetaPost except that it represents a point in three-dimensional space. It therefore contains an x-, y-, and z-coordinate. However, `point` has an additional w-coordinate for use in *projections*. Currently, the only projection implemented is the *perspective projection*.

`points` can be assigned to using the `:=` operator:

```
point p;
p := (1, 2, 3);
```

The `:=` operator must be used because `=` has a special meaning in METAFONT and MetaPost: METAFONT and MetaPost can solve linear equations interactively and the `=` operator will only assign a value to a variable if this doesn't contradict the results of previous operations pertaining to it. While it would be desirable to implement this feature, 3DLDF, like most other programming languages, does not implement it (and may never do so). The author is not a mathematician and does not know what would be involved in implementing it. 3DLDF defines considerably more, and more complex, data types than METAFONT and MetaPost and it might not be practicable to implement this feature, even for someone with considerably greater mathematical skills than the author.

As in METAFONT and MetaPost, the `:=` operator is used for *assignments* in 3DLDF.

The value of variables in a run of 3DLDF can be output using the `show` command:

```
show p;
+ point: (1.00000000, 2.00000000, 3.00000000)
```

Please note that the w-coordinate is not shown by `show [point]`. It can, however, be output by using the `wpart` operator:

```
show wpart p;
+ >> 1
```

It cannot, however, be assigned to!

The data type that is next highest in complexity to `point` is `path`. Just as in METAFONT and MetaPost `paths` consist of `pairs` joined by *connectors*, in 3DLDF, they consist of `points` joined by connectors:

```
point p, q;
p := (1, 2, 3);
q := (4, 5, 6);
path r;
r := p .. q;
show r;
```



```
└─ >> path:
type: PATH_TYPE
surface_hiding_ctr: 0
decomposition_level: 0
points.size() == 2
connectors.size() == 1
(1.000000000, 2.000000000, 3.000000000) .. (4.000000000, 5.000000000, 6.000000000);■
fill_draw_value == 0
'fill_color_vector' == 0
'draw_color_vector' == 0
'pen_vector' == 0
'dash_pattern_vector' == 0
'arrow' == 'Path::NO_ARROW'.
```

Paths can be drawn:

```
draw r;
```

⇒

5 Data Types

5.1 Numeric types

`numeric` Integers and floating point numbers.

`boolean` `true` or `false`

`ulong_long`
Unsigned long long integers. Corresponds to the C type `unsigned long long int`.

`complex` Complex number.

`matrix` Matrix.

5.2 Types for drawing and labeling:

`transform`
Transformation matrix.

`focus` Focus for the *perspective projection*.

`pen`
`dash_pattern`
`color`
`string`

5.3 Shape types

point
path
circle
circle_slice
arc
cone
conic_section_lattice
cuboid
cylinder
ellipse_slice
ellipse
ellipsoid
glyph
helix
hyperbola
parabola
paraboloid
polygon
polyhedron_slice
polyhedron
rectangle
reg_polygon
sphere
sphere_development
triangle

5.4 Combined types

bool_point

5.5 Other types

plane
nurb
origami_figure

5.6 Vector types

Vector types (alphabetical):

arc_vector
boolean_vector
bool_point_vector
circle_slice_vector
circle_vector
color_vector
complex_vector
cone_vector
conic_section_lattice_vector
cuboid_vector
cylinder_vector
dash_pattern_vector
ellipse_slice_vector
ellipse_vector
ellipsoid_vector
focus_vector
glyph_vector
helix_vector
hyperbola_vector
macro_vector
matrix_vector
numeric_vector
nurb_vector
origami_figure_vector
parabola_vector
paraboloid_vector
path_vector
pen_vector
picture_vector
plane_vector
point_vector
polygon_vector
polyhedron_slice_vector
polyhedron_vector
rectangle_vector
reg_polygon_vector
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transform_vector
triangle_vector
ulong_long_vector

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