The luamplib package

Hans Hagen, Taco Hoekwater, Elie Roux, Philipp Gesang and Kim Dohyun
Maintainer: LuaLaTeX Maintainers — Support: <lualatex-dev@tug.org>

2016/01/02 v2.11.2

Abstract

Package to have metapost code typeset directly in a document with LuaTEX.

1 Documentation

This packages aims at providing a simple way to typeset directly metapost code in a document with LuaTEX. LuaTEX is built with the lua `mplib` library, that runs metapost code. This package is basically a wrapper (in Lua) for the Lua `mplib` functions and some TEX functions to have the output of the `mplib` functions in the pdf.

In the past, the package required PDF mode in order to output something. Starting with version 2.7 it works in DVI mode as well, though DVIPDFMx is the only DVI tool currently supported.

The metapost figures are put in a TEX `hbox` with dimensions adjusted to the metapost code.

Using this package is easy: in Plain, type your metapost code between the macros `\mplibcode` and `\endmplibcode`, and in LATEX in the `mplibcode` environment.

The code is from the `luatex-mplib.lua` and `luatex-mplib.tex` files from ConTEXt, they have been adapted to LATEX and Plain by Elie Roux and Philipp Gesang, new functionalities have been added by Kim Dohyun. The changes are:

- a LATEX environment
- all TEX macros start by `mplib`
- use of luatexbase for errors, warnings and declaration
- possibility to use `btex ... etex` to typeset TEX code. `textext()` is a more versatile macro equivalent to `TEX()` from TEX.mp. `TEX()` is also allowed and is a synomym of `textext()`.

  N.B. Since v2.5, `btex ... etex` input from external `mp` files will also be processed by luamplib. However, `verbatimtex ... etex` will be entirely ignored in this case.

- `verbatimtex ... etex` (in TeX file) that comes just before `beginfig()` is not ignored, but the TeX code inbetween will be inserted before the following mplib hbox. Using this command, each mplib box can be freely moved horizontally and/or vertically. Also, a box number might be assigned to mplib box, allowing it to be reused later (see test files). *E.G.*

  ```
  \mplibcode
  verbatimtex \moveright 3cm etex; beginfig(0); ... endfig;
  verbatimtex \leavevmode etex; beginfig(1); ... endfig;
  verbatimtex \leavevmode\lower 1ex etex; beginfig(2); ... endfig;
  verbatimtex \endgraf\moveright 1cm etex; beginfig(3); ... endfig;
  \endmplibcode
  ```

  N.B. `\endgraf` should be used instead of `\par` inside `verbatimtex ... etex`.

- TeX code in `VerbatimTeX(...)` or `verbatimtex ... etex` (in TeX file) between `beginfig()` and `endfig` will be inserted after flushing out the mplib figure. *E.G.*

  ```
  \mplibcode
    D := sqrt(2)**7;
    beginfig(0);
    draw fullcircle scaled D;
    VerbatimTeX("\gdef\Dia{" & decimal D & "}");
    endfig;
  \endmplibcode
  diameter: \Dia bp.
  ```

- Notice that, after each figure is processed, macro `\MPwidth` stores the width value of latest figure; `\MPheight`, the height value. Incidentally, also note that `\MPllx`, `\MPlly`, `\MPurx`, and `\MPury` store the bounding box information of latest figure without the unit `bp`.

- Since v2.3, new macros `\everymplib` and `\everyendmplib` redefine token lists `\everymplibtoks` and `\everyendmplibtoks` respectively, which will be automatically inserted at the beginning and ending of each mplib code. *E.G.*

  ```
  \everymplib{ verbatimtex \leavevmode etex; beginfig(0); }
  \everyendmplib{ endfig; }
  \mplibcode % beginfig/endfig not needed; always in horizontal mode
    draw fullcircle scaled 1cm;
  \endmplibcode
  ```

  N.B. Many users have complained that mplib figures do not respect alignment commands such as `\centering` or `\raggedleft`. That's because luamplib does not force horizontal or vertical mode. If you want all mplib figures center- (or right-) aligned, please use `\everymplib` command with `\leavevmode` as shown above.

- Since v2.3, `\mpdim` and other raw TEX commands are allowed inside mplib code. This feature is inpired by gmp.sty authored by Enrico Gregorio. Please refer the manual of gmp package for details. *E.G.*

  ```
  \begin{mplibcode}
    draw origin--(\mpdim{\linewidth},0) withpen pencircle scaled 4
    dashed evenly scaled 4 withcolor \mpcolor{orange};
  \end{mplibcode}
  ```

  N.B. Users should not use the protected variant of `btex ... etex` as provided by gmp package. As **luamplib** automatically protects TEX code inbetween, `\btex` is not supported here.

- With `\mpcolor` command, color names or expressions of **color**/**xcolor** packages can be used inside mplibcode enviroment, though **luamplib** does not automatically load these packages. See the example code above. For spot colors, **(x)spotcolor** (in PDF mode) and **xespotcolor** (in DVI mode) packages are supported as well.

- Users can choose `numbersystem` option since v2.4. The default value `scaled` can be changed to `double` by declaring `\mplibnumbersystem{double}`. For details see `http://github.com/lualatex/luamplib/issues/21`.

- To support `btex ... etex` in external `.mp` files, **luamplib** inspects the content of each and every `.mp` input files and makes caches if nececcsary, before returning their paths to LuaTEX's mplib library. This would make the compilation time longer wastefully, as most `.mp` files do not contain `btex ... etex` command. So **luamplib** provides macros as follows, so that users can give instruction about files that do not require this functionality.

  - `\mplibmakenocache{<filename>[,<filename>,...]}`
  - `\mplibcancelnocache{<filename>[,<filename>,...]}`

  where `<filename>` is a file name excluding `.mp` extension. Note that `.mp` files under `$TEXMFMAIN/metapost/base` and `$TEXMFMAIN/metapost/context/base` are already registered by default.

- By default, cache files will be stored in `$TEXMFVAR/luamplib_cache` or, if it's not available, in the same directory as where pdf/dvi output file is saved. This however can be changed by the command `\mplibcachedir{<directory path>}`, where tilde (`~`) is interpreted as the user's home directory (on a windows machine as well). As backslashes (`\`) should be escaped by users, it would be easier to use slashes (`/`) instead.

- Starting with v2.6, `\mplibtextextlabel{enable}` enables string labels typeset via `textext()` instead of `infont` operator. So, `label("my text",origin)` thereafter is exactly the same as `label(textext("my text"),origin)`. *N.B.* In the background, **luamplib** redefines `infont` operator so that the right side argument (the font part) is totally ignored. Every string label therefore will be typeset with current TEX font. Also take care of `char` operator in the left side argument, as this might bring unpermitted characters into TEX.

- Starting with v2.9, `\mplibcodeinherit{enable}` enables the inheritance of variables, constants, and macros defined by previous `mplibcode` chunks. On the contrary, the default value `\mplibcodeinherit{disable}` will make each code chunks being treated as an independent instance, and never affected by previous code chunks.

  N.B. It does not work to pass across code chunks those variables containing `btex ... etex` pictures, as these are not METAPOST, but TEX elements from the standpoint of luamplib. Likewise, `graph.mp` does not work properly with the inheritance functionality.

```
\mplibcodeinherit{enable}
\everymplib{ beginfig(0);} \everyendmplib{ endfig;}
A circle
\mplibcode
  u := 10;
  draw fullcircle scaled u;
\endmplibcode
and twice the size
\mplibcode
  draw fullcircle scaled 2u;
\endmplibcode
```

- Starting with v2.11, users can issue `\mplibverbatim{enable}`, after which the contents of mplibcode environment will be read verbatim. As a result, users cannot use `\mpdim`, `\mpcolor` etc. All TEX commands outside of `btex ... etex` or `verbatimtex ... etex` are not expanded and will be fed literally into the mplib process.

- At the end of package loading, luamplib searches `luamplib.cfg` and, if found, reads the file in automatically. Frequently used settings such as `\everymplib` or `\mplibcachedir` are suitable for going into this file.

There are (basically) two formats for metapost: *plain* and *metafun*. By default, the *plain* format is used, but you can set the format to be used by future figures at any time using `\mplibsetformat{`⟨*format name*⟩`}`.

2 Implementation

2.1 Lua module

Use the `luamplib` namespace, since `mplib` is for the metapost library itself. ConTEXt uses `metapost`.

```

luamplib          = luamplib or { }

```

Identification.

```

local luamplib    = luamplib
luamplib.showlog  = luamplib.showlog or false
luamplib.lastlog  = ""

luatexbase.provides_module {
  name          = "luamplib",
  version       = "2.11.2",
  date          = "2016/01/02",
  description   = "Lua package to typeset Metapost with LuaTeX's MPLib.",
}

```

This module is a stripped down version of libraries that are used by ConTEXt. Provide a few "shortcuts" expected by the imported code.

```

local format, abs = string.format, math.abs

local err  = function(...) return luatexbase.module_error  ("luamplib", format(...)) end
local warn = function(...) return luatexbase.module_warning("luamplib", format(...)) end
local info = function(...) return luatexbase.module_info   ("luamplib", format(...)) end

local stringgsub    = string.gsub
local stringfind    = string.find
local stringmatch   = string.match
local stringgmatch  = string.gmatch
local stringexplode = string.explode
local tableconcat   = table.concat
local texsprint     = tex.sprint
local textprint     = tex.tprint

local texget      = tex.get
local texgettoks  = tex.gettoks
local texgetbox   = tex.getbox

local mplib = require ('mplib')
local kpse  = require ('kpse')
local lfs   = require ('lfs')

local lfsattributes = lfs.attributes
local lfsisdir      = lfs.isdir
local lfsmkdir      = lfs.mkdir
local lfstouch      = lfs.touch
local ioopen        = io.open

local file = file or { }
```

This is a small trick for LaTeX. In LaTeX we read the metapost code line by line, but it needs to be passed entirely to `process()`, so we simply add the lines in `data` and at the end we call `process(data)`.

A few helpers, taken from `l-file.lua`.

```
local replacesuffix = file.replacesuffix or function(filename, suffix)
  return (stringgsub(filename,"%.[%a%d]+$","")) .. "." .. suffix
end
local stripsuffix = file.stripsuffix or function(filename)
  return (stringgsub(filename,"%.[%a%d]+$",""))
end

```

`btex ... etex` in input .mp files will be replaced in finder.

```
local is_writable = file.is_writable or function(name)
  if lfsisdir(name) then
    name = name .. "/_luam_plib_temp_file_"
    local fh = ioopen(name,"w")
    if fh then
      fh:close(); os.remove(name)
      return true
    end
  end
end
local mk_full_path = lfs.mkdirs or function(path)
  local full = ""
  for sub in stringgmatch(path,"(/*[^\\/]+)") do
    full = full .. sub
    lfsmkdir(full)
  end
end

local luamplibtime = kpse.find_file("luamplib.lua")
luamplibtime = luamplibtime and lfsattributes(luamplibtime,"modification")

local currenttime = os.time()

local outputdir
if lfstouch then
  local texmfvar = kpse.expand_var('$TEXMFVAR')
  if texmfvar and texmfvar ~= "" and texmfvar ~= '$TEXMFVAR' then
    for _,dir in next,stringexplode(texmfvar,os.type == "windows" and ";" or ":") do
      if not lfsisdir(dir) then
        mk_full_path(dir)
      end
      if is_writable(dir) then
        local cached = format("%s/luamplib_cache",dir)
        lfsmkdir(cached)
        outputdir = cached
        break
      end
    end
  end
end
if not outputdir then
  outputdir = "."
  for _,v in ipairs(arg) do
    local t = stringmatch(v,"%-output%-directory=(.+)")
    if t then
      outputdir = t
      break
    end
  end
end

function luamplib.getcachedir(dir)
  dir = dir:gsub("##","#")
  dir = dir:gsub("^~",
    os.type == "windows" and os.getenv("UserProfile") or os.getenv("HOME"))
  if lfstouch and dir then
    if lfsisdir(dir) then
      if is_writable(dir) then
        luamplib.cachedir = dir
      else
        warn("Directory '"..dir.."' is not writable!")
      end
    else
      warn("Directory '"..dir.."' does not exist!")
    end
  end
end

local noneedtoreplace = {
  ["boxes.mp"] = true,
  --  ["format.mp"] = true,
  ["graph.mp"] = true,
  ["marith.mp"] = true,
  ["mfplain.mp"] = true,
  ["mpost.mp"] = true,
  ["plain.mp"] = true,
  ["rboxes.mp"] = true,
  ["sarith.mp"] = true,
  ["string.mp"] = true,
  ["TEX.mp"] = true,
  ["metafun.mp"] = true,
  ["metafun.mpiv"] = true,
  ["mp-abck.mpiv"] = true,
  ["mp-apos.mpiv"] = true,
  ["mp-asnc.mpiv"] = true,
  ["mp-bare.mpiv"] = true,
  ["mp-base.mpiv"] = true,
  ["mp-butt.mpiv"] = true,
  ["mp-char.mpiv"] = true,
  ["mp-chem.mpiv"] = true,
  ["mp-core.mpiv"] = true,
  ["mp-crop.mpiv"] = true,
  ["mp-figs.mpiv"] = true,
  ["mp-form.mpiv"] = true,
  ["mp-func.mpiv"] = true,
  ["mp-grap.mpiv"] = true,
  ["mp-grid.mpiv"] = true,
  ["mp-grph.mpiv"] = true,
  ["mp-idea.mpiv"] = true,
  ["mp-luas.mpiv"] = true,
  ["mp-mlib.mpiv"] = true,
  ["mp-page.mpiv"] = true,
  ["mp-shap.mpiv"] = true,
  ["mp-step.mpiv"] = true,
  ["mp-text.mpiv"] = true,
  ["mp-tool.mpiv"] = true,
}
luamplib.noneedtoreplace = noneedtoreplace

local function replaceformatmp(file,newfile,ofmodify)
  local fh = ioopen(file,"r")
  if not fh then return file end
  local data = fh:read("*all"); fh:close()
  fh = ioopen(newfile,"w")
  if not fh then return file end
  fh:write(
    "let normalinfont = infont;\n",
    "primarydef str infont name = rawtextext(str) enddef;\n",
    data,
    "vardef Fmant_(expr x) = rawtextext(decimal abs x) enddef;\n",
    "vardef Fexp_(expr x) = rawtextext(\"$^{\"&decimal x&\"}$\") enddef;\n",
    "let infont = normalinfont;\n"
  ); fh:close()
  lfstouch(newfile,currenttime,ofmodify)
  return newfile
end

local esctex  = "!!!T!!!E!!!X!!!"
local esclbr  = "!!!!!LEFTBRCE!!!!!"
local escrbr  = "!!!!!RGHTBRCE!!!!!"
local escpcnt = "!!!!!PERCENT!!!!!"
local eschash = "!!!!!HASH!!!!!"
local begname = "%f[A-Z_a-z]"
local endname = "%f[^A-Z_a-z]"

local btex_etex        = begname.."btex"..endname.."%s*(.-)%s*"..begname.."etex"..endname
local verbatimtex_etex = begname.."verbatimtex"..endname.."%s*(.-)%s*"..begname.."etex"..endname

local function protecttexcontents(str)
  return str:gsub("\\%%", "\\"..escpcnt)
            :gsub("%%.-\n", "")
            :gsub("%%.-$",  "")
            :gsub('"', '"&ditto&"')
            :gsub("\n%s*", " ")
            :gsub(escpcnt, "%%")
end

local function replaceinputmpfile (name,file)
  local ofmodify = lfsattributes(file,"modification")
  if not ofmodify then return file end
  local cachedir = luamplib.cachedir or outputdir
  local newfile = name:gsub("%W","_")
  newfile = cachedir .."/luamplib_input_"..newfile
  if newfile and luamplibtime then
    local nf = lfsattributes(newfile)
    if nf and nf.mode == "file" and ofmodify == nf.modification and luamplibtime < nf.ac-
cess then
      return nf.size == 0 and file or newfile
    end
  end
  if name == "format.mp" then return replaceformatmp(file,newfile,ofmodify) end

  local fh = ioopen(file,"r")
  if not fh then return file end
  local data = fh:read("*all"); fh:close()

  local count,cnt = 0,0

  data = data:gsub("\"[^\n]-\"", function(str)
    return str:gsub("([bem])tex"..endname,"%1"..esctex)
  end)

  data, cnt = data:gsub(btex_etex, function(str)
    return format("rawtextext(\"%s\")",protecttexcontents(str))
  end)
  count = count + cnt
  data, cnt = data:gsub(verbatimtex_etex, "")
  count = count + cnt

  data = data:gsub("\"[^\n]-\"", function(str) -- restore string btex .. etex
    return str:gsub("([bem])"..esctex, "%1tex")
  end)

  if count == 0 then
    noneedtoreplace[name] = true
    fh = ioopen(newfile,"w");
    if fh then
      fh:close()
      lfstouch(newfile,currenttime,ofmodify)
    end
    return file
  end
  fh = ioopen(newfile,"w")
  if not fh then return file end
  fh:write(data); fh:close()
  lfstouch(newfile,currenttime,ofmodify)
  return newfile
end

local randomseed = nil
```

As the finder function for `mplib`, use the `kpse` library and make it behave like as if MetaPost was used (or almost, since the engine name is not set this way—not sure if this is a problem).

```

local mpkpse = kpse.new("luatex", "mpost")

local special_ftype = {
  pfb = "type1 fonts",
  enc = "enc files",
}

local function finder(name, mode, ftype)
  if mode == "w" then
    return name
  else
    ftype = special_ftype[ftype] or ftype
    local file = mpkpse:find_file(name,ftype)
    if file then
      if not lfstouch or ftype ~= "mp" or noneedtoreplace[name] then
        return file
      end
      return replaceinputmpfile(name,file)
    end
    return mpkpse:find_file(name,stringmatch(name,"[a-zA-Z]+$"))
  end
end
luamplib.finder = finder

```

The rest of this module is not documented. More info can be found in the LuaTeX manual, articles in user group journals and the files that ship with ConTeXt.

```

function luamplib.resetlastlog()
  luamplib.lastlog = ""
```

```
end

```

Below included is section that defines fallbacks for older versions of mplib.

```
local mplibone = tonumber(mplib.version()) <= 1.50

if mplibone then

  luamplib.make = luamplib.make or function(name,mem_name,dump)
    local t = os.clock()
    local mpx = mplib.new {
      ini_version = true,
      find_file = luamplib.finder,
      job_name = stripsuffix(name)
    }
    mpx:execute(format("input %s ;",name))
    if dump then
      mpx:execute("dump ;")
      info("format %s made and dumped for %s in %0.3f seconds",mem_name,name,os.clock()-t)
    else
      info("%s read in %0.3f seconds",name,os.clock()-t)
    end
    return mpx
  end

  function luamplib.load(name)
    local mem_name = replacesuffix(name,"mem")
    local mpx = mplib.new {
      ini_version = false,
      mem_name = mem_name,
      find_file = luamplib.finder
    }
    if not mpx and type(luamplib.make) == "function" then
      -- when i have time i'll locate the format and dump
      mpx = luamplib.make(name,mem_name)
    end
    if mpx then
      info("using format %s",mem_name,false)
      return mpx, nil
    else
      return nil, { status = 99, error = "out of memory or invalid format" }
    end
  end

else

```

These are the versions called with sufficiently recent mplib.

```
  local preamble = [[
    boolean mplib ; mplib := true ;
    let dump = endinput ;
    let normalfontsize = fontsize;
    input %s ;
  ]]

  luamplib.make = luamplib.make or function()
  end

  function luamplib.load(name,verbatim)
    local mpx = mplib.new {
      ini_version = true,
      find_file = luamplib.finder,
```

Provides `numbersystem` option since v2.4. Default value `"scaled"` can be changed by declaring `\mplibnumbersystem{double}`. See `https://github.com/lualatex/luamplib/issues/21`.

```
    math_mode = luamplib.numbersystem,
    random_seed = randomseed,
  }
```

Append our own preamble to the preamble above.

```
  local preamble = preamble .. (verbatim and "" or luamplib.mplibcodepreamble)
  if luamplib.textextlabel then
    preamble = preamble .. (verbatim and "" or luamplib.textextlabelpreamble)
  end
  local result
  if not mpx then
    result = { status = 99, error = "out of memory"}
  else
    result = mpx:execute(format(preamble, replacesuffix(name,"mp")))
  end
  luamplib.reporterror(result)
  return mpx, result
end

end

local currentformat = "plain"

local function setformat (name) --- used in .sty
  currentformat = name
end
luamplib.setformat = setformat


luamplib.reporterror = function (result)
  if not result then
    err("no result object returned")
  else
    local t, e, l = result.term, result.error, result.log
    local log = stringgsub(t or l or "no-term","^%s+","\n")
    luamplib.lastlog = luamplib.lastlog .. "\n " .. (l or t or "no-log")
    if result.status > 0 then
      warn("%s",log)
      if result.status > 1 then
        err("%s",e or "see above messages")
      end
    end
    return log
  end
end

local function process_indeed (mpx, data, indeed)
  local converted, result = false, {}
  if mpx and data then
    result = mpx:execute(data)
    local log = luamplib.reporterror(result)
    if indeed and log then
      if luamplib.showlog then
        info("%s",luamplib.lastlog)
        luamplib.resetlastlog()
      elseif result.fig then
```

v2.6.1: now luamplib does not disregard `show` command, even when `luamplib.showlog` is false. Incidentally, it does not raise error, but just prints a warning, even if output has no figure.

```
        if stringfind(log,"\n>>") then info("%s",log) end
        converted = luamplib.convert(result)
      else
        info("%s",log)
        warn("No figure output. Maybe no beginfig/endfig")
      end
    end
  else
    err("Mem file unloadable. Maybe generated with a different version of mplib?")
  end
  return converted, result
end

```

v2.9 has introduced the concept of 'code inherit'

```
luamplib.codeinherit = false
local mplibinstances = {}
local process = function (data,indeed,verbatim)
  local standalone, firstpass = not luamplib.codeinherit, not indeed
  local currfmt = currentformat .. (luamplib.numbersystem or "scaled")
  currfmt = firstpass and currfmt or (currfmt.."2")
  local mpx = mplibinstances[currfmt]
  if standalone or not mpx then
    randomseed = firstpass and math.random(65535) or randomseed
    mpx = luamplib.load(currentformat,verbatim)
    mplibinstances[currfmt] = mpx
  end
  return process_indeed(mpx, data, indeed)
end
luamplib.process = process

local function getobjects(result,figure,f)
  return figure:objects()
end

local function convert(result, flusher)
  luamplib.flush(result, flusher)
  return true -- done
end
luamplib.convert = convert

local function pdf_startfigure(n,llx,lly,urx,ury)
```

The following line has been slightly modified by Kim.

```
  texsprint(format("\\mplibstarttoPDF{%f}{%f}{%f}{%f}",llx,lly,urx,ury))
end

local function pdf_stopfigure()
  texsprint("\\mplibstoptoPDF")
end

```

`tex.tprint` and catcode regime -2, as sometimes # gets doubled in the argument of pdfliteral. — modified by Kim

```
local function pdf_literalcode(fmt,...) -- table
  textprint({"\\mplibtoPDF{"},{-2,format(fmt,...)},{"}"})
end
luamplib.pdf_literalcode = pdf_literalcode

local function pdf_textfigure(font,size,text,width,height,depth)
```

The following three lines have been modified by Kim.

```
  -- if text == "" then text = "\0" end -- char(0) has gone
  text = text:gsub(".",function(c)
    return format("\\hbox{\\char%i}",string.byte(c)) -- kerning happens in meta-
post
  end)
  texsprint(format("\\mplibtextext{%s}{%f}{%s}{%s}{%f}",font,size,text,0,-( 7200/ 7227)/65536*depth))
end
luamplib.pdf_textfigure = pdf_textfigure

local bend_tolerance = 131/65536

local rx, sx, sy, ry, tx, ty, divider = 1, 0, 0, 1, 0, 0, 1

local function pen_characteristics(object)
```

```
  local t = mplib.pen_info(object)
  rx, ry, sx, sy, tx, ty = t.rx, t.ry, t.sx, t.sy, t.tx, t.ty
  divider = sx*sy - rx*ry
  return not (sx==1 and rx==0 and ry==0 and sy==1 and tx==0 and ty==0), t.width
end

local function concat(px, py) -- no tx, ty here
  return (sy*px-ry*py)/divider,(sx*py-rx*px)/divider
end

local function curved(ith,pth)
  local d = pth.left_x - ith.right_x
  if abs(ith.right_x - ith.x_coord - d) <= bend_tolerance and abs(pth.x_coord - pth.left_x - d) <= bend
erance then
    d = pth.left_y - ith.right_y
    if abs(ith.right_y - ith.y_coord - d) <= bend_tolerance and abs(pth.y_coord - pth.left_y - d) <= be
erance then
      return false
    end
  end
  return true
end

local function flushnormalpath(path,open)
  local pth, ith
  for i=1,#path do
    pth = path[i]
    if not ith then
      pdf_literalcode("%f %f m",pth.x_coord,pth.y_coord)
    elseif curved(ith,pth) then
      pdf_literalcode("%f %f %f %f %f %f c",ith.right_x,ith.right_y,pth.left_x,pth.left_y,pth.x_coord,p
    else
      pdf_literalcode("%f %f l",pth.x_coord,pth.y_coord)
    end
    ith = pth
  end
  if not open then
    local one = path[1]
    if curved(pth,one) then
      pdf_literalcode("%f %f %f %f %f %f c",pth.right_x,pth.right_y,one.left_x,one.left_y,one.x_coord,o
    else
      pdf_literalcode("%f %f l",one.x_coord,one.y_coord)
    end
  elseif #path == 1 then
    -- special case .. draw point
    local one = path[1]
    pdf_literalcode("%f %f l",one.x_coord,one.y_coord)
  end
  return t
end
```

```

local function flushconcatpath(path,open)
  pdf_literalcode("%f %f %f %f %f %f cm", sx, rx, ry, sy, tx ,ty)
  local pth, ith
  for i=1,#path do
    pth = path[i]
    if not ith then
      pdf_literalcode("%f %f m",concat(pth.x_coord,pth.y_coord))
    elseif curved(ith,pth) then
      local a, b = concat(ith.right_x,ith.right_y)
      local c, d = concat(pth.left_x,pth.left_y)
      pdf_literalcode("%f %f %f %f %f %f c",a,b,c,d,concat(pth.x_coord, pth.y_co-
ord))
    else
      pdf_literalcode("%f %f l",concat(pth.x_coord, pth.y_coord))
    end
    ith = pth
  end
  if not open then
    local one = path[1]
    if curved(pth,one) then
      local a, b = concat(pth.right_x,pth.right_y)
      local c, d = concat(one.left_x,one.left_y)
      pdf_literalcode("%f %f %f %f %f %f c",a,b,c,d,concat(one.x_coord, one.y_co-
ord))
    else
      pdf_literalcode("%f %f l",concat(one.x_coord,one.y_coord))
    end
  elseif #path == 1 then
    -- special case .. draw point
    local one = path[1]
    pdf_literalcode("%f %f l",concat(one.x_coord,one.y_coord))
  end
  return t
end

```

Below code has been contributed by Dohyun Kim. It implements `btex` / `etex` functions.

v2.1: `textext()` is now available, which is equivalent to `TEX()` macro from TEX.mp. `TEX()` is synonym of `textext()` unless TEX.mp is loaded.

v2.2: Transparency and Shading

v2.3: `\everymplib`, `\everyendmplib`, and allows naked TeX commands.

```
local further_split_keys = {
  ["MPlibTEXboxID"] = true,
  ["sh_color_a"]    = true,
  ["sh_color_b"]    = true,
}

local function script2table(s)
  local t = {}
  for _,i in ipairs(stringexplode(s,"\13+")) do
    local k,v = stringmatch(i,"(.-)=(.*)") -- v may contain = or empty.
    if k and v and k ~= "" then
      if further_split_keys[k] then
        t[k] = stringexplode(v,":")
      else
        t[k] = v
      end
    end
  end
  return t
end

local mplibcodepreamble = [[
vardef rawtextext (expr t) =
  if unknown TEXBOX_:
    image( special "MPlibmkTEXbox="&t;
      addto currentpicture doublepath unitsquare; )
  else:
    TEXBOX_ := TEXBOX_ + 1;
    if known TEXBOX_wd_[TEXBOX_]:
      image ( addto currentpicture doublepath unitsquare
        xscaled TEXBOX_wd_[TEXBOX_]
        yscaled (TEXBOX_ht_[TEXBOX_] + TEXBOX_dp_[TEXBOX_])
        shifted (0, -TEXBOX_dp_[TEXBOX_])
        withprescript "MPlibTEXboxID=" &
          decimal TEXBOX_ & ":" &
          decimal TEXBOX_wd_[TEXBOX_] & ":" &
          decimal(TEXBOX_ht_[TEXBOX_]+TEXBOX_dp_[TEXBOX_]); )
    else:
      image( special "MPlibTEXError=1"; )
    fi
  fi
enddef;
if known context_mlib:
  defaultfont := "cmtt10";
  let infont = normalinfont;
  let fontsize = normalfontsize;
  vardef thelabel@#(expr p,z) =
    if string p :
      thelabel@#(p infont defaultfont scaled defaultscale,z)
    else :
      p shifted (z + labeloffset*mfun_laboff@# -
        (mfun_labxf@#*lrcorner p + mfun_labyf@#*ulcorner p +
        (1-mfun_labxf@#-mfun_labyf@#)*llcorner p))
    fi
  enddef;
  def graphictext primary filename =
    if (readfrom filename = EOF):
      errmessage "Please prepare '"&filename&"' in advance with"&
      " 'pstoedit -ssp -dt -f mpost yourfile.ps "&filename&"'";
    fi
    closefrom filename;
    def data_mpy_file = filename enddef;
    mfun_do_graphic_text (filename)
  enddef;
  if unknown TEXBOX_: def mfun_do_graphic_text text t = enddef; fi
else:
  vardef textext@# (text t) = rawtextext (t) enddef;
fi
def externalfigure primary filename =
  draw rawtextext("\includegraphics{"& filename &"}")
enddef;
def TEX = textext enddef;
def specialVerbatimTeX (text t) = special "MPlibVerbTeX="&t; enddef;
def normalVerbatimTeX  (text t) = special "PostMPlibVerbTeX="&t; enddef;
let VerbatimTeX = specialVerbatimTeX;
extra_beginfig := extra_beginfig & " let VerbatimTeX = normalVerbatimTeX;" ;
extra_endfig   := extra_endfig   & " let VerbatimTeX = specialVerbatimTeX;" ;
]]
luamplib.mplibcodepreamble = mplibcodepreamble

local textextlabelpreamble = [[
primarydef s infont f = rawtextext(s) enddef;
def fontsize expr f =
  begingroup
  save size,pic; numeric size; picture pic;
  pic := rawtextext("\hskip\pdffontsize\font");
  size := xpart urcorner pic - xpart llcorner pic;
  if size = 0: 10pt else: size fi
  endgroup
enddef;
]]
luamplib.textextlabelpreamble = textextlabelpreamble

local TeX_code_t = {}

local function domakeTEXboxes (data)
  local num = 255 -- output box
  if data and data.fig then
    local figures = data.fig
    for f=1, #figures do
      TeX_code_t[f] = nil
      local figure = figures[f]
      local objects = getobjects(data,figure,f)
      if objects then
        for o=1,#objects do
          local object    = objects[o]
          local prescript = object.prescript
          prescript = prescript and script2table(prescript)
          local str = prescript and prescript.MPlibmkTEXbox
          if str then
            num = num + 1
            texsprint(format("\\setbox%i\\hbox{%s}",num,str))
          end
```

`verbatimtex ... etex` before `beginfig()` is not ignored, but the TEX code inbetween is inserted before the mplib box.

```
        local texcode = prescript and prescript.MPlibVerbTeX
        if texcode and texcode ~= "" then
          TeX_code_t[f] = texcode
        end
      end
    end
  end
end
end

local function protect_tex_text_common (data)
  local everymplib    = texgettoks('everymplibtoks')    or ''
  local everyendmplib = texgettoks('everyendmplibtoks') or ''
  data = format("\n%s\n%s\n%s",everymplib, data, everyendmplib)
  data = data:gsub("\r","\n")

  data = data:gsub("\"[^\n]-\"", function(str)
    return str:gsub("([bem])tex"..endname,"%1"..esctex)
  end)

  data = data:gsub(btex_etex, function(str)
    return format("rawtextext(\"%s\")",protecttexcontents(str))
  end)
  data = data:gsub(verbatimtex_etex, function(str)
    return format("VerbatimTeX(\"%s\")",protecttexcontents(str))
  end)

  return data
end

local function protecttextextVerbatim(data)
  data = protect_tex_text_common(data)

  data = data:gsub("\"[^\n]-\"", function(str) -- restore string btex .. etex
    return str:gsub("([bem])"..esctex, "%1tex")
  end)

  local _,result = process(data, false)
  domakeTEXboxes(result)
  return data
end

```

```
luamplib.protecttextextVerbatim = protecttextextVerbatim

local function protecttextext(data)
  data = protect_tex_text_common(data)

  data = data:gsub("\"[^\n]-\"", function(str)
    str = str:gsub("([bem])"..esctex, "%1tex")
             :gsub("%%", escpcnt)
             :gsub("{",  esclbr)
             :gsub("}",  escrbr)
             :gsub("#",  eschash)
    return format("\\detokenize{%s}",str)
  end)

  data = data:gsub("%%.-\n", "")

  luamplib.mpxcolors = {}
  data = data:gsub("\\mpcolor"..endname.."(.-){(.-)}", function(opt,str)
    local cnt = #luamplib.mpxcolors + 1
    luamplib.mpxcolors[cnt] = format(
      "\\expandafter\\mplibcolor\\csname mpxcolor%i\\endcsname%s{%s}",
      cnt,opt,str)
    return format("\\csname mpxcolor%i\\endcsname",cnt)
  end)

```

Next line to address bug #55

```
  data = data:gsub("([^`\\])#","%1##")

  texsprint(data)
end

luamplib.protecttextext = protecttextext

local function makeTEXboxes (data)
  data = data:gsub("##","#")
             :gsub(escpcnt,"%%")
             :gsub(esclbr,"{")
             :gsub(escrbr,"}")
             :gsub(eschash,"#")
  local _,result = process(data, false)
  domakeTEXboxes(result)
  return data
end

luamplib.makeTEXboxes = makeTEXboxes

local factor = 65536*(7227/7200)

local function processwithTEXboxes (data)
```

```
  if not data then return end
  local num = 255 -- output box
  local prepreamble = format("TEXBOX_:=%i;\n",num)
  while true do
    num = num + 1
    local box = texgetbox(num)
    if not box then break end
    prepreamble = format(
      "%sTEXBOX_wd_[%i]:=%f;\nTEXBOX_ht_[%i]:=%f;\nTEXBOX_dp_[%i]:=%f;\n",
      prepreamble,
      num, box.width /factor,
      num, box.height/factor,
      num, box.depth /factor)
  end
  process(prepreamble .. data, true)
end
luamplib.processwithTEXboxes = processwithTEXboxes

local pdfoutput = tonumber(texget("outputmode")) or tonumber(texget("pdfoutput"))
local pdfmode = pdfoutput > 0

local function start_pdf_code()
  if pdfmode then
    pdf_literalcode("q")
  else
    texsprint("\\special{pdf:bcontent}") -- dvipdfmx
  end
end
local function stop_pdf_code()
  if pdfmode then
    pdf_literalcode("Q")
  else
    texsprint("\\special{pdf:econtent}") -- dvipdfmx
  end
end

local function putTEXboxes (object,prescript)
  local box = prescript.MPlibTEXboxID
  local n,tw,th = box[1],tonumber(box[2]),tonumber(box[3])
  if n and tw and th then
    local op = object.path
    local first, second, fourth = op[1], op[2], op[4]
    local tx, ty = first.x_coord, first.y_coord
    local sx, rx, ry, sy = 1, 0, 0, 1
    if tw ~= 0 then
      sx = (second.x_coord - tx)/tw
      rx = (second.y_coord - ty)/tw
      if sx == 0 then sx = 0.00001 end
    end
    if th ~= 0 then
```

```
      sy = (fourth.y_coord - ty)/th
      ry = (fourth.x_coord - tx)/th
      if sy == 0 then sy = 0.00001 end
    end
    start_pdf_code()
    pdf_literalcode("%f %f %f %f %f %f cm",sx,rx,ry,sy,tx,ty)
    texsprint(format("\\mplibputtextbox{%i}",n))
    stop_pdf_code()
  end
end

```

Transparency and Shading

```
local pdf_objs = {}
local token, getpageres, setpageres = newtoken or token
local pgf = { bye = "pgfutil@everybye", extgs = "pgf@sys@addpdfresource@extgs@plain" }

if pdfmode then -- repect luaotfload-colors
  getpageres = pdf.getpageresources or function() return pdf.pageresources end
  setpageres = pdf.setpageresources or function(s) pdf.pageresources = s end
else
  texsprint("\\special{pdf:obj @MPlibTr<<>>}",
            "\\special{pdf:obj @MPlibSh<<>>}")
end

-- objstr <string> => obj <number>, new <boolean>
local function update_pdfobjs (os)
  local on = pdf_objs[os]
  if on then
    return on,false
  end
  if pdfmode then
    on = pdf.immediateobj(os)
  else
    on = pdf_objs.cnt or 0
    pdf_objs.cnt = on + 1
  end
  pdf_objs[os] = on
  return on,true
end

local transparancy_modes = { [0] = "Normal",
  "Normal",       "Multiply",     "Screen",       "Overlay",
  "SoftLight",    "HardLight",    "ColorDodge",   "ColorBurn",
  "Darken",       "Lighten",      "Difference",   "Exclusion",
  "Hue",          "Saturation",   "Color",        "Luminosity",
  "Compatible",
}

local function update_tr_res(res,mode,opaq)
```

```
  local os = format("<</BM /%s/ca %.3f/CA %.3f/AIS false>>",mode,opaq,opaq)
  local on, new = update_pdfobjs(os)
  if new then
    if pdfmode then
      res = format("%s/MPlibTr%i %i 0 R",res,on,on)
    else
      if pgf.loaded then
        texsprint(format("\\csname %s\\endcsname{/MPlibTr%i%s}", pgf.extgs, on, os))
      else
        texsprint(format("\\special{pdf:put @MPlibTr<</MPlibTr%i%s>>}",on,os))
      end
    end
  end
  return res,on
end

local function tr_pdf_pageresources(mode,opaq)
  if token and pgf.bye and not pgf.loaded then
    pgf.loaded = token.create(pgf.bye).cmdname == "assign_toks"
    pgf.bye    = pgf.loaded and pgf.bye
  end
  local res, on_on, off_on = "", nil, nil
  res, off_on = update_tr_res(res, "Normal", 1)
  res, on_on  = update_tr_res(res, mode, opaq)
  if pdfmode then
    if res ~= "" then
      if pgf.loaded then
        texsprint(format("\\csname %s\\endcsname{%s}", pgf.extgs, res))
      else
        local tpr, n = getpageres() or "", 0
        tpr, n = tpr:gsub("/ExtGState<<", "%1"..res)
        if n == 0 then
          tpr = format("%s/ExtGState<<%s>>", tpr, res)
        end
        setpageres(tpr)
      end
    end
  else
    if not pgf.loaded then
      texsprint(format("\\special{pdf:put @resources<</ExtGState @MPlibTr>>}"))
    end
  end
  return on_on, off_on
end

local shading_res

local function shading_initialize ()
  shading_res = {}
  if pdfmode and luatexbase.callbacktypes and luatexbase.callbacktypes.finish_pdf-
```

```
file then -- ltluatex
    local shading_obj = pdf.reserveobj()
    setpageres(format("%s/Shading %i 0 R",getpageres() or "",shading_obj))
    luatexbase.add_to_callback("finish_pdffile", function()
      pdf.immediateobj(shading_obj,format("<<%s>>",tableconcat(shading_res)))
      end, "luamplib.finish_pdffile")
    pdf_objs.finishpdf = true
  end
end

local function sh_pdfpageresources(shtype,domain,colorspace,colora,colorb,coordinates)
  if not shading_res then shading_initialize() end
  local os = format("<</FunctionType 2/Domain [ %s ]/C0 [ %s ]/C1 [ %s ]/N 1>>",
                    domain, colora, colorb)
  local funcobj = pdfmode and format("%i 0 R",update_pdfobjs(os)) or os
  os = format("<</ShadingType %i/ColorSpace /%s/Function %s/Coords [ %s ]/Extend [ true true ]/An-
tiAlias true>>",
              shtype, colorspace, funcobj, coordinates)
  local on, new = update_pdfobjs(os)
  if pdfmode then
    if new then
      local res = format("/MPlibSh%i %i 0 R", on, on)
      if pdf_objs.finishpdf then
        shading_res[#shading_res+1] = res
      else
        local pageres = getpageres() or ""
        if not stringfind(pageres,"/Shading<<.*>>") then
          pageres = pageres.."/Shading<<>>"
        end
        pageres = pageres:gsub("/Shading<<","%1"..res)
        setpageres(pageres)
      end
    end
  else
    if new then
      texsprint(format("\\special{pdf:put @MPlibSh<</MPlibSh%i%s>>}",on,os))
    end
    texsprint(format("\\special{pdf:put @resources<</Shading @MPlibSh>>}"))
  end
  return on
end

local function color_normalize(ca,cb)
  if #cb == 1 then
    if #ca == 4 then
      cb[1], cb[2], cb[3], cb[4] = 0, 0, 0, 1-cb[1]
    else -- #ca = 3
      cb[1], cb[2], cb[3] = cb[1], cb[1], cb[1]
    end
  elseif #cb == 3 then -- #ca == 4
```

```
    cb[1], cb[2], cb[3], cb[4] = 1-cb[1], 1-cb[2], 1-cb[3], 0
  end
end

local prev_override_color

local function do_preobj_color(object,prescript)
  -- transparency
  local opaq = prescript and prescript.tr_transparency
  local tron_no, troff_no
  if opaq then
    local mode = prescript.tr_alternative or 1
    mode = transparancy_modes[tonumber(mode)]
    tron_no, troff_no = tr_pdf_pageresources(mode,opaq)
    pdf_literalcode("/MPlibTr%i gs",tron_no)
  end
  -- color
  local override = prescript and prescript.MPlibOverrideColor
  if override then
    if pdfmode then
      pdf_literalcode(override)
      override = nil
    else
      texsprint(format("\\special{color push %s}",override))
      prev_override_color = override
    end
  else
    local cs = object.color
    if cs and #cs > 0 then
      pdf_literalcode(luamplib.colorconverter(cs))
      prev_override_color = nil
    elseif not pdfmode then
      override = prev_override_color
      if override then
        texsprint(format("\\special{color push %s}",override))
      end
    end
  end
  -- shading
  local sh_type = prescript and prescript.sh_type
  if sh_type then
    local domain  = prescript.sh_domain
    local centera = stringexplode(prescript.sh_center_a)
    local centerb = stringexplode(prescript.sh_center_b)
    for _,t in pairs({centera,centerb}) do
      for i,v in ipairs(t) do
        t[i] = format("%f",v)
      end
    end
    centera = tableconcat(centera," ")
    centerb = tableconcat(centerb,” ”)
    local colora  = prescript.sh_color_a or {0};
    local colorb  = prescript.sh_color_b or {1};
    for _,t in pairs({colora,colorb}) do
      for i,v in ipairs(t) do
        t[i] = format(”%.3f”,v)
      end
    end
    if #colora > #colorb then
      color_normalize(colora,colorb)
    elseif #colorb > #colora then
      color_normalize(colorb,colora)
    end
    local colorspace
    if     #colorb == 1 then colorspace = ”DeviceGray”
    elseif #colorb == 3 then colorspace = ”DeviceRGB”
    elseif #colorb == 4 then colorspace = ”DeviceCMYK”
    else   return troff_no,override
    end
    colora = tableconcat(colora, ” ”)
    colorb = tableconcat(colorb, ” ”)
    local shade_no
    if sh_type == ”linear” then
      local coordinates = tableconcat({centera,centerb},” ”)
      shade_no = sh_pdfpageresources(2,domain,colorspace,colora,colorb,coordinates)
    elseif sh_type == ”circular” then
      local radiusa = format(”%f”,prescript.sh_radius_a)
      local radiusb = format(”%f”,prescript.sh_radius_b)
      local coordinates = tableconcat({centera,radiusa,centerb,radiusb},” ”)
      shade_no = sh_pdfpageresources(3,domain,colorspace,colora,colorb,coordinates)
    end
    pdf_literalcode(”q /Pattern cs”)
    return troff_no,override,shade_no
  end
  return troff_no,override
end

local function do_postobj_color(tr,over,sh)
  if sh then
    pdf_literalcode(”W n /MPlibSh%s sh Q”,sh)
  end
  if over then
    texsprint(”\\special{color pop}”)
  end
  if tr then
    pdf_literalcode(”/MPlibTr%i gs”,tr)
  end
end

```

End of `btex` – `etex` and Transparency/Shading patch.

```

local function flush(result,flusher)
  if result then
    local figures = result.fig
    if figures then
      for f=1, #figures do
        info("flushing figure %s",f)
        local figure = figures[f]
        local objects = getobjects(result,figure,f)
        local fignum = tonumber(stringmatch(figure:filename(),"([%d]+)$") or figure:charcode() or 0)
        local miterlimit, linecap, linejoin, dashed = -1, -1, -1, false
        local bbox = figure:boundingbox()
        local llx, lly, urx, ury = bbox[1], bbox[2], bbox[3], bbox[4] -- faster than unpack
        if urx < llx then
          -- invalid
          pdf_startfigure(fignum,0,0,0,0)
          pdf_stopfigure()
        else
```

Insert `verbatimtex` code before mplib box. And prepare for those codes that will be executed afterwards.

```
          if TeX_code_t[f] then
            texsprint(TeX_code_t[f])
          end
          local TeX_code_bot = {} -- PostVerbatimTeX
          pdf_startfigure(fignum,llx,lly,urx,ury)
          start_pdf_code()
          if objects then
            for o=1,#objects do
              local object        = objects[o]
              local objecttype    = object.type
```

Change from ConTEXt code: the following 7 lines are part of the `btex...etex` patch. Again, colors are processed at this stage. Also, we collect TEX codes that will be executed after flushing.

```
              local prescript     = object.prescript
              prescript = prescript and script2table(prescript) -- prescript is now a table
              local tr_opaq,cr_over,shade_no = do_preobj_color(object,prescript)
              if prescript and prescript.MPlibTEXboxID then
                putTEXboxes(object,prescript)
              elseif prescript and prescript.PostMPlibVerbTeX then
                TeX_code_bot[#TeX_code_bot+1] = prescript.PostMPlibVerbTeX
              elseif objecttype == "start_bounds" or objecttype == "stop_bounds" then
                -- skip
              elseif objecttype == "start_clip" then
                start_pdf_code()
                flushnormalpath(object.path,t,false)
```

```
            pdf_literalcode("W n")
          elseif objecttype == "stop_clip" then
            stop_pdf_code()
            miterlimit, linecap, linejoin, dashed = -1, -1, -1, false
          elseif objecttype == "special" then
            -- not supported
            if prescript and prescript.MPlibTEXError then
              warn("textext() anomaly. Try disabling \\mplibtextextlabel.")
            end
          elseif objecttype == "text" then
            local ot = object.transform -- 3,4,5,6,1,2
            start_pdf_code()
            pdf_literalcode("%f %f %f %f %f %f cm",ot[3],ot[4],ot[5],ot[6],ot[1],ot[2])
            pdf_textfigure(object.font,object.dsize,object.text,object.width,object.height,object.d
            stop_pdf_code()
          else
```

Color stuffs are modified and moved to several lines above.

```
            local ml = object.miterlimit
            if ml and ml ~= miterlimit then
              miterlimit = ml
              pdf_literalcode("%f M",ml)
            end
            local lj = object.linejoin
            if lj and lj ~= linejoin then
              linejoin = lj
              pdf_literalcode("%i j",lj)
            end
            local lc = object.linecap
            if lc and lc ~= linecap then
              linecap = lc
              pdf_literalcode("%i J",lc)
            end
            local dl = object.dash
            if dl then
              local d = format("[%s] %i d",tableconcat(dl.dashes or {}," "),dl.offset)
              if d ~= dashed then
                dashed = d
                pdf_literalcode(dashed)
              end
            elseif dashed then
              pdf_literalcode("[] 0 d")
              dashed = false
            end
            local path = object.path
            local transformed, penwidth = false, 1
            local open = path and path[1].left_type and path[#path].right_type
            local pen = object.pen
            if pen then
              if pen.type == 'elliptical' then
                transformed, penwidth = pen_characteristics(object) -- boolean, value
                pdf_literalcode("%f w",penwidth)
                if objecttype == 'fill' then
                  objecttype = 'both'
                end
              else -- calculated by mplib itself
                objecttype = 'fill'
              end
            end
            if transformed then
              start_pdf_code()
            end
            if path then
              if transformed then
                flushconcatpath(path,open)
              else
                flushnormalpath(path,open)
              end
```

Change from ConTEXt code: color stuff

```
          if not shade_no then ----- conflict with shading
            if objecttype == "fill" then
              pdf_literalcode("h f")
            elseif objecttype == "outline" then
              pdf_literalcode((open and "S") or "h S")
            elseif objecttype == "both" then
              pdf_literalcode("h B")
            end
          end
        end
        if transformed then
          stop_pdf_code()
        end
        local path = object.htap
        if path then
          if transformed then
            start_pdf_code()
          end
          if transformed then
            flushconcatpath(path,open)
          else
            flushnormalpath(path,open)
          end
          if objecttype == "fill" then
            pdf_literalcode("h f")
          elseif objecttype == "outline" then
            pdf_literalcode((open and "S") or "h S")
          elseif objecttype == "both" then
            pdf_literalcode("h B")
          end
```

```
                if transformed then
                  stop_pdf_code()
                end
              end
--              if cr then
--                pdf_literalcode(cr)
--              end
            end
```

Added to ConTEXt code: color stuff. And execute `verbatimtex` codes.

```
            do_postobj_color(tr_opaq,cr_over,shade_no)
          end
        end
        stop_pdf_code()
        pdf_stopfigure()
        if #TeX_code_bot > 0 then
          texsprint(TeX_code_bot)
        end
      end
    end
  end
  end
end
luamplib.flush = flush

local function colorconverter(cr)
  local n = #cr
  if n == 4 then
    local c, m, y, k = cr[1], cr[2], cr[3], cr[4]
    return format("%.3f %.3f %.3f %.3f k %.3f %.3f %.3f %.3f K",c,m,y,k,c,m,y,k), "0 g 0 G"
  elseif n == 3 then
    local r, g, b = cr[1], cr[2], cr[3]
    return format("%.3f %.3f %.3f rg %.3f %.3f %.3f RG",r,g,b,r,g,b), "0 g 0 G"
  else
    local s = cr[1]
    return format("%.3f g %.3f G",s,s), "0 g 0 G"
  end
end
luamplib.colorconverter = colorconverter
```

2.2 TEX package

⟨∗package⟩

First we need to load some packages.

```
\bgroup\expandafter\expandafter\expandafter\egroup
\expandafter\ifx\csname selectfont\endcsname\relax
  \input ltluatex
\else
  \NeedsTeXFormat{LaTeX2e}
  \ProvidesPackage{luamplib}
    [2016/01/02 v2.11.2 mplib package for LuaTeX]
  \ifx\newluafunction\@undefined
  \input ltluatex
  \fi
\fi
```

Loading of lua code.

```
\directlua{require("luamplib")}
```

Support older formats

```
\ifx\scantextokens\undefined
  \let\scantextokens\luatexscantextokens
\fi
\ifx\pdfoutput\undefined
  \let\pdfoutput\outputmode
  \protected\def\pdfliteral{\pdfextension literal}
\fi
```

Set the format for metapost.

```
\def\mplibsetformat#1{\directlua{luamplib.setformat("#1")}}
```

luamplib works in both PDF and DVI mode, but only DVIPDFMx is supported currently among a number of DVI tools. So we output a warning.

```
\ifnum\pdfoutput>0
  \let\mplibtoPDF\pdfliteral
\else
  \def\mplibtoPDF#1{\special{pdf:literal direct #1}}
  \ifcsname PackageWarning\endcsname
    \PackageWarning{luamplib}{take dvipdfmx path, no support for other dvi tools currently.}
  \else
    \write128{}
    \write128{luamplib Warning: take dvipdfmx path, no support for other dvi tools currently.}
    \write128{}
  \fi
\fi
\def\mplibsetupcatcodes{%
  %catcode`\{=12 %catcode`\}=12
  \catcode`\#=12 \catcode`\^=12 \catcode`\~=12 \catcode`\_=12
  \catcode`\&=12 \catcode`\$=12 \catcode`\%=12 \catcode`\^^M=12 \endlinechar=10
}
```

Make `btex...etex` box zero-metric.

```
\def\mplibputtextbox#1{\vbox to 0pt{\vss\hbox to 0pt{\raise\dp#1\copy#1\hss}}}
\newcount\mplibstartlineno
\def\mplibpostmpcatcodes{%
  \catcode`\{=12 \catcode`\}=12 \catcode`\#=12 \catcode`\%=12 }
\def\mplibreplacenewlinebr{%
  \begingroup \mplibpostmpcatcodes \mplibdoreplacenewlinebr}
\begingroup\lccode`\~=`\^^M \lowercase{\endgroup
```

```
  \def\mplibdoreplacenewlinebr#1^^J{\endgroup\scantextokens{{}#1~}}}
```

The Plain-specific stuff.

```
\bgroup\expandafter\expandafter\expandafter\egroup
\expandafter\ifx\csname selectfont\endcsname\relax
\def\mplibreplacenewlinecs{%
  \begingroup \mplibpostmpcatcodes \mplibdoreplacenewlinecs}
\begingroup\lccode`\~=`\^^M \lowercase{\endgroup
  \def\mplibdoreplacenewlinecs#1^^J{\endgroup\scantextokens{\relax#1~}}}
\def\mplibcode{%
  \mplibstartlineno\inputlineno
  \begingroup
  \begingroup
  \mplibsetupcatcodes
  \mplibdocode
}
\long\def\mplibdocode#1\endmplibcode{%
  \endgroup
  \ifdefined\mplibverbatimYes
    \directlua{luamplib.tempdata = luamplib.protecttextextVerbatim([===[\detok-
enize{#1}]===])}%
    \directlua{luamplib.processwithTEXboxes(luamplib.tempdata)}%
  \else
    \edef\mplibtemp{\directlua{luamplib.protecttextext([===[\unexpanded{#1}]===])}}%
    \directlua{ tex.sprint(luamplib.mpxcolors) }%
    \directlua{luamplib.tempdata = luamplib.makeTEXboxes([===[\mplibtemp]===])}%
    \directlua{luamplib.processwithTEXboxes(luamplib.tempdata)}%
  \fi
  \endgroup
  \ifnum\mplibstartlineno<\inputlineno\expandafter\mplibreplacenewlinecs\fi
}
\else
```

The LaTeX-specific parts: a new environment.

```
\newenvironment{mplibcode}{%
  \global\mplibstartlineno\inputlineno
  \toks@{}\ltxdomplibcode
}{}
\def\ltxdomplibcode{%
  \begingroup
  \mplibsetupcatcodes
  \ltxdomplibcodeindeed
}
\def\mplib@mplibcode{mplibcode}
\long\def\ltxdomplibcodeindeed#1\end#2{%
  \endgroup
  \toks@\expandafter{\the\toks@#1}%
  \def\mplibtemp@a{#2}\ifx\mplib@mplibcode\mplibtemp@a
    \ifdefined\mplibverbatimYes
      \directlua{luamplib.tempdata = luamplib.protecttextextVerbatim([===[\the\toks@]===])}%
      \directlua{luamplib.processwithTEXboxes(luamplib.tempdata)}%
    \else
      \edef\mplibtemp{\directlua{luamplib.protecttextext([===[\the\toks@]===])}}%
      \directlua{ tex.sprint(luamplib.mpxcolors) }%
      \directlua{luamplib.tempdata=luamplib.makeTEXboxes([===[\mplibtemp]===])}%
      \directlua{luamplib.processwithTEXboxes(luamplib.tempdata)}%
    \fi
    \end{mplibcode}%
    \ifnum\mplibstartlineno<\inputlineno
      \expandafter\expandafter\expandafter\mplibreplacenewlinebr
    \fi
  \else
    \toks@\expandafter{\the\toks@\end{#2}}\expandafter\ltxdomplibcode
  \fi
}
\fi
\def\mplibverbatim#1{%
  \begingroup
  \def\mplibtempa{#1}\def\mplibtempb{enable}%
  \expandafter\endgroup
  \ifx\mplibtempa\mplibtempb
    \let\mplibverbatimYes\relax
  \else
    \let\mplibverbatimYes\undefined
  \fi
}
```

\everymplib & \everyendmplib: macros redefining \everymplibtoks & \everyendmplibtoks respectively

```
\newtoks\everymplibtoks
\newtoks\everyendmplibtoks
\protected\def\everymplib{%
  \mplibstartlineno\inputlineno
  \begingroup
  \mplibsetupcatcodes
  \mplibdoeverymplib
}
\long\def\mplibdoeverymplib#1{%
  \endgroup
  \everymplibtoks{#1}%
  \ifnum\mplibstartlineno<\inputlineno\expandafter\mplibreplacenewlinebr\fi
}
\protected\def\everyendmplib{%
  \mplibstartlineno\inputlineno
  \begingroup
  \mplibsetupcatcodes
  \mplibdoeveryendmplib
}
\long\def\mplibdoeveryendmplib#1{%
  \endgroup
  \everyendmplibtoks{#1}%
  \ifnum\mplibstartlineno<\inputlineno\expandafter\mplibreplacenewlinebr\fi
}
\def\mpdim#1{ begingroup \the\dimexpr #1\relax\space endgroup } % gmp.sty
```

Support color/xcolor packages. User interface is: `\mpcolor{teal}` or `\mpcolor[HTML]{008080}`, for example.

```
\def\mplibcolor#1{%
  \def\set@color{\edef#1{1 withprescript "MPlibOverrideColor=\current@color"}}%
  \color
}
\def\mplibnumbersystem#1{\directlua{luamplib.numbersystem = "#1"}}
\def\mplibmakenocache#1{\mplibdomakenocache #1,*,}
\def\mplibdomakenocache#1,{%
  \ifx\empty#1\empty
    \expandafter\mplibdomakenocache
  \else
    \ifx*#1\else
      \directlua{luamplib.noneedtoreplace["#1.mp"]=true}%
      \expandafter\expandafter\expandafter\mplibdomakenocache
    \fi
  \fi
}
\def\mplibcancelnocache#1{\mplibdocancelnocache #1,*,}
\def\mplibdocancelnocache#1,{%
  \ifx\empty#1\empty
    \expandafter\mplibdocancelnocache
  \else
    \ifx*#1\else
      \directlua{luamplib.noneedtoreplace["#1.mp"]=false}%
      \expandafter\expandafter\expandafter\mplibdocancelnocache
    \fi
  \fi
}
\def\mplibcachedir#1{\directlua{luamplib.getcachedir("\unexpanded{#1}")}}
\def\mplibtextextlabel#1{%
  \begingroup
  \def\tempa{enable}\def\tempb{#1}%
  \ifx\tempa\tempb
    \directlua{luamplib.textextlabel = true}%
  \else
    \directlua{luamplib.textextlabel = false}%
  \fi
  \endgroup
}
\def\mplibcodeinherit#1{%
  \begingroup
  \def\tempa{enable}\def\tempb{#1}%
  \ifx\tempa\tempb
    \directlua{luamplib.codeinherit = true}%
  \else
```

```
    \directlua{luamplib.codeinherit = false}%
  \fi
  \endgroup
}
```

We use a dedicated scratchbox.

```
\ifx\mplibscratchbox\undefined \newbox\mplibscratchbox \fi
```

We encapsulate the litterals.

```
\def\mplibstarttoPDF#1#2#3#4{%
  \hbox\bgroup
  \xdef\MPllx{#1}\xdef\MPlly{#2}%
  \xdef\MPurx{#3}\xdef\MPury{#4}%
  \xdef\MPwidth{\the\dimexpr#3bp-#1bp\relax}%
  \xdef\MPheight{\the\dimexpr#4bp-#2bp\relax}%
  \parskip0pt%
  \leftskip0pt%
  \parindent0pt%
  \everypar{}%
  \setbox\mplibscratchbox\vbox\bgroup
  \noindent
}
```

```
\def\mplibstoptoPDF{%
  \egroup %
  \setbox\mplibscratchbox\hbox %
    {\hskip-\MPllx bp%
     \raise-\MPlly bp%
     \box\mplibscratchbox}%
  \setbox\mplibscratchbox\vbox to \MPheight
    {\vfill
     \hsize\MPwidth
     \wd\mplibscratchbox0pt%
     \ht\mplibscratchbox0pt%
     \dp\mplibscratchbox0pt%
     \box\mplibscratchbox}%
  \wd\mplibscratchbox\MPwidth
  \ht\mplibscratchbox\MPheight
  \box\mplibscratchbox
  \egroup
}
```

Text items have a special handler.

```
\def\mplibtextext#1#2#3#4#5{%
  \begingroup
  \setbox\mplibscratchbox\hbox
    {\font\temp=#1 at #2bp%
     \temp
     #3}%
  \setbox\mplibscratchbox\hbox
    {\hskip#4 bp%
     \raise#5 bp%
```

```
      \box\mplibscratchbox}%
  \wd\mplibscratchbox0pt%
  \ht\mplibscratchbox0pt%
  \dp\mplibscratchbox0pt%
  \box\mplibscratchbox
  \endgroup
}
```

input luamplib.cfg when it exists

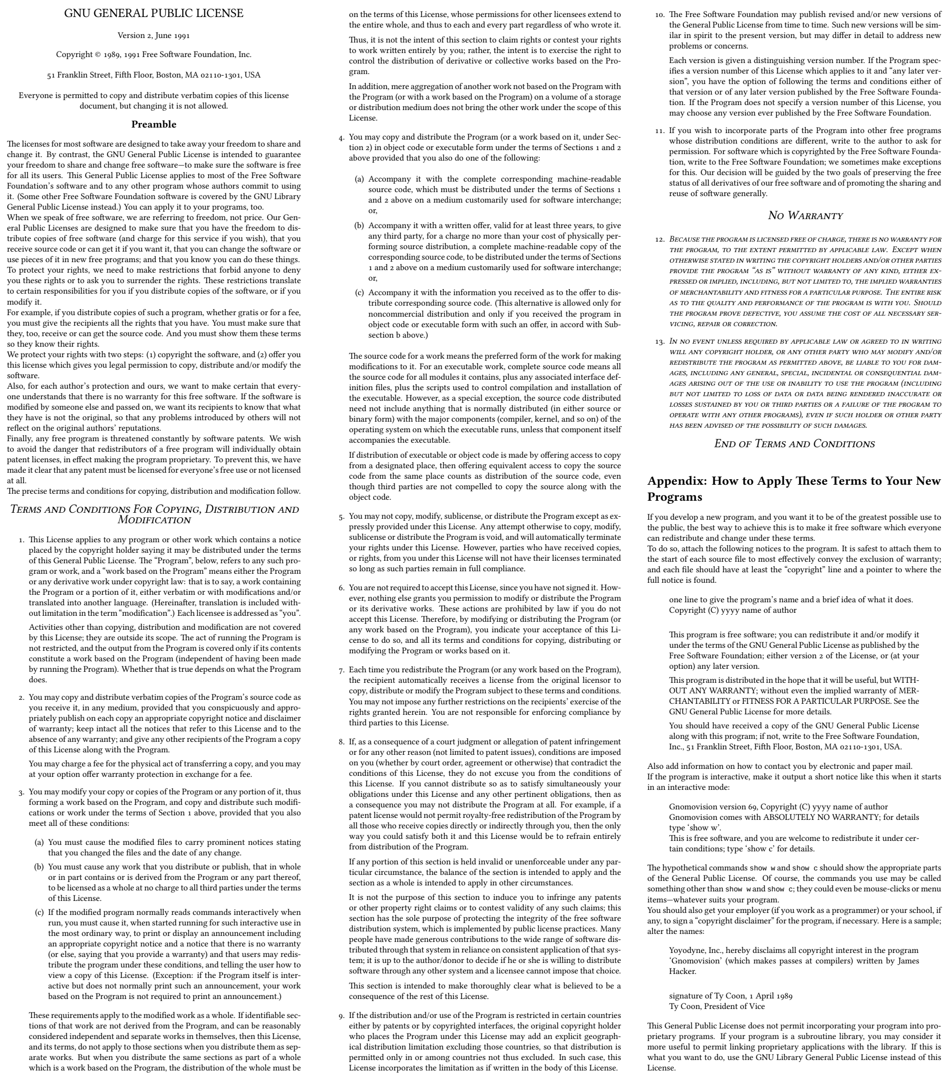
```
\openin0=luamplib.cfg
\ifeof0 \else
  \closein0
  \input luamplib.cfg
\fi
```

That's all folks!

```
⟨/package⟩
```

3 The GNU GPL License v2

The GPL requires the complete license text to be distributed along with the code. I recommend the canonical source, instead: `http://www.gnu.org/licenses/old-licenses/gpl-2.0.html`. But if you insist on an included copy, here it is. You might want to zoom in.



Preamble

The licenses for most software are designed to take away your freedom to share and change it. By contrast, the GNU General Public License is intended to guarantee your freedom to share and change free software—to make sure the software is free for all its users. This General Public License applies to most of the Free Software Foundation's software and to any other program whose authors commit to using it. (Some other Free Software Foundation software is covered by the GNU Library General Public License instead.) You can apply it to your programs, too.
When we speak of free software, we are referring to freedom, not price. Our General Public Licenses are designed to make sure that you have the freedom to distribute copies of free software (and charge for this service if you wish), that you receive source code or can get it if you want it, that you can change the software or use pieces of it in new free programs; and that you know you can do these things.
To protect your rights, we need to make restrictions that forbid anyone to deny you these rights or to ask you to surrender the rights. These restrictions translate to certain responsibilities for you if you distribute copies of the software, or if you modify it.
For example, if you distribute copies of such a program, whether gratis or for a fee, you must give the recipients all the rights that you have. You must make sure that they, too, receive or can get the source code. And you must show them these terms so they know their rights.
We protect your rights with two steps: (1) copyright the software, and (2) offer you this license which gives you legal permission to copy, distribute and/or modify the software.
Also, for each author's protection and ours, we want to make certain that everyone understands that there is no warranty for this free software. If the software is modified by someone else and passed on, we want its recipients to know that what they have is not the original, so that any problems introduced by others will not reflect on the original authors' reputations.
Finally, any free program is threatened constantly by software patents. We wish to avoid the danger that redistributors of a free program will individually obtain patent licenses, in effect making the program proprietary. To prevent this, we have made it clear that any patent must be licensed for everyone's free use or not licensed at all.
The precise terms and conditions for copying, distribution and modification follow.

Terms and Conditions For Copying, Distribution and Modification

1. This License applies to any program or other work which contains a notice placed by the copyright holder saying it may be distributed under the terms of this General Public License. The "Program", below, refers to any such program or work, and a "work based on the Program" means either the Program or any derivative work under copyright law: that is to say, a work containing the Program or a portion of it, either verbatim or with modifications and/or translated into another language. (Hereinafter, translation is included without limitation in the term "modification".) Each licensee is addressed as "you".

   Activities other than copying, distribution and modification are not covered by this License; they are outside its scope. The act of running the Program is not restricted, and the output from the Program is covered only if its contents constitute a work based on the Program (independent of having been made by running the Program). Whether that is true depends on what the Program does.

2. You may copy and distribute verbatim copies of the Program's source code as you receive it, in any medium, provided that you conspicuously and appropriately publish on each copy an appropriate copyright notice and disclaimer of warranty; keep intact all the notices that refer to this License and to the absence of any warranty; and give any other recipients of the Program a copy of this License along with the Program.

   You may charge a fee for the physical act of transferring a copy, and you may at your option offer warranty protection in exchange for a fee.

3. You may modify your copy or copies of the Program or any portion of it, thus forming a work based on the Program, and copy and distribute such modifications or work under the terms of Section 1 above, provided that you also meet all of these conditions:

   (a) You must cause the modified files to carry prominent notices stating that you changed the files and the date of any change.

   (b) You must cause any work that you distribute or publish, that in whole or in part contains or is derived from the Program or any part thereof, to be licensed as a whole at no charge to all third parties under the terms of this License.

   (c) If the modified program normally reads commands interactively when run, you must cause it, when started running for such interactive use in the most ordinary way, to print or display an announcement including an appropriate copyright notice and a notice that there is no warranty (or else, saying that you provide a warranty) and that users may redistribute the program under these conditions, and telling the user how to view a copy of this License. (Exception: if the Program itself is interactive but does not normally print such an announcement, your work based on the Program is not required to print an announcement.)

   These requirements apply to the modified work as a whole. If identifiable sections of that work are not derived from the Program, and can be reasonably considered independent and separate works in themselves, then this License, and its terms, do not apply to those sections when you distribute them as separate works. But when you distribute the same sections as part of a whole which is a work based on the Program, the distribution of the whole must be on the terms of this License, whose permissions for other licensees extend to the entire whole, and thus to each and every part regardless of who wrote it.

   Thus, it is not the intent of this section to claim rights or contest your rights to work written entirely by you; rather, the intent is to exercise the right to control the distribution of derivative or collective works based on the Program.

   In addition, mere aggregation of another work not based on the Program with the Program (or with a work based on the Program) on a volume of a storage or distribution medium does not bring the other work under the scope of this License.

4. You may copy and distribute the Program (or a work based on it, under Section 2) in object code or executable form under the terms of Sections 1 and 2 above provided that you also do one of the following:

   (a) Accompany it with the complete corresponding machine-readable source code, which must be distributed under the terms of Sections 1 and 2 above on a medium customarily used for software interchange; or,

   (b) Accompany it with a written offer, valid for at least three years, to give any third party, for a charge no more than your cost of physically performing source distribution, a complete machine-readable copy of the corresponding source code, to be distributed under the terms of Sections 1 and 2 above on a medium customarily used for software interchange; or,

   (c) Accompany it with the information you received as to the offer to distribute corresponding source code. (This alternative is allowed only for noncommercial distribution and only if you received the program in object code or executable form with such an offer, in accord with Subsection b above.)

   The source code for a work means the preferred form of the work for making modifications to it. For an executable work, complete source code means all the source code for all modules it contains, plus any associated interface definition files, plus the scripts used to control compilation and installation of the executable. However, as a special exception, the source code distributed need not include anything that is normally distributed (in either source or binary form) with the major components (compiler, kernel, and so on) of the operating system on which the executable runs, unless that component itself accompanies the executable.

   If distribution of executable or object code is made by offering access to copy from a designated place, then offering equivalent access to copy the source code from the same place counts as distribution of the source code, even though third parties are not compelled to copy the source along with the object code.

5. You may not copy, modify, sublicense, or distribute the Program except as expressly provided under this License. Any attempt otherwise to copy, modify, sublicense or distribute the Program is void, and will automatically terminate your rights under this License. However, parties who have received copies, or rights, from you under this License will not have their licenses terminated so long as such parties remain in full compliance.

6. You are not required to accept this License, since you have not signed it. However, nothing else grants you permission to modify or distribute the Program or its derivative works. These actions are prohibited by law if you do not accept this License. Therefore, by modifying or distributing the Program (or any work based on the Program), you indicate your acceptance of this License to do so, and all its terms and conditions for copying, distributing or modifying the Program or works based on it.

7. Each time you redistribute the Program (or any work based on the Program), the recipient automatically receives a license from the original licensor to copy, distribute or modify the Program subject to these terms and conditions. You may not impose any further restrictions on the recipients' exercise of the rights granted herein. You are not responsible for enforcing compliance by third parties to this License.

8. If, as a consequence of a court judgment or allegation of patent infringement or for any other reason (not limited to patent issues), conditions are imposed on you (whether by court order, agreement or otherwise) that contradict the conditions of this License, they do not excuse you from the conditions of this License. If you cannot distribute so as to satisfy simultaneously your obligations under this License and any other pertinent obligations, then as a consequence you may not distribute the Program at all. For example, if a patent license would not permit royalty-free redistribution of the Program by all those who receive copies directly or indirectly through you, then the only way you could satisfy both it and this License would be to refrain entirely from distribution of the Program.

   If any portion of this section is held invalid or unenforceable under any particular circumstance, the balance of the section is intended to apply and the section as a whole is intended to apply in other circumstances.

   It is not the purpose of this section to induce you to infringe any patents or other property right claims or to contest validity of any such claims; this section has the sole purpose of protecting the integrity of the free software distribution system, which is implemented by public license practices. Many people have made generous contributions to the wide range of software distributed through that system in reliance on consistent application of that system; it is up to the author/donor to decide if he or she is willing to distribute software through any other system and a licensee cannot impose that choice.

   This section is intended to make thoroughly clear what is believed to be a consequence of the rest of this License.

9. If the distribution and/or use of the Program is restricted in certain countries either by patents or by copyrighted interfaces, the original copyright holder who places the Program under this License may add an explicit geographical distribution limitation excluding those countries, so that distribution is permitted only in or among countries not thus excluded. In such case, this License incorporates the limitation as if written in the body of this License.

10. The Free Software Foundation may publish revised and/or new versions of the General Public License from time to time. Such new versions will be similar in spirit to the present version, but may differ in detail to address new problems or concerns.

    Each version is given a distinguishing version number. If the Program specifies a version number of this License which applies to it and "any later version", you have the option of following the terms and conditions either of that version or of any later version published by the Free Software Foundation. If the Program does not specify a version number of this License, you may choose any version ever published by the Free Software Foundation.

11. If you wish to incorporate parts of the Program into other free programs whose distribution conditions are different, write to the author to ask for permission. For software which is copyrighted by the Free Software Foundation, write to the Free Software Foundation; we sometimes make exceptions for this. Our decision will be guided by the two goals of preserving the free status of all derivatives of our free software and of promoting the sharing and reuse of software generally.

No Warranty

12. *BECAUSE THE PROGRAM IS LICENSED FREE OF CHARGE, THERE IS NO WARRANTY FOR THE PROGRAM, TO THE EXTENT PERMITTED BY APPLICABLE LAW. EXCEPT WHEN OTHERWISE STATED IN WRITING THE COPYRIGHT HOLDERS AND/OR OTHER PARTIES PROVIDE THE PROGRAM "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THE ENTIRE RISK AS TO THE QUALITY AND PERFORMANCE OF THE PROGRAM IS WITH YOU. SHOULD THE PROGRAM PROVE DEFECTIVE, YOU ASSUME THE COST OF ALL NECESSARY SERVICING, REPAIR OR CORRECTION.*

13. *IN NO EVENT UNLESS REQUIRED BY APPLICABLE LAW OR AGREED TO IN WRITING WILL ANY COPYRIGHT HOLDER, OR ANY OTHER PARTY WHO MAY MODIFY AND/OR REDISTRIBUTE THE PROGRAM AS PERMITTED ABOVE, BE LIABLE TO YOU FOR DAMAGES, INCLUDING ANY GENERAL, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OR INABILITY TO USE THE PROGRAM (INCLUDING BUT NOT LIMITED TO LOSS OF DATA OR DATA BEING RENDERED INACCURATE OR LOSSES SUSTAINED BY YOU OR THIRD PARTIES OR A FAILURE OF THE PROGRAM TO OPERATE WITH ANY OTHER PROGRAMS), EVEN IF SUCH HOLDER OR OTHER PARTY HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.*

End of Terms and Conditions

Appendix: How to Apply These Terms to Your New Programs

If you develop a new program, and you want it to be of the greatest possible use to the public, the best way to achieve this is to make it free software which everyone can redistribute and change under these terms.
To do so, attach the following notices to the program. It is safest to attach them to the start of each source file to most effectively convey the exclusion of warranty; and each file should have at least the "copyright" line and a pointer to where the full notice is found.

> one line to give the program's name and a brief idea of what it does.
> Copyright (C) yyyy name of author
>
> This program is free software; you can redistribute it and/or modify it under the terms of the GNU General Public License as published by the Free Software Foundation; either version 2 of the License, or (at your option) any later version.
>
> This program is distributed in the hope that it will be useful, but WITHOUT ANY WARRANTY; without even the implied warranty of MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. See the GNU General Public License for more details.
>
> You should have received a copy of the GNU General Public License along with this program; if not, write to the Free Software Foundation, Inc., 51 Franklin Street, Fifth Floor, Boston, MA 02110-1301, USA.

Also add information on how to contact you by electronic and paper mail.
If the program is interactive, make it output a short notice like this when it starts in an interactive mode:

> Gnomovision version 69, Copyright (C) yyyy name of author
> Gnomovision comes with ABSOLUTELY NO WARRANTY; for details type 'show w'.
> This is free software, and you are welcome to redistribute it under certain conditions; type 'show c' for details.

The hypothetical commands `show w` and `show c` should show the appropriate parts of the General Public License. Of course, the commands you use may be called something other than `show w` and `show c`; they could even be mouse-clicks or menu items—whatever suits your program.
You should also get your employer (if you work as a programmer) or your school, if any, to sign a "copyright disclaimer" for the program, if necessary. Here is a sample; alter the names:

> Yoyodyne, Inc., hereby disclaims all copyright interest in the program 'Gnomovision' (which makes passes at compilers) written by James Hacker.
>
> signature of Ty Coon, 1 April 1989
> Ty Coon, President of Vice

This General Public License does not permit incorporating your program into proprietary programs. If your program is a subroutine library, you may consider it more useful to permit linking proprietary applications with the library. If this is what you want to do, use the GNU Library General Public License instead of this License.