

The luamplib package

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

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Abstract

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

1 Documentation

This package 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.

The package needs to be in PDF mode in order to output something, as PDF specials are not supported by the DVI format and tools.

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

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

- a L^AT_EX environment
- all TeX macros start by mplib
- use of luatexbase for errors, warnings and declaration
- possibility to use btex ... etex to typeset TeX. texttext() is a more versatile macro equivalent to TEX() from TEX.mp. TEX() is also allowed unless TEX.mp is loaded, which should be always avoided.

Using this package is easy: in Plain, type your metapost code between the macros mplibcode and endmplibcode, and in L^AT_EX in the mplibcode environment.

There are (basically) two formats for metapost: *plain* and *mpfun*. 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. ConT_EXt uses metapost.

```
1
2 luamplib          = luamplib or { }
3
```

Identification.

```
4
5 local luamplib    = luamplib
6 luamplib.showlog  = luamplib.showlog or false
7 luamplib.lastlog  = ""
8
9 local err, warn, info, log = luatexbase.provides_module({
10   name           = "luamplib",
11   version        = 2.03,
12   date           = "2013/12/11",
13   description    = "Lua package to typeset Metapost with LuaTeX's MPLib.",
14 })
15
16
```

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

```
17
18 local format, abs = string.format, math.abs
19
20 local stringgsub   = string.gsub
21 local stringfind   = string.find
22 local stringmatch  = string.match
23 local stringgmatch = string.gmatch
24 local tableconcat  = table.concat
25 local textsprint   = tex.sprint
26
27 local mplib = require ('mplib')
28 local kpse  = require ('kpse')
29
30 local file = file
31 if not file then
32
```

This is a small trick for L^AT_EX. In L^AT_EX 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`.

```
33
```

```

34 file = { }
35
36 function file.replacesuffix(filename, suffix)
37     return (stringgsub(filename,"%.[%a%d]+$","") .. "." .. suffix)
38 end
39
40 function file.stripsuffix(filename)
41     return (stringgsub(filename,"%.[%a%d]+$",""))
42 end
43 end

```

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).

```

44
45 local mpkpse = kpse.new("luatex", "mpost")
46
47 local function finder(name, mode, ftype)
48     if mode == "w" then
49         return name
50     else
51         return mpkpse.find_file(name, ftype)
52     end
53 end
54 luamplib.finder = finder
55

```

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.

```

56
57 function luamplib.resetlastlog()
58     luamplib.lastlog = ""
59 end
60

```

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

```

61 local mplibone = tonumber(mplib.version()) <= 1.50
62
63 if mplibone then
64
65     luamplib.make = luamplib.make or function(name, mem_name, dump)
66         local t = os.clock()
67         local mpx = mplib.new {
68             ini_version = true,
69             find_file = luamplib.finder,
70             job_name = file.stripsuffix(name)
71         }
72         mpx:execute(format("input %s ;", name))
73         if dump then
74             mpx:execute("dump ;")
75         end
76     end
77 end

```

```

75         info("format %s made and dumped for %s in %0.3f seconds",mem_name,name,os.clock()-t)
76     else
77         info("%s read in %0.3f seconds",name,os.clock()-t)
78     end
79     return mpx
80 end
81
82 function luamplib.load(name)
83     local mem_name = file.replacesuffix(name,"mem")
84     local mpx = mplib.new {
85         ini_version = false,
86         mem_name = mem_name,
87         find_file = luamplib.finder
88     }
89     if not mpx and type(luamplib.make) == "function" then
90         -- when i have time i'll locate the format and dump
91         mpx = luamplib.make(name,mem_name)
92     end
93     if mpx then
94         info("using format %s",mem_name,false)
95         return mpx, nil
96     else
97         return nil, { status = 99, error = "out of memory or invalid format" }
98     end
99 end
100
101 else
102

```

These are the versions called with sufficiently recent mplib.

```

103
104     local preamble = [[
105         boolean mplib ; mplib := true ;
106         let dump = endinput ;
107         input %s ;
108     ]]
109
110     luamplib.make = luamplib.make or function()
111     end
112
113     function luamplib.load(name)
114         local mpx = mplib.new {
115             ini_version = true,
116             find_file = luamplib.finder,
117         }
118         local result
119         if not mpx then
120             result = { status = 99, error = "out of memory"}
121         else
122             result = mpx:execute(format(preamble, file.replacesuffix(name,"mp")))

```

```

123         end
124         luamplib.reporterror(result)
125         return mpx, result
126     end
127
128 end
129
130 local currentformat = "plain"
131
132 local function setformat (name) --- used in .sty
133     currentformat = name
134 end
135 luamplib.setformat = setformat
136
137
138 luamplib.reporterror = function (result)
139     if not result then
140         err("no result object returned")
141     elseif result.status > 0 then
142         local t, e, l = result.term, result.error, result.log
143         if t then
144             info(t)
145         end
146         if e then
147             err(e)
148         end
149         if not t and not e and l then
150             luamplib.lastlog = luamplib.lastlog .. "\n " .. l
151             log(l)
152         else
153             err("unknown, no error, terminal or log messages")
154         end
155     else
156         return false
157     end
158     return true
159 end
160
161 local function process_indeed (mpx, data)
162     local converted, result = false, {}
163     local mpx = luamplib.load(mpx)
164     if mpx and data then
165         local result = mpx:execute(data)
166         if not result then
167             err("no result object returned")
168         elseif result.status > 0 then
169             err("%s", (result.term or "no-term") .. "\n" .. (result.error or "no-error"))
170         elseif luamplib.showlog then
171             luamplib.lastlog = luamplib.lastlog .. "\n" .. result.term
172             info("%s", result.term or "no-term")

```

```

173     elseif result.fig then
174         converted = luamplib.convert(result)
175     else
176         err("unknown error, maybe no beginfig/endfig")
177     end
178 else
179     err("Mem file unloadable. Maybe generated with a different version of mplib?")
180 end
181 return converted, result
182 end
183 local process = function (data)
184     return process_indeed(currentformat, data)
185 end
186 luamplib.process = process
187
188 local function getobjects(result, figure, f)
189     return figure:objects()
190 end
191
192 local function convert(result, flusher)
193     luamplib.flush(result, flusher)
194     return true -- done
195 end
196 luamplib.convert = convert
197
198 local function pdf_startfigure(n, llx, lly, urx, ury)

```

The following line has been slightly modified by Kim.

```

199     texsprint(format("\mplibstarttoPDF{%f}{%f}{%f}{%f}", llx, lly, urx, ury))
200 end
201
202 local function pdf_stopfigure()
203     texsprint("\mplibstoptoPDF")
204 end
205
206 local function pdf_literalcode(fmt, ...) -- table
207     texsprint(format("\mplibtoPDF{%s}", format(fmt, ...)))
208 end
209 luamplib.pdf_literalcode = pdf_literalcode
210
211 local function pdf_textfigure(font, size, text, width, height, depth)
212     text = text:gsub(".", "\hbox{%1}") -- kerning happens in metapost

```

The following line has been slightly modified by Kim.

```

213     texsprint(format("\mplibtexttext{%s}{%f}{%s}{%s}{%f}", font, size, text, 0, -( 7200/ 7227)/65536*depth))
214 end
215 luamplib.pdf_textfigure = pdf_textfigure
216
217 local bend_tolerance = 131/65536
218

```

```

219 local rx, sx, sy, ry, tx, ty, divider = 1, 0, 0, 1, 0, 0, 1
220
221 local function pen_characteristics(object)
222     local t = mplib.pen_info(object)
223     rx, ry, sx, sy, tx, ty = t.rx, t.ry, t.sx, t.sy, t.tx, t.ty
224     divider = sx*sy - rx*ry
225     return not (sx==1 and rx==0 and ry==0 and sy==1 and tx==0 and ty==0), t.width
226 end
227
228 local function concat(px, py) -- no tx, ty here
229     return (sy*px-ry*py)/divider, (sx*py-rx*px)/divider
230 end
231
232 local function curved(ith,pth)
233     local d = pth.left_x - ith.right_x
234     if abs(ith.right_x - ith.x_coord - d) <= bend_tolerance and abs(pth.x_coord - pth.left_x - d) <= bend_tolerance then
235         d = pth.left_y - ith.right_y
236         if abs(ith.right_y - ith.y_coord - d) <= bend_tolerance and abs(pth.y_coord - pth.left_y - d) <= bend_tolerance then
237             return false
238         end
239     end
240     return true
241 end
242
243 local function flushnormalpath(path,open)
244     local pth, ith
245     for i=1,#path do
246         pth = path[i]
247         if not ith then
248             pdf_literalcode("%f %f m",pth.x_coord,pth.y_coord)
249         elseif curved(ith,pth) then
250             pdf_literalcode("%f %f %f %f %f c",ith.right_x,ith.right_y,pth.left_x,pth.left_y,pth.x_coord,pth.y_coord)
251         else
252             pdf_literalcode("%f %f l",pth.x_coord,pth.y_coord)
253         end
254         ith = pth
255     end
256     if not open then
257         local one = path[1]
258         if curved(pth,one) then
259             pdf_literalcode("%f %f %f %f %f %f c",pth.right_x,pth.right_y,one.left_x,one.left_y,one.x_coord,one.y_coord)
260         else
261             pdf_literalcode("%f %f l",one.x_coord,one.y_coord)
262         end
263     elseif #path == 1 then
264         -- special case .. draw point
265         local one = path[1]
266         pdf_literalcode("%f %f l",one.x_coord,one.y_coord)

```

```

267     end
268     return t
269 end
270
271 local function flushconcatpath(path,open)
272     pdf_literalcode("%f %f %f %f %f %f cm", sx, rx, ry, sy, tx ,ty)
273     local pth, ith
274     for i=1,#path do
275         pth = path[i]
276         if not ith then
277             pdf_literalcode("%f %f m",concat(pth.x_coord,pth.y_coord))
278         elseif curved(ith,pth) then
279             local a, b = concat(ith.right_x,ith.right_y)
280             local c, d = concat(pth.left_x,pth.left_y)
281             pdf_literalcode("%f %f %f %f %f %f c",a,b,c,d,concat(pth.x_coord, pth.y_co-
ord))
282         else
283             pdf_literalcode("%f %f l",concat(pth.x_coord, pth.y_coord))
284         end
285         ith = pth
286     end
287     if not open then
288         local one = path[1]
289         if curved(pth,one) then
290             local a, b = concat(pth.right_x,pth.right_y)
291             local c, d = concat(one.left_x,one.left_y)
292             pdf_literalcode("%f %f %f %f %f %f c",a,b,c,d,concat(one.x_coord, one.y_co-
ord))
293         else
294             pdf_literalcode("%f %f l",concat(one.x_coord,one.y_coord))
295         end
296     elseif #path == 1 then
297         -- special case .. draw point
298         local one = path[1]
299         pdf_literalcode("%f %f l",concat(one.x_coord,one.y_coord))
300     end
301     return t
302 end
303

```

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

v2.2: `texttext()` is now available, which is equivalent to `TEX()` macro from `TEX.mp`.
`TEX()` is synonym of `texttext()` unless `TEX.mp` is loaded.

```

304
305 local mplibcodepreamblefirst = [[
306 def texttext (expr t) =
307     image( special "%mkTEXbox:"&t; )
308 enddef;
309 let TEX = texttext;
310 ]]

```



```

311
312 local mplibcodepreamblesecond = [[
313 vardef texttext (expr t) =
314     TEXBOX := TEXBOX + 1;
315     image (
316         addto currentpicture doublepath unitsquare
317         xscaled TEXBOXwd[TEXBOX]
318         yscaled (TEXBOXht[TEXBOX] + TEXBOXdp[TEXBOX])
319         shifted (0, -TEXBOXdp[TEXBOX])
320         withprescript "%TEXttxbox:" &
321             decimal TEXBOX & ":" &
322             decimal TEXBOXwd[TEXBOX] & ":" &
323             decimal(TEXBOXht[TEXBOX]+TEXBOXdp[TEXBOX]);
324 )
325 enddef;
326 def TEX (expr t) = texttext (t) enddef;
327 ]]
328
329 local factor = 65536*(7227/7200)
330
331 local function putTEXboxes (object)
332     local n,tw,th = stringmatch(object.prescript,
333         "%TEXttxbox: (%d+): ([%d%.%+%-]+): ([%d%.%+%-]+)")
334     if n and tw and th then
335         local op = object.path
336         local first, second, fourth = op[1], op[2], op[4]
337         local tx, ty = first.x_coord, first.y_coord
338         local sx, sy = (second.x_coord - tx)/tw, (fourth.y_coord - ty)/th
339         local rx, ry = (second.y_coord - ty)/tw, (fourth.x_coord - tx)/th
340         if sx == 0 then sx = 0.00001 end
341         if sy == 0 then sy = 0.00001 end
342         pdf_literalcode("q %f %f %f %f %f %f cm",sx,rx,ry,sy,tx,ty)
343         texpstr(format("\mplibputtextbox{%i}",n))
344         pdf_literalcode("Q")
345     end
346 end
347
348 local function domakeTEXboxes (data)
349     local num = tex.count[14] -- newbox register
350     if data and data.fig then
351         local figures = data.fig
352         for f=1, #figures do
353             local figure = figures[f]
354             local objects = getobjects(data,figure,f)
355             if objects then
356                 for o=1,#objects do
357                     local object = objects[o]
358                     local prescript = object.prescript
359                     if prescript and stringfind(prescript,"%mkTEXbox:") then
360                         num = num + 1

```

```

361         stringgsub(prescript, "%%mkTEXbox:(.)",
362         function(str)
363             texpstr(format("\\setbox%i\\hbox{%s}", num, str))
364         end)
365     end
366 end
367 end
368 end
369 end
370 end
371
372 local function makeTEXboxes (data)
373     data = stringgsub(data, "(%A)btex(%A.-%A)etex(%A)",
374     function(pre, texcode, post)
375         texcode = stringgsub(texcode, "^%s*(.)%s*$", "%1")
376         return pre .. "texttext(\"" .. texcode .. "\")" .. post
377     end)
378     local mpx = luamplib.load(currentformat)
379     if mpx and data then
380         local result = mpx:execute(mplibcodepreamblefirst .. data)
381         domakeTEXboxes(result)
382     end
383     return data
384 end
385
386 luamplib.makeTEXboxes = makeTEXboxes
387
388 local function processwithTEXboxes (data)
389     local num = tex.count[14] -- the same newbox register
390     local prepreamble = "numeric TEXBOX, TEXBOXwd[], TEXBOXht[], TEXBOXdp[];\n" ..
391     "TEXBOX := \"..num..\";\n"
392     while true do
393         num = num + 1
394         local box = tex.box[num]
395         if not box then break end
396         prepreamble = prepreamble ..
397         "TEXBOXwd[\"..num..\"] := \"..box.width/factor ..\";\n" ..
398         "TEXBOXht[\"..num..\"] := \"..box.height/factor ..\";\n" ..
399         "TEXBOXdp[\"..num..\"] := \"..box.depth /factor ..\";\n"
400     end
401     process(prepreamble .. mplibcodepreamblesecond .. data)
402 end
403
404 luamplib.processwithTEXboxes = processwithTEXboxes
405
End of btex – etex patch.
406
407 local function flush(result, flusher)
408     if result then

```

```

409     local figures = result.fig
410     if figures then
411         for f=1, #figures do
412             info("flushing figure %s",f)
413             local figure = figures[f]
414             local objects = getobjects(result,figure,f)
415             local fignum = tonumber(stringmatch(figure:filename(),"([%d]+)$") or figure:charcode() or 0)
416             local miterlimit, linecap, linejoin, dashed = -1, -1, -1, false
417             local bbox = figure:boundingbox()
418             local llx, lly, urx, ury = bbox[1], bbox[2], bbox[3], bbox[4] -- faster than unpack
419             if urx < llx then
420                 -- invalid
421                 pdf_startfigure(fignum,0,0,0,0)
422                 pdf_stopfigure()
423             else
424                 pdf_startfigure(fignum,llx,lly,urx,ury)
425                 pdf_literalcode("q")
426                 if objects then
427                     for o=1,#objects do
428                         local object = objects[o]
429                         local objecttype = object.type

```

Change from ConT_EXt code: the following 3 lines are part of the btex...etex patch.

```

430                     local prescript = object.prescript --- [be]tex patch
431                     if prescript and stringfind(prescript,"%%%TEXTxtbox:") then
432                         putTEXboxes(object)
433                     elseif objecttype == "start_bounds" or objecttype == "stop_bounds" then
434                         -- skip
435                     elseif objecttype == "start_clip" then
436                         pdf_literalcode("q")
437                         flushnormalpath(object.path,t,false)
438                         pdf_literalcode("W n")
439                     elseif objecttype == "stop_clip" then
440                         pdf_literalcode("Q")
441                         miterlimit, linecap, linejoin, dashed = -1, -1, -1, false
442                     elseif objecttype == "special" then
443                         -- not supported
444                     elseif objecttype == "text" then
445                         local ot = object.transform -- 3,4,5,6,1,2
446                         pdf_literalcode("q %f %f %f %f %f %f cm",ot[3],ot[4],ot[5],ot[6],ot[1],ot[2])
447                         pdf_textfigure(object.font,object.dsize,object.text,object.width,object.height)
448                         pdf_literalcode("Q")
449                     else
450                         local cs = object.color

```

Change from ConT_EXt code: the following 5 lines are part of the btex...etex patch.

```

451                     local cr = nil
452                     if cs and #cs > 0 then

```

```

453         local start, stop = luamplib.colorconverter(cs)
454         pdf_literalcode(start)
455         cr = stop
456     end
457     local ml = object.miterlimit
458     if ml and ml ~= miterlimit then
459         miterlimit = ml
460         pdf_literalcode("%f M", ml)
461     end
462     local lj = object.linejoin
463     if lj and lj ~= linejoin then
464         linejoin = lj
465         pdf_literalcode("%i j", lj)
466     end
467     local lc = object.linecap
468     if lc and lc ~= linecap then
469         linecap = lc
470         pdf_literalcode("%i J", lc)
471     end
472     local dl = object.dash
473     if dl then
474         local d = format("[%s] %i d", tableconcat(dl.dashes or {}, " "), dl.offset)
475         if d ~= dashed then
476             dashed = d
477             pdf_literalcode(dashed)
478         end
479     elseif dashed then
480         pdf_literalcode("[] 0 d")
481         dashed = false
482     end
483     local path = object.path
484     local transformed, penwidth = false, 1
485     local open = path and path[1].left_type and path[#path].right_type
486     local pen = object.pen
487     if pen then
488         if pen.type == 'elliptical' then
489             transformed, penwidth = pen.characteristics
490             pdf_literalcode("%f w", penwidth)
491             if objecttype == 'fill' then
492                 objecttype = 'both'
493             end
494         else -- calculated by mplib itself
495             objecttype = 'fill'
496         end
497     end
498     if transformed then
499         pdf_literalcode("q")
500     end
501     if path then

```

```

502         if transformed then
503             flushconcatpath(path,open)
504         else
505             flushnormalpath(path,open)
506         end
507         if objecttype == "fill" then
508             pdf_literalcode("h f")
509         elseif objecttype == "outline" then
510             pdf_literalcode((open and "S") or "h S")
511         elseif objecttype == "both" then
512             pdf_literalcode("h B")
513         end
514     end
515     if transformed then
516         pdf_literalcode("Q")
517     end
518     local path = object.htap
519     if path then
520         if transformed then
521             pdf_literalcode("q")
522         end
523         if transformed then
524             flushconcatpath(path,open)
525         else
526             flushnormalpath(path,open)
527         end
528         if objecttype == "fill" then
529             pdf_literalcode("h f")
530         elseif objecttype == "outline" then
531             pdf_literalcode((open and "S") or "h S")
532         elseif objecttype == "both" then
533             pdf_literalcode("h B")
534         end
535         if transformed then
536             pdf_literalcode("Q")
537         end
538     end
539     if cr then
540         pdf_literalcode(cr)
541     end
542 end
543     end
544 end
545 pdf_literalcode("Q")
546 pdf_stopfigure()
547 end
548     end
549 end
550 end
551 end

```

```

552 luamplib.flush = flush
553
554 local function colorconverter(cr)
555     local n = #cr
556     if n == 4 then
557         local c, m, y, k = cr[1], cr[2], cr[3], cr[4]
558         return format("%.3f %.3f %.3f %.3f k %.3f %.3f %.3f %.3f K", c, m, y, k, c, m, y, k), "0 g 0 G"
559     elseif n == 3 then
560         local r, g, b = cr[1], cr[2], cr[3]
561         return format("%.3f %.3f %.3f rg %.3f %.3f %.3f RG", r, g, b, r, g, b), "0 g 0 G"
562     else
563         local s = cr[1]
564         return format("%.3f g %.3f G", s, s), "0 g 0 G"
565     end
566 end
567 luamplib.colorconverter = colorconverter

```

2.2 T_EX package

```

568 <*package>

```

First we need to load some packages.

```

569 \bgroup\expandafter\expandafter\expandafter\egroup
570 \expandafter\ifx\csname ProvidesPackage\endcsname\relax
571     \input luatexbase-modutils.sty
572 \else
573     \NeedsTeXFormat{LaTeX2e}
574     \ProvidesPackage{luamplib}
575     [2013/12/11 v2.03 mplib package for LuaTeX]
576     \RequirePackage{luatexbase-modutils}
577     \RequirePackage{pdftexcmds}
578 \fi

```

Loading of lua code.

```

579 \RequireLuaModule{luamplib}

```

Set the format for metapost.

```

580 \def\mplibsetformat#1{%
581     \directlua{luamplib.setformat("\luatexluaescapestring{#1}")}}

```

MPLib only works in PDF mode, we don't do anything if we are in DVI mode, and we output a warning.

```

582 \ifnum\pdfoutput>0
583     \let\mplibtoPDF\pdfliteral
584 \else
585     %\def\MPLIBtoPDF#1{\special{pdf:literal direct #1}} % not ok yet
586     \def\mplibtoPDF#1{}
587     \expandafter\ifx\csname PackageWarning\endcsname\relax
588         \write16{}
589         \write16{Warning: MPLib only works in PDF mode, no figure will be output.}
590         \write16{}

```

```

591 \else
592 \PackageWarning{mplib}{MPLib only works in PDF mode, no figure will be out-
put.}
593 \fi
594 \fi
595 \def\mplibsetupcatcodes{%
596 \catcode'\{=12 \catcode'\}=12 \catcode'\#=12
597 \catcode'\^=12 \catcode'\~=12 \catcode'\_ =12
598 %catcode'\%=12 %% don't in Plain!
599 \catcode'\&=12 \catcode'\$=12
600 }

Make btex...etex box zero-metric.
601 \def\mplibputtextbox#1{\vbox to 0pt{\vss\hbox to 0pt{\raise\dp#1\copy#1\hss}}}

The Plain-specific stuff.
602 \bgroup\expandafter\expandafter\expandafter\egroup
603 \expandafter\ifx\csname ProvidesPackage\endcsname\relax
604 \def\mplibcode{%
605 \bgroup
606 \mplibsetupcatcodes
607 \mplibdocode %
608 }
609 \long\def\mplibdocode#1\endmplibcode{%
610 \egroup
611 \directlua{
612 luamplib.tempdata = luamplib.makeTEXboxes([==[\unexpanded{#1}]==])
613 }%
614 \directlua{
615 luamplib.processwithTEXboxes(luamplib.tempdata)
616 }%
617 }
618 \else

The LATEX-specific parts: a new environment.
619 \newenvironment{mplibcode}{\toks@{}\ltxdomplibcode}{\}
620 \def\ltxdomplibcode{%
621 \bgroup
622 \mplibsetupcatcodes
623 \ltxdomplibcodeindeed %
624 }
625 %
626 \long\def\ltxdomplibcodeindeed#1\end{%
627 \egroup
628 \toks@\expandafter{\the\toks@#1}\ltxdomplibcodefinally%
629 }%
630 %
631 \def\ltxdomplibcodefinally#1{%
632 \ifnum\pdf@strcmp{#1}{mplibcode}=\z@
633 \directlua{
634 luamplib.tempdata = luamplib.makeTEXboxes([==[\the\toks@]===])

```

```

635 }%
636 \directlua{
637   luampplib.processwithTEXboxes(luampplib.tempdata)
638 }%
639 \end{mplibcode}%
640 \else
641   \toks@\expandafter{\the\toks@\end{#1}}\expandafter\ltxdomplibcode
642 \fi%
643 }
644 \fi

```

We use a dedicated scratchbox.

```

645 \ifx\mplibscratchbox\undefined \newbox\mplibscratchbox \fi

```

We encapsulate the literals.

```

646 \def\mplibstarttoPDF#1#2#3#4{%
647   \hbox\bgroup
648   \xdef\MPllx{#1}\xdef\MPlly{#2}%
649   \xdef\MPurx{#3}\xdef\MPury{#4}%
650   \xdef\MPwidth{\the\dimexpr#3bp-#1bp\relax}%
651   \xdef\MPheight{\the\dimexpr#4bp-#2bp\relax}%
652   \parskip0pt%
653   \leftskip0pt%
654   \parindent0pt%
655   \everypar{}%
656   \setbox\mplibscratchbox\vbox\bgroup
657   \noindent
658 }

659 \def\mplibstoptoPDF{%
660   \egroup %
661   \setbox\mplibscratchbox\hbox %
662     {\hskip-\MPllx bp%
663      \raise-\MPlly bp%
664      \box\mplibscratchbox}%
665   \setbox\mplibscratchbox\vbox to \MPheight
666     {\vfill
667      \hsize\MPwidth
668      \wd\mplibscratchbox0pt%
669      \ht\mplibscratchbox0pt%
670      \dp\mplibscratchbox0pt%
671      \box\mplibscratchbox}%
672   \wd\mplibscratchbox\MPwidth
673   \ht\mplibscratchbox\MPheight
674   \box\mplibscratchbox
675   \egroup
676 }

```

Text items have a special handler.

```

677 \def\mplibtexttext#1#2#3#4#5{%
678   \begingroup
679   \setbox\mplibscratchbox\hbox

```



```

680     {\font\temp=#1 at #2bp%
681       \temp
682       #3}%
683 \setbox\mplibscratchbox\hbox
684   {\hskip#4 bp%
685     \raise#5 bp%
686     \box\mplibscratchbox}%
687 \wd\mplibscratchbox0pt%
688 \ht\mplibscratchbox0pt%
689 \dp\mplibscratchbox0pt%
690 \box\mplibscratchbox
691 \endgroup
692 }

    That's all folks!
693 \</package>

```

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