Sketching free-hand, importing into TikZ

Asked 5 years, 9 months ago Modified today Viewed 5k times

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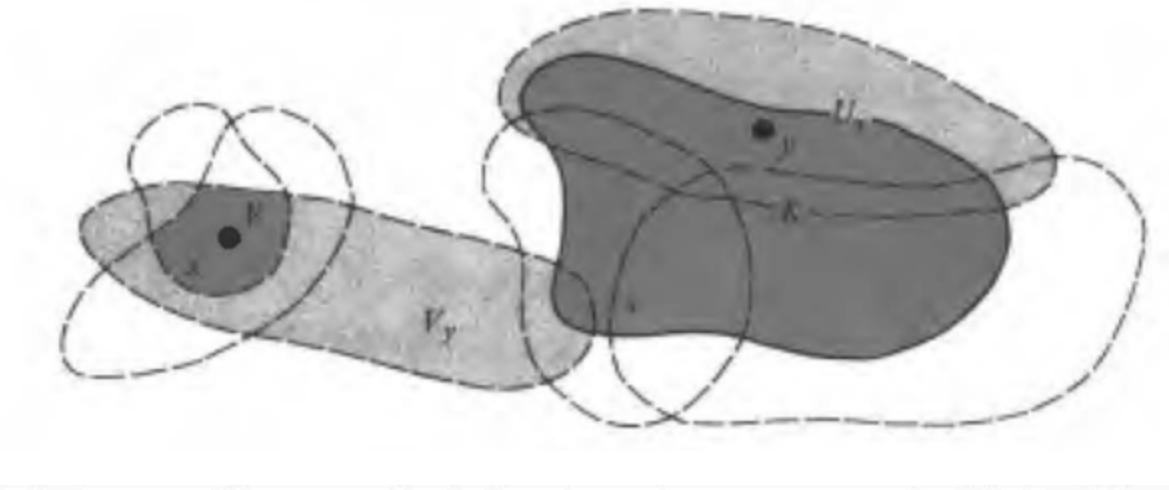
I need to reproduce various 2D and3D figures, such as the ones shown below, which were originally hand-drawn. Parts of each figure can clearly be done directly with `TikZ` code, but other parts, especially irregular "curvy" parts, would be more easily created by hand drawing.

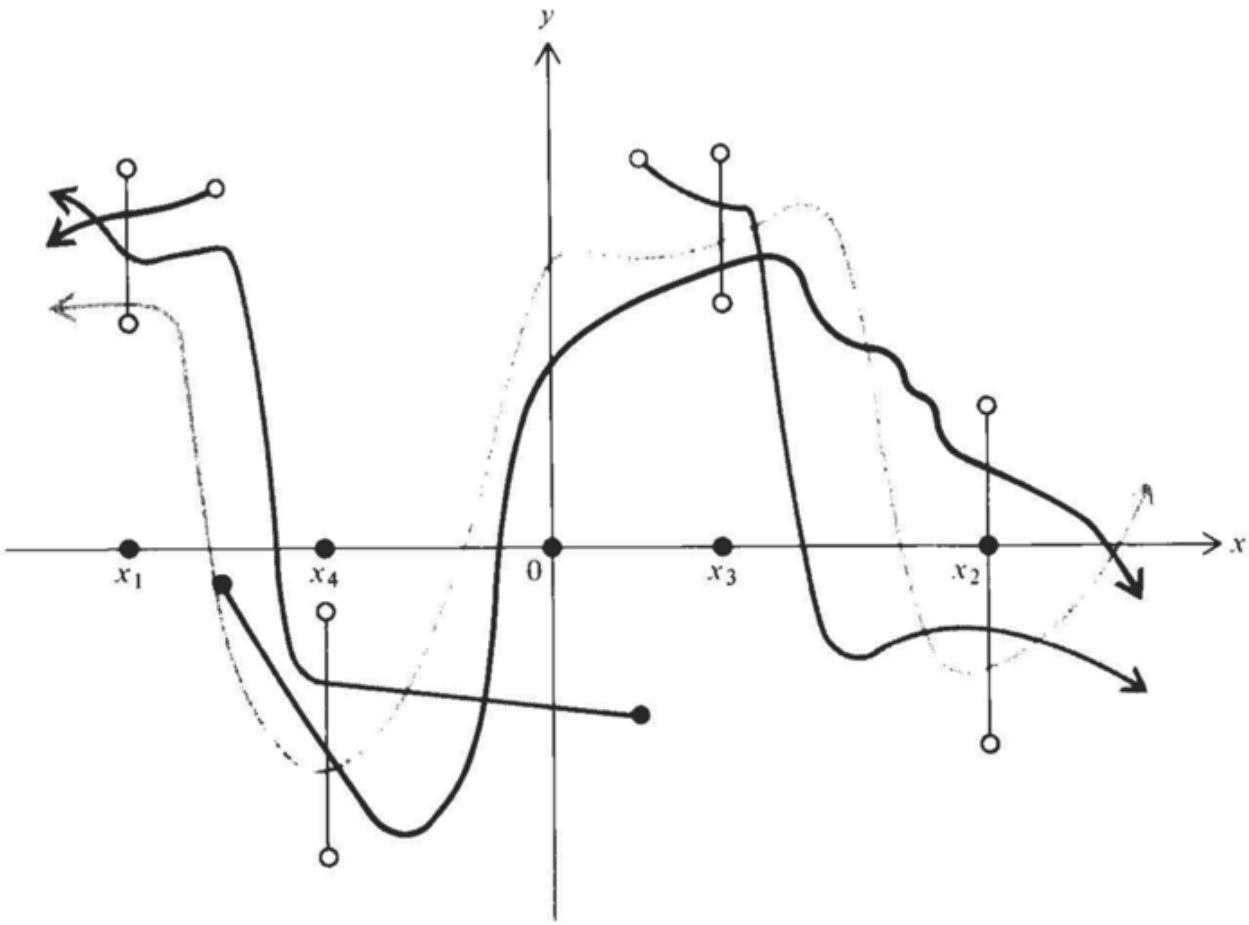
Note that I will be modifying some of these figures and creating new ones as well that have both regular, readily-codeable parts (including mathematical notation) and irregular, "curvy" parts.

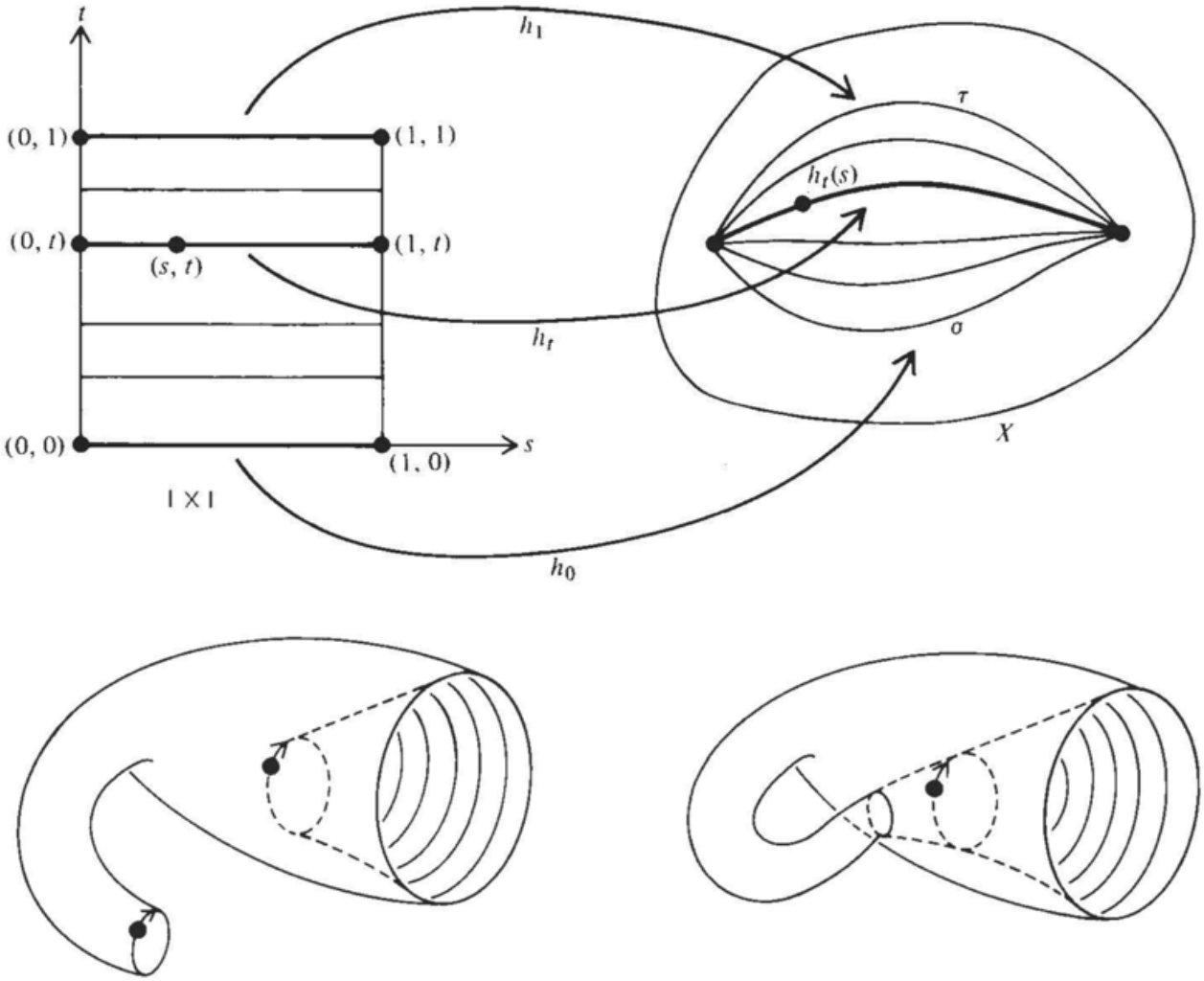
I envision a work-flow in which those "curvy" parts are constructed with a drawing app on an iPad Pro.

Question: Is there some iOS app for iPad Pro from which free-hand drawings of the "curvy" parts could readily be converted into `TikZ` code that could be added to the parts that are best constructed directly in `TikZ` ? Or is there some better way?

Note: I am *not* asking for `TikZ` code to create these figures! Rather, I am asking about a technological methodology leading to that code.


U_y
y
x
V_x


y
x
x_1
x_4
0
x_3
x_2



tikz-pgf graphics

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asked Jun 9, 2018 at 21:34

murray
7,924 6 33 79

5 inkscape has two features that combined could help: raster image tracing and tikz export. The tracing takes a bitmap and produces svg curves that approximate it. The tikz export outputs some tikz code equivalent to the svg – Bordaigorl Jun 9, 2018 at 21:39

Do you want to do everything with the iPad or only draw things there? In the latter case, there is `potrace` which can convert a black/white figure to vector graphics, and this can then be converted to (unfortunately far from optimal) Ti*k*Z code with inkscape. Notice also that really nice Klein bottles can be made with asymptote. – user121799 Jun 9, 2018 at 21:39

Must admit, it's something I've been pondering doing for a while. I have a prototype that produces code for my knots library, but needs a bit of work to make it a general TikZ code producer. I'm guessing that the import part is generating the curves, but not particularly the styles of the codes - that can be added in the TeX document later. – Andrew Stacey Jun 9, 2018 at 21:50

@marmot: I presume the optimal way would be to do just the "drawing" on the iPad (Pro). But I'm open to suggestions! – murray Jun 9, 2018 at 21:59

1 I would not think it especially worth the trouble to use the work-flow you describe. Either draw them using code or draw them free-hand and convert: I would bother doing some bits one way and some another. The diagrams are pretty simple and I don't see why curves should be particularly problematic. – cfr Jun 9, 2018 at 22:57

3 Answers

Sorted by: Highest score (default)

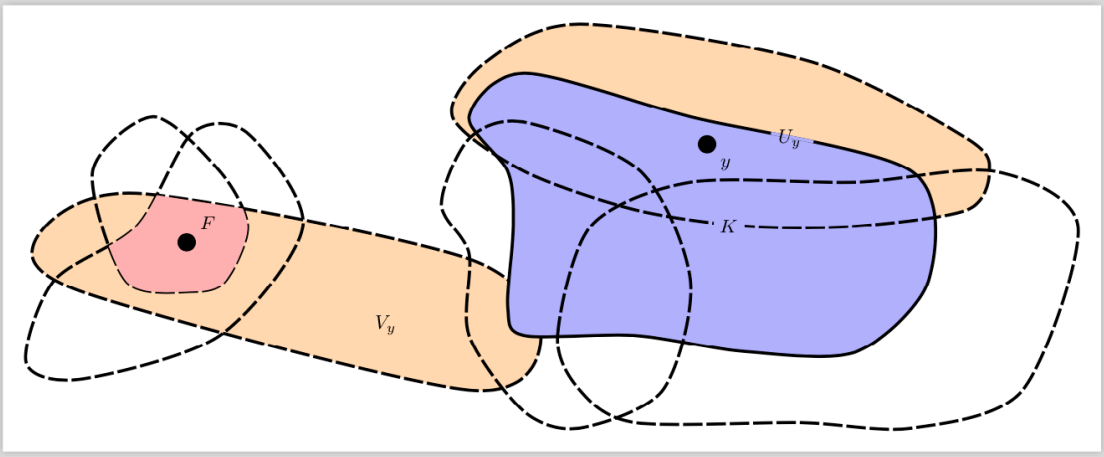
15

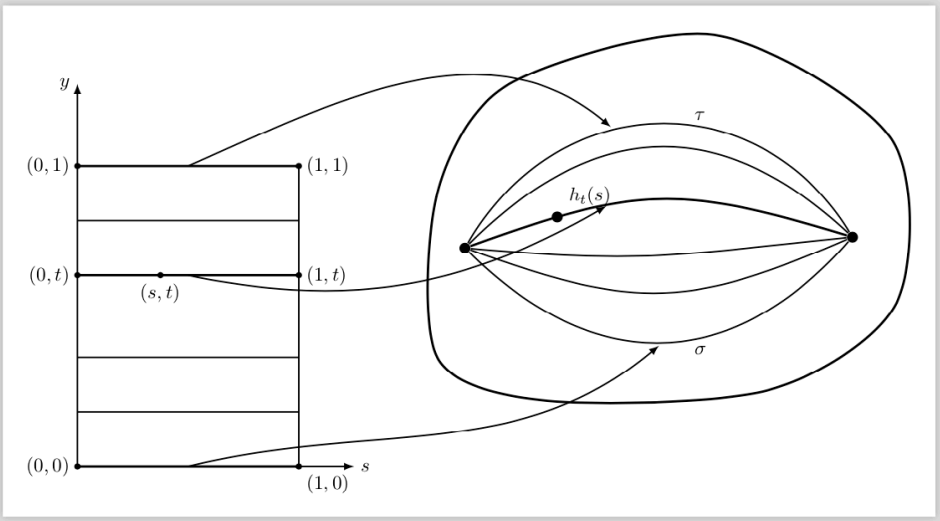
Not an answer and really just for fun. I understand that you did not ask for the codes. The main purpose of this is to substantiate the claim that it is not too difficult to draw these irregular shapes with elementary Ti*k*Z syntax. Here are some reproductions of two of the figures of your list.

```
\documentclass[tikz,border=3.14mm]{standalone}
\usetikzlibrary{calc,intersections,arrows.meta}
\usepackage{pgfplots}
\usepgfplotslibrary{fillbetween}
\begin{document}
\begin{tikzpicture}[long dash/.style={dash pattern=on 10pt off 2pt}]
\draw[ultra thick,long dash,name path=left,fill=orange!30] plot[smooth cycle]
coordinates
{(0.3,-2) (-1,-3) (-8,-1.2) (-8.8,-0.2) (-7,0.6) (-1,-0.6)};
\draw[ultra thick,long dash,name path=left bottom] plot[smooth cycle]
coordinates
{(-8,-2.8) (-9,-2.5) (-8.5,-1) (-7,0) (-6,1.7) (-5,1.7) (-4,-0) (-5.5,-2)};
\draw[ultra thick,long dash,name path=left top] plot[smooth cycle] coordinates
{(-7.2,-1) (-7.8,1) (-6.7,2) (-5.5,1) (-5,0) (-5.4,-1) (-6,-1.2)};
\path [%draw,blue,ultra thick,
    name path=left arc,
    intersection segments={
        of=left top and left,
        sequence={A1--B1}
    }];
\path [%draw,red,ultra thick,
    fill=red!30,
    name path=left blob,
    intersection segments={
        of=left bottom and left arc,
        sequence={A1--B0}
    }];
\node[fill,circle,label=above right:$F$] at (-6.1,-0.3){};
\node at (-2.5,-1.8){$V_y$};
% right part
\path[fill=orange!30] plot[smooth cycle] coordinates
{(-1.3,2) (-0.7,3) (1,3.7) (5.2,3) (8,1.6) (8.4,1) (8,0.3) (6,0) (4,0) (2,0.3)
```

```
(0,1)};
\path[fill=blue!30] plot[smooth cycle] coordinates
{(0,-2) (-0.3,-1.5) (-0.2,0) (-0.3,1) (-1,2) (0,2.8) (3,2) (7,1) (7.3,-1)
(6,-2.3) (4,-2.3) (2,-2)};
\draw[ultra thick,long dash,name path=right top] plot[smooth cycle] coordinates
{(-1.3,2) (-0.7,3) (1,3.7) (5.2,3) (8,1.6) (8.4,1) (8,0.3) (6,0) (4,0) (2,0.3)
(0,1)};
\draw[ultra thick,name path=right] plot[smooth cycle] coordinates
{(0,-2) (-0.3,-1.5) (-0.2,0) (-0.3,1) (-1,2) (0,2.8) (3,2) (7,1) (7.3,-1)
(6,-2.3) (4,-2.3) (2,-2)};
\draw[ultra thick,long dash,name path=middle] plot[smooth cycle] coordinates
{(0,-3.4) (-1,-2) (-1,-0.5) (-1.5,0.4) (-1,1.6) (0,1.9) (2.1,1) (3,-1) (2.5,-3)
(1,-3.7)};
\draw[ultra thick,long dash,name path=right bottom] plot[smooth cycle]
coordinates
{(1,-3) (0.6,-2) (1.2,0) (3,0.8) (6,0.8) (8.5,1) (10,0) (9,-3) (7,-3.7)
(5,-3.6) (2,-3.6)};
\path[name path=circle] (5.2,1.5) arc(-30:190:4mm);
\path [%draw,red,ultra thick,
    name path=aux1,
    intersection segments={
        of=circle and right,
        sequence={B1}
    }];
\path [draw,blue!30,ultra thick,
    name path=aux2,
    intersection segments={
        of=circle and aux1,
        sequence={B0}
    }];
\node at (4.8,1.6){$U_y$};
\node[fill,circle,label=below right:$y$] at (3.3,1.5){};
\node[fill=blue!30] at (3.7,0){$K$};
\end{tikzpicture}

\begin{tikzpicture}[thick]
\draw[-latex] (0,0) -- (5,0) node[right]{$s$};
\draw[-latex] (0,0) -- (0,7) node[left]{$y$};
\draw (4,0) -- (4,5.5);
\foreach \X in {1,2,4.5}
{\draw (0,\X) -- (4,\X);}
\foreach \X/\Y [count=\Z]in {0/0,3.5/t,5.5/1}
{
\ifnum\Z=1
\draw[very thick,fill] (0,\X) circle(1pt) node[left]{$(0,\Y)$} -- (4,\X)
coordinate[midway,below] (l1) circle(1pt)
node[below right]{$(1,\Y)$};
\else
\draw[very thick,fill] (0,\X) circle(1pt) node[left]{$(0,\Y)$} -- (4,\X)
\ifnum\Z=2
```

```
coordinate[midway,below] (l3)
\fi
\ifnum\Z=3
coordinate[midway,above] (l2)
\fi
circle(1pt)
node[right]{$(1,\Y)$};
\fi
}
\draw[fill,very thick] (1.5,3.5) circle (1pt) node[below] {$(s,t)$};
\begin{scope}[xshift=6.5cm]

 \draw[very thick] plot[smooth cycle] coordinates
 {(0,2) (0,5) (1.3,7) (5,7.9) (8.2,6) (8.3,3) (6,1.4) (2,1.2)};
 \node[circle,fill,scale=0.6] (L) at (0.5,4){};
 \node[circle,fill,scale=0.6] (R) at (7.5,4.2){};
 \foreach \X in {-45,-20,-5,45,60}
 {\pgfmathsetmacro{\Y}{180-\X+4*rnd}
 \draw (L) to[out=\X,in=\Y,looseness=1.2]  (R);
 \ifnum\X=-45
 \path  (L) to[out=\X,in=\Y,looseness=1.2] coordinate[pos=0.5,below] (r1)
 node[pos=0.6,below]{$\sigma$} (R);
 \fi
 \ifnum\X=60
\path  (L) to[out=\X,in=\Y,looseness=1.2] coordinate[pos=0.4,above] (r2)
 node[pos=0.6,above]{$\tau$} (R);
 \fi
 }
 \draw[very thick] (L) to[out=20,in=163,looseness=1.2]
 node[pos=0.2,circle,fill,scale=0.6,label=above right:$h_t(s)$]{}
 coordinate[pos=0.35] (r3) (R);
\end{scope}
\draw[-latex,shorten >=2pt] (l1) to[out=14,in=220] (r1);
\draw[-latex,shorten >=2pt] (l2) to[out=24,in=140] (r2);
\draw[-latex,shorten >=2pt] (l3) to[out=-12,in=210] (r3);
\end{tikzpicture}

\end{document}
```



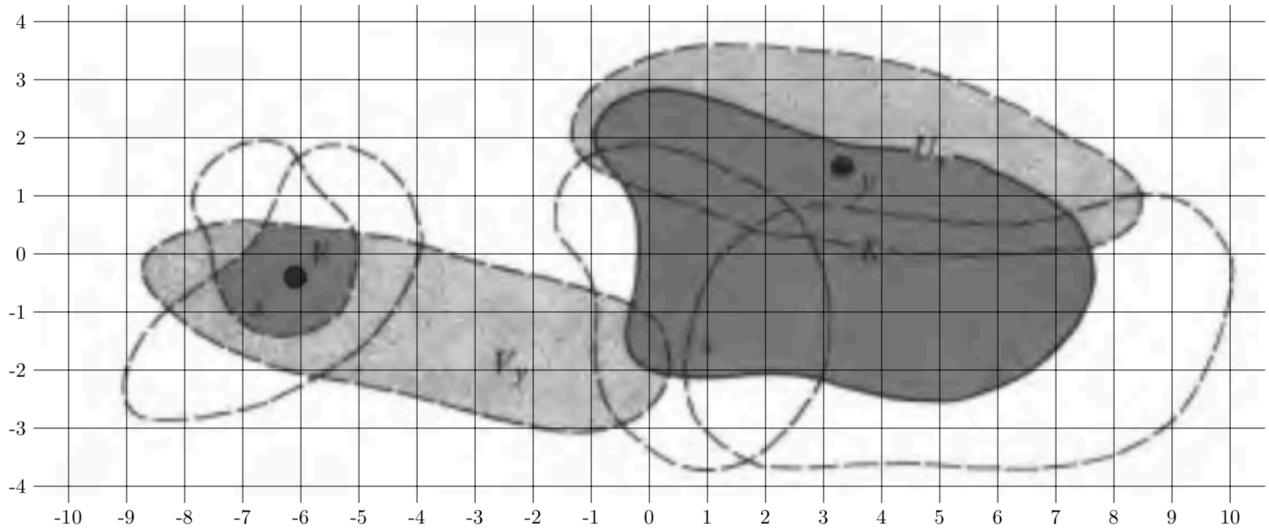


They should illustrate that with Ti*k*Z you can do all sorts of cool things like computing intersections of lines and/or surfaces. Of course, you may do similar things with some graphics software, but IMHO the advantage of this approach is that you only need to change one thing to have global changes. For instance, if you do not like the lengths of the dashes all you need to do is to redefine the style. And last but not least I think it is more fun to do it that way. I understand of course that others may not share that opinion.

ADDENDUM: A proposal to convert freehand graphics to "nice(r)" Ti*k*Z code. First save your freehand graphics in some format, here I will call the file `tmp.png` (for which I just took the first of your pictures). Then include it into a Ti*k*Z picture and read off some coordinates for `smooth cycles` etc.

```
\documentclass[tikz,border=3.14mm]{standalone}
\usetikzlibrary{calc}
\begin{document}
\begin{tikzpicture}
\node  (tmp)  {\includegraphics{tmp.png}};
\draw (tmp.south west) grid (tmp.north east);
\draw let \p1=(tmp.south west), \p2=(tmp.north east) in
\pgfextra{\pgfmathsetmacro{\xmin}{int(\x1/1cm)}
```

```
\pgfmathsetmacro{\xmax}{int(\x2/1cm)}
\pgfmathsetmacro{\ymin}{int(\y1/1cm)}
\pgfmathsetmacro{\ymax}{int(\y2/1cm)}
\typeout{\xmin,\xmax}}
\foreach \X in {\xmin,...,\xmax} {(\X,\y1) node[anchor=north] {\X}}
\foreach \Y in {\ymin,...,\ymax} {(\x1,\Y) node[anchor=east] {\Y}};
\end{tikzpicture}
\end{document}
```



Most likely one could write a code that extracts some coordinates along the contours. I guess that with machine learning it will be possible very soon to let the computer do that. It is painful, yes, at present to do that by hand but not super painful. (And I apologize in advance if someone already has done the thing with the automatic grid with labels, I could not find it so I wrote it quickly myself. In the examples I found the range of the tick labels was hard coded.)

Share Improve this answer Follow edited Jun 10, 2018 at 15:12 answered Jun 10, 2018 at 5:43 user121799

1 How did you determine all those coordinate pairs for the curves? That's the part of such figures that seem to me painfully difficult to get, as opposed to just drawing the curves in a sketching app. – murray Jun 10, 2018 at 14:55

1 @murray I added a possible way to get the coordinates. – user121799 Jun 10, 2018 at 15:12

2 Superimposing a Ti*k*Z grid on an imported `.png` like you show is enormously helpful to me as a way forward. – murray Jun 10, 2018 at 19:45

2 @murray I would love to make this automatic by converting the pic to some automatic (but IMHO ugly) Ti*k*Z code and then get the coordinates then with a routine (by computing the intersections with the grid, say), but sadly I never succeeded in installing the plugin that allows me to do that. Anyway, I think sooner or later there will be some software that recognizes something is a circle and then just draws a circle, say, instead of drawing a path with zillions of data point obtained by `potrace`. – user121799 Jun 10, 2018 at 20:42

1 Did you use that grid to get coordinates for the 2nd of the two `tikzpicture` s? I ask because the grid appears to have equal x- ad y-scales, yet the picture does not (the y-axis is stretched, so that the square in my original `png` becomes a rectangle that's taller than wide. – murray Jun 10, 2018 at 22:04

2

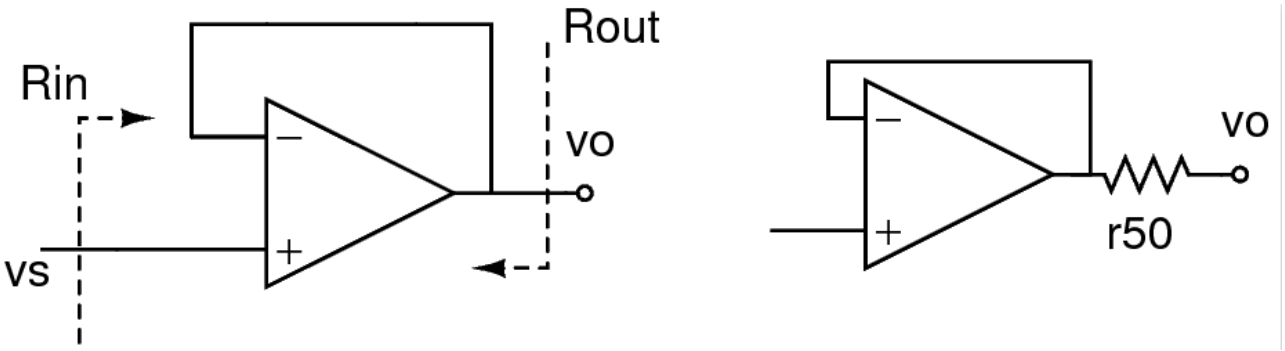
You have to weight in the initial effort and the maintenance one. @marmot answer is the way to go if you think you'll need to modify the diagrams a lot in the future.

If you think you'll never change the hand-made graphics, maybe a simple solution like importing them and writing over them with `tikz` , using an help grid, is the fastest way.

A possible intermediate solution is a jump to the past and use a solution based on `psfrag` . Notice that this package does not work (and cannot work) with a modern engine, so a bit of tricks must be used.

`psfrag` was nice, because it let you substitute strings in an `.eps` file with LaTeX construct (whatever). I used it to enhance the output of my circuits drawn with `xcircuit` (which is so fast to use I never found something better; although I am trying to move to `tkcircuitz` now I have such a big trove of circuits...).

I'll show you by example. I drew this circuit with labels in plain text; suppose it's called `buffer.eps` :



and then I write a "substitution file" for it, call it `buffer-psfrag.eps` :

```
\mypsf{r50}{\SI{50}{\ohm}}
```

and I have a generic `psfragdefinitions.tex` :

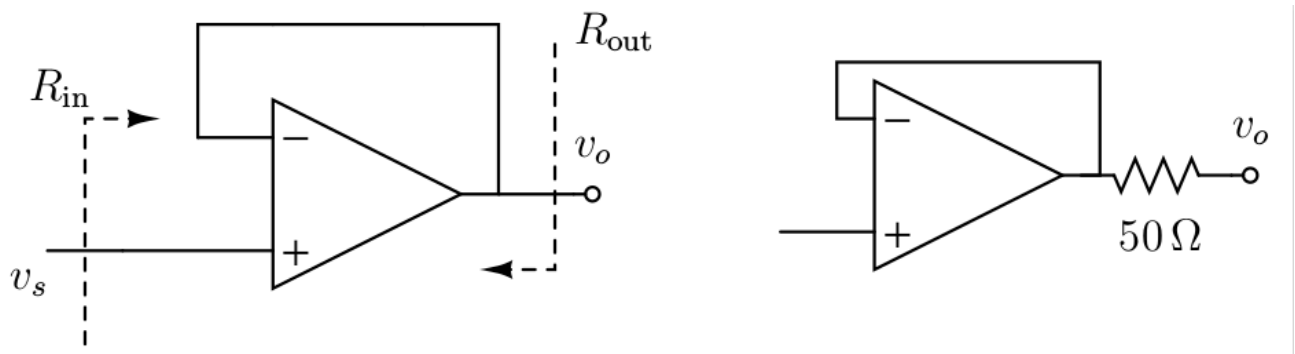
```
%%
%% psfrag and general replacements
%%
\newcommand{\psfscale}{1.2}

\newcommand{\mypsf}[2]{%
```

```
  \psfrag{#1}[Bl][Bl][\psfscale]{#2}
}

\mypsf{R}{$R$}
\mypsf{R1}{$R_1$}
\mypsf{R2}{$R_2$}
\mypsf{Rin}{$R_\mathrm{in}$}
\mypsf{Rout}{$R_\mathrm{out}$}
\mypsf{E}{$E$}
\mypsf{I}{$I$}
\mypsf{vo}{$v_o$}
\mypsf{vs}{$v_s$}
\mypsf{vi}{$v_i$}
\mypsf{v+}{$v^+$}
\mypsf{v-}{$v^-$}
\mypsf{L+}{$L^+$}
\mypsf{L-}{$L^-$}

\endinput
```

Then I use a python script I wrote (appended at the end of this answer) that call old `latex` and perform `dvi -> ps -> pdf` transformation trying to embed and subset all fonts (I had problems with that...):

```
./epsfragtopdf.py buffer.eps
```

to obtain:



Once you have a well-structured set of include scripts and a Makefile to automate it it's really fast; labels are often repeated and so you have to write the psfrag files just once.

I suppose you can do the same with whatever app that let you hand-drawing, add labels and save to Encapsulated Postscript.

The script called with `subdir/name.eps` will use `psfrag` definitions found in `./psfragdefinitios.tex` , then `subdir/psfragdefinitions.tex` and finally `name-psfrag.tex` :

```
#!/usr/bin/env python3
#
import sys
import os
import argparse
import tempfile
import subprocess
import shutil
#
latex_pre=r"""\documentclass[12pt]{article}
\usepackage{graphicx,psfrag}
\usepackage[active,tightpage]{preview}
\usepackage{siunitx}
"""
latex_med=r"""\pagestyle {empty}
\begin{document}
\centering\null\vfill
\begin{preview}
"""
latex_post=r"""\end{preview}
\vfill
\end{document}

"""
global_def_fname="psfragdefinitions.tex"
local_def_post="-psfrag"
latex_cmd="TEXINPUTS=$TEXINPUTS:../ latex -interaction nonstopmode go.tex
>/dev/null 2>&1"
dvips_cmd="dvips go.dvi >/dev/null 2>&1"
ps2pdf_cmd="ps2pdf -dPDFSETTINGS=/prepress -dEmbedAllFonts=true -
dSubsetFonts=true go.ps >/dev/null 2>&1"
#
# Main
#
parser = argparse.ArgumentParser(description='Convert eps to pdf using psfrag')
parser.add_argument('--force', dest='force', action='store_true',
default=False,
                    help='force conversion even if the PDF is newer (default:
false)')
parser.add_argument('epsfiles', metavar='eps_file', nargs='+',
                    help='files to be converted')
args = parser.parse_args()
for filepath in args.epsfiles:
    filedir, filename = os.path.split(filepath)
    filebase, fileext = os.path.splitext(filename)
    # print ("dir:", filedir, " base:", filebase, " ext:", fileext)
    if fileext!= ".eps":
        print(filepath, "does not end in .eps, skipped")
        continue
```

```
    if not os.path.exists(filepath):
        print(filepath, "does not exists, skipped")
        continue
    targetfilename = filebase + ".pdf"
    targetfilepath = os.path.join(filedir, targetfilename)
    if os.path.exists(targetfilepath) and not args.force and
os.path.getmtime(targetfilepath)>os.path.getmtime(filepath):
        print(targetfilepath, "is newer than", filepath, ", skipped")
        continue
    print("processing", filepath, "to", targetfilepath)
    tmpdir = tempfile.mkdtemp(dir=".")
    # tmpdir = "tmp"
    if not os.path.exists(tmpdir):
        os.mkdir(tmpdir)
    latexf = open(os.path.join(tmpdir,"go.tex"),"w")
    latexf.write(latex_pre)
    # search the file-definitions in the current dir, in the target dir
    if os.path.exists(global_def_fname):
        latexf.write("\\input{%s}\n" % os.path.join("..",global_def_fname))
        print("including",  global_def_fname)
    if filedir!="" and os.path.exists(os.path.join(filedir, global_def_fname)):
        latexf.write("\\input{%s}\n" % os.path.join("..", os.path.join(filedir,
global_def_fname)))
        print("including",  os.path.join(filedir, global_def_fname))
    # search specific file-definition
    specfpath = os.path.join(filedir, filebase + local_def_post + ".tex")
    if os.path.exists(specfpath):
        latexf.write("\\input{%s}\n" % os.path.join("..", specfpath))
        print("including",  specfpath)
    latexf.write(latex_med)
    latexf.write("\\includegraphics{%s}\n" % os.path.join("..",filepath))
    latexf.write(latex_post)
    latexf.close()
    # now we build the figure
    subprocess.check_call(latex_cmd, cwd=tmpdir, shell=True)
    subprocess.check_call(dvips_cmd, cwd=tmpdir, shell=True)
    subprocess.check_call(ps2pdf_cmd,cwd=tmpdir,  shell=True)
    # now we copy the file back where it should be
    shutil.copy(os.path.join(tmpdir,"go.pdf"), targetfilepath)
    shutil.rmtree(tmpdir)
```

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edited Jun 10, 2018 at 8:49

answered Jun 10, 2018 at 8:44

Rmano
40.6k 3 63 124

External drawing programs (mostly with a mouse, not by hand sketch)

0

These are all listed in Is There an Online Diagram Graphical Editor that Produces the Corresponding LaTeX Code? or What You See is What You Get (WYSIWYG) for PGF/TikZ? or What GUI applications are there to assist in generating graphics for TeX? .

- Mathcha
- GeoGebra
- ktikz/qtikz
- Dia
- Inkscape
- TikZit
- Cirkuit
- TikZedt
- more miscellaneouses tools...

yEd

> yEd is a general-purpose graph editor that can import a variety of file formats, including images of hand-drawn graphs. It has a feature to export the graph as TikZ code, which you can then include in your LaTeX document. While it is not able to perfectly recreate the hand-drawn graph, it can save you a significant amount of time and effort compared to manually recreating the graph in TikZ.

FreeTikZ

> FreeTikz is a web-based tool to convert hand-drawn diagrams into tikz code. Click here to run.

Credit: https://tex.stackexchange.com/a/670615/250119

Share Improve this answer Follow answered 2 hours ago community wiki user202729

Reposting this here because there are way too many duplicates scattered around and this is the highest-voted question. – user202729 2 hours ago

TikZedt is no more maintained and freetikz.sty is not on CTAN. Since this is a new answer it should be up-to-date. – CarLaTeX 2 hours ago

@CarLaTeX FreeTikZ is never on CTAN, it's supposed to be downloaded from the website. TikZedt is no longer maintained, but still usable as is. (there are lots of LaTeX packages that hadn't been changed in decades as well) – user202729 2 hours ago

Sorry, I don't trust packages that aren't on CTAN. TikZedt is usable but very buggy, unfortunately. – CarLaTeX 2 hours ago