

How to make informative figures, purty pictures, and waste time with free and open source software

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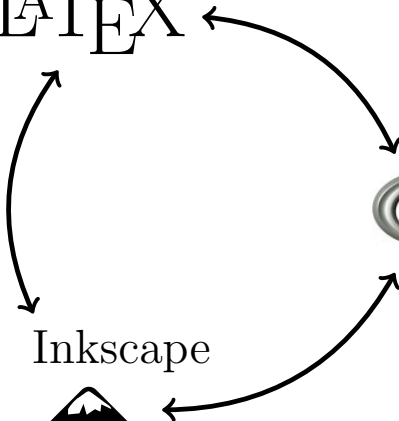
Quantitative Ecology and Resource Management
University of Washington

May 7, 2008

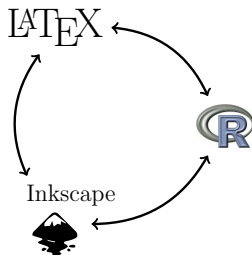
L^AT_EX



Inkscape



L^AT_EX packages TikZ & PGF



```
\begin{tikzpicture}[auto,bend left]
  \node (R)      at (0:1) {\includegraphics[width=.2in]{Rlogo.jpg}};
  \node (latex) at (120:1) {\LaTeX};
  \node [text width=1cm] (ink) at (240:1){Inkscape
                                     \includegraphics[width=.2in]{inkscape.logo.pdf}};

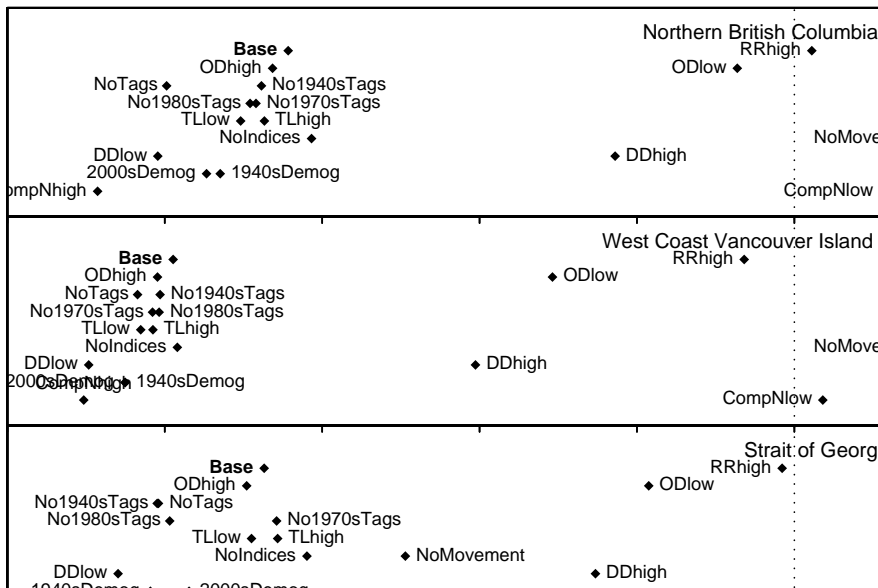
  \path (R)      edge[very thick,<->] (Inkscape)
        (ink)    edge[very thick,<->] (latex)
        (latex)  edge[very thick,<->] (R);
\end{tikzpicture}
```

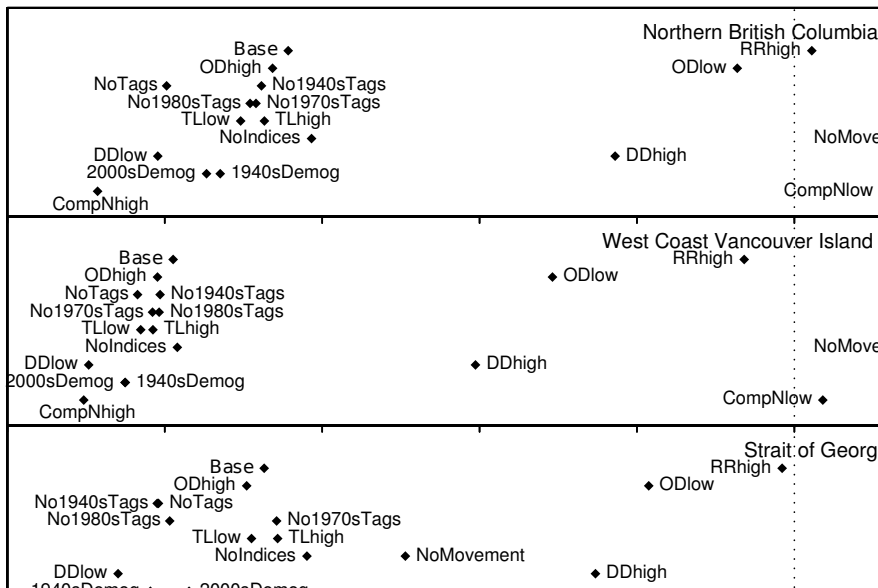
Inkscape

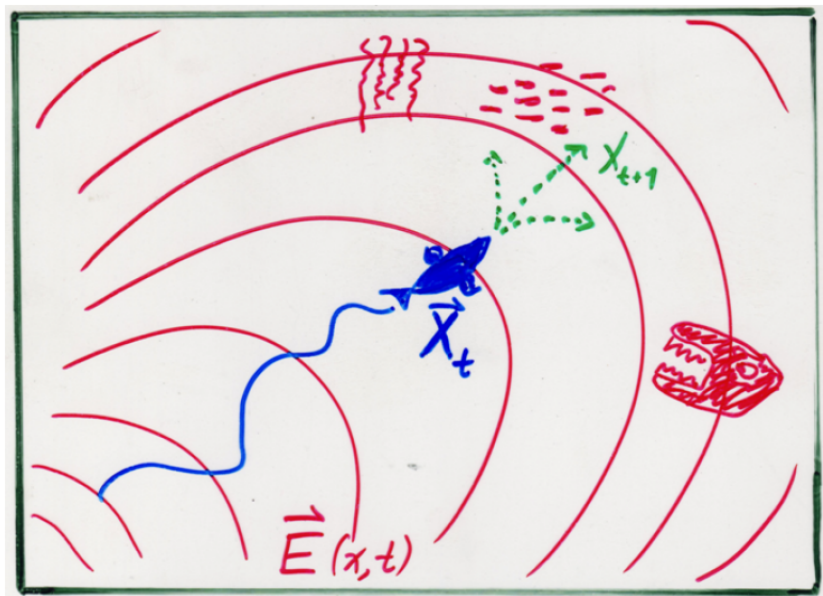


- ▶ Inkscape is a vector graphics editor application.
- ▶ “Vector graphics is the use of geometrical primitives such as points, lines, curves, and shapes or polygon(s), which are all based upon mathematical equations, to represent images in computer graphics.”¹
- ▶ Two key features I’m aware of so far:
 - ▶ edit PDF
 - ▶ trace bitmap.

¹http://en.wikipedia.org/wiki/Vector_graphics

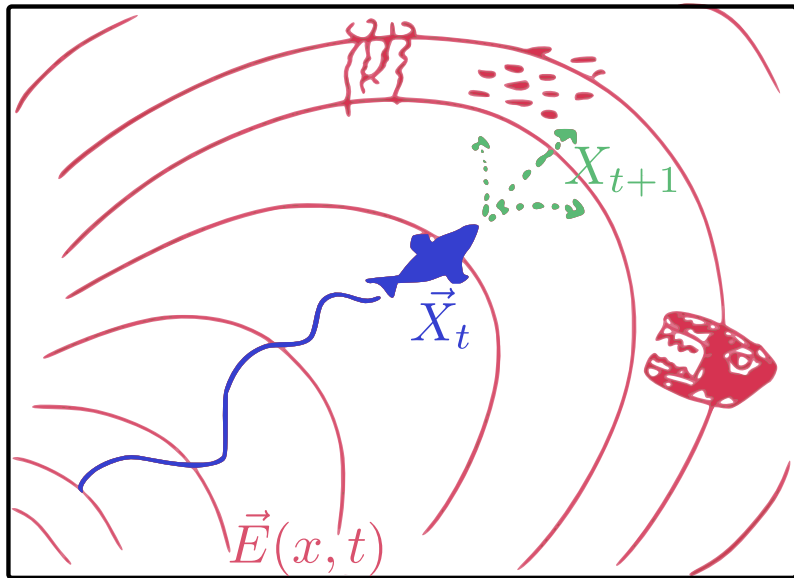






 \rightarrow L^AT_EX

trace bitmap, add text



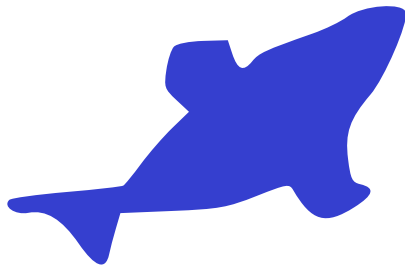


trace bitmap, export



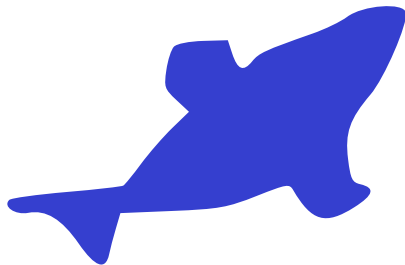


trace bitmap, export





trace bitmap, export



“Vector graphics is the use of geometrical primitives such as points, lines, curves, and shapes or **polygon(s), which are all based upon mathematical equations**, to represent images in computer graphics.”

```

%LaTeX with PSTricks extensions
%%Creator: inkscape 0.46
%%Please note this file requires PSTricks extensions
\psset{xunit=.5pt,yunit=.5pt,runit=.5pt}
\begin{pspicture}(200,150)
{
  \newrgbcolor{curcolor}{0.20784314 0.24705882 0.81176472}
  \pscustom[linestyle=none,fillstyle=solid,fillcolor=curcolor]
  {
    \newpath
    \moveto(62.481523,45.57681)
    \curveto(58.004483,52.025789)(53.961043,54.497499)(49.314352,53.625779)
    \curveto(45.893402,52.984009)(42.555682,55.26854)(44.389722,56.99648)
    \curveto(44.888912,57.46679)(51.594992,58.38924)(59.292123,59.04637)
    \curveto(66.989253,59.70349)(73.636733,60.45735)(74.064303,60.7216)
    \curveto(74.491873,60.98585)(76.565533,63.53184)(78.672443,66.37934)
    \curveto(80.779343,69.22684)(84.447673,73.44041)(86.824283,75.74284)
    \lineto(91.145383,79.92908)
    \lineto(87.858773,82.99922)
    \curveto(84.764683,85.88954)(84.612583,86.34723)(85.262193,90.81299)
    \curveto(85.641703,93.42198)(86.525463,96.14864)(87.226113,96.87223)
    \curveto(87.971723,97.64226)(91.145193,98.26432)(94.878463,98.37223)
    \lineto(101.25692,98.55661)
    \lineto(102.39403,95.10098)
    \curveto(103.80439,90.81498)(105.30864,90.23153)(107.61264,93.07685)
    \curveto(109.3492,95.2214)(110.90552,95.93584)(123.29734,100.27701)
    \curveto(126.59734,101.43308)(130.64734,103.38913)(132.29734,104.62379)
    \curveto(136.41234,107.70295)(147.05384,108.47965)(147.60432,105.74101)
    %...six lines cut out...
    \curveto(101.09076,54.99221)(99.030263,54.62606)(86.797343,54.117669)
    \lineto(73.297343,53.556609)
    \lineto(72.126123,49.55661)
    \curveto(71.481953,47.35661)(70.685873,44.31911)(70.357073,42.80661)
    \curveto(69.424843,38.5184)(66.721533,39.46928)(62.481523,45.57681)
    \closepath
  }
}
\end{pspicture}

```

```

# R code
fish = c(
  62.481523,45.57681,
  58.004483,52.025789,53.961043,54.497499,49.314352,53.625779,
  45.893402,52.984009,42.555682,55.26854,44.389722,56.99648,
  44.888912,57.46679,51.594992,58.38924,59.292123,59.04637,
  66.989253,59.70349,73.636733,60.45735,74.064303,60.7216,
  74.491873,60.98585,76.565533,63.53184,78.672443,66.37934,
  80.779343,69.22684,84.447673,73.44041,86.824283,75.74284,
  91.145383,79.92908,
  87.858773,82.99922,
  84.764683,85.88954,84.612583,86.34723,85.262193,90.81299,
  85.641703,93.42198,86.525463,96.14864,87.226113,96.87223,
  87.971723,97.64226,91.145193,98.26432,94.878463,98.37223,
  101.25692,98.55661,
  102.39403,95.10098,
  103.80439,90.81498,105.30864,90.23153,107.61264,93.07685,
  109.3492,95.2214,110.90552,95.93584,123.29734,100.27701,
  126.59734,101.43308,130.64734,103.38913,132.29734,104.62379,
  136.41234,107.70295,147.05384,108.47965,147.60432,105.74101,
  #...six lines cut out...
  101.09076,54.99221,99.030263,54.62606,86.797343,54.117669,
  73.297343,53.556609,
  72.126123,49.55661,
  71.481953,47.35661,70.685873,44.31911,70.357073,42.80661,
  69.424843,38.5184,66.721533,39.46928,62.481523,45.57681)

```

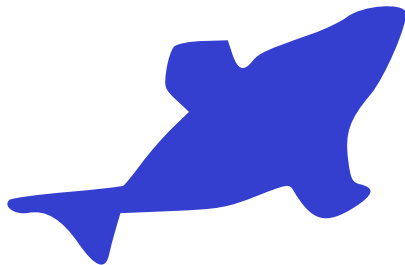
```

fish = matrix(fish,length(fish)/2,2,byrow=T)

```

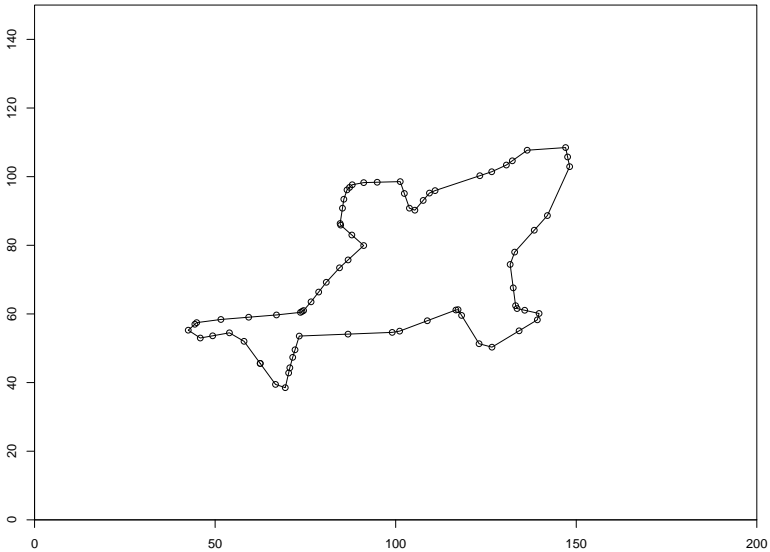


trace bitmap, export





trace bitmap, export





Rotation matrices:²

In matrix theory, a rotation matrix... is a real special orthogonal matrix. The name refers to the fact that an $n \times n$ rotation matrix corresponds to a geometric rotation about a fixed origin in an n -dimensional Euclidean space....

$$Q_{2 \times 2} = \begin{bmatrix} \cos \theta & -\sin \theta \\ \sin \theta & \cos \theta \end{bmatrix},$$

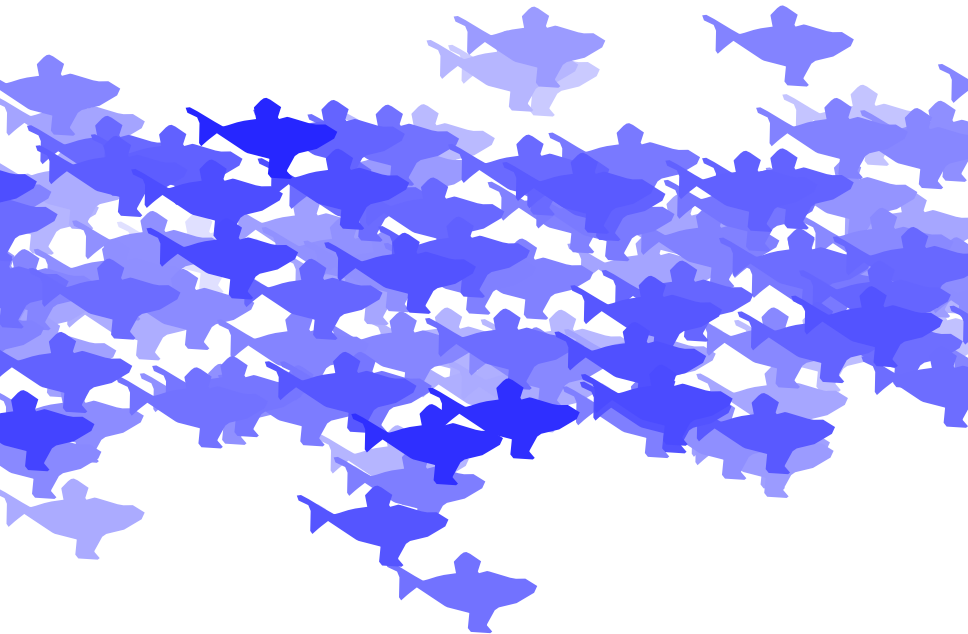
²http://en.wikipedia.org/wiki/Rotation_matrix



trace bitmap, export



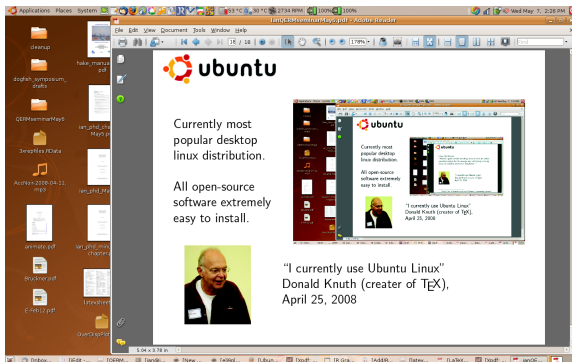
trace bitmap, export





Currently most popular desktop linux distribution.

All open-source software extremely easy to install.



"I currently use Ubuntu Linux"
Donald Knuth (creator of T_EX),
April 25, 2008

Books of Edward Tufte

One-day courses in Seattle July 17 & 18, 2008,
\$200 with student ID (includes copies of 4 books):
<http://www.edwardtufte.com/>.

