Diagram, graph and mindmap software

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We are going to talk about diagrams like this.

**Figure:** Flowchart

1. **Lamp doesn't work**
   - Lamp plugged in?
     - No: Plug in lamp
     - Yes: **Bulb burned out?**
       - Yes: Replace bulb
       - No: **Buy new lamp**
Figure: Neural network
No flow to receiver
No flow from Component B
No flow into Component B
No flow from Component A1
No flow from Component A2
Component B blocks flow
Component A1 blocks flow
Component A2 blocks flow

Figure: Fault-tree
Figure: Train diagram
Figure: Electrical circuit
Figure: Timing diagram
Then we are going to talk about graphs

Figure: XY graph
.. graphs

Figure: 3d graph
.. and even more graphs

Figure: Error bar
Who know what mindmap is?
Ways to create the diagram

- Paper, paint (M$ Paint, Gimp, Inkscape), CAD
- Office suits
- Specialized software
- Tex/Tikz/PSTricks
Office suits

+ Quick start
+ Quick draft
  - Align and distribute
  - Box size
  - Arrows (inclined, doesn’t come from the same place above)
OpenOffice vs. KOffice

**OOffice - Draw**

+ Connection points
+ Similar to usual office suits
  - Box types
  - Modification (possible but it will hurt you)

**KOffice - Kivio**

- Connection points
- Different from usual office suits
+ Box types
+ Modification (painfull but better than OOffice)
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**OOffice** Usable for drafts of flow diagrams

**KOffice** Usable for network or other unaligned diagrams
OpenOffice vs. KOffice

Figure: OpenOffice Draw diagram

Figure: KOffice Kivio diagram

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Diagram, graph and mindmap software
Fast
Easy to start with
A lot of box types
Good alignment & distribution
Connection points
  - Alignment with existing connections
  - No symbols in the text
  - Old and new box types together
  - Hard to insert own box
Figure: Dia - network diagram
Latex addon Tikz

Examples of what can you do and how are here:
http://www.texample.net/tikz/examples/all

+ Same font and style of diagrams and text
+ All symbols/equations inside of the diagram
+ Amazingly quick
+ A lot of box types
+ The best alignment & distribution
+ You can do anything you can imagine (- but nothing more)
  - Hard (for some impossible) to start with
  - Not a WYSIWYG (?KTikz?)
How to create a diagram using Tikz

1. Include package Tikz into your Latex document
2. Define which library you needs
3. Re/define styles
4. Start with tikzpicture environment (\begin{tikzpicture})
Tikz: Node

Node is a box you want to place somewhere and connect with other boxes/nodes

$\textbf{\$FORM}$ Defines the style of the box. You should probably start with the shape, color, text format, .... You can predefine them as shown in the example using

\begin{verbatim}
( \tikzstyle{$\textbf{\$NAME}} = \textbf{\$FORM} )
\end{verbatim}

$\textbf{\$POS}$ Specify where this node is placed. You can use absolute '(0,0)', relative '+ (2,0)' or direction based 'below of=$\textbf{\$NAME}$' definition.

$\textbf{\$NAME}$ Node name - used for bonds and position specification

$\textbf{\$TEXT}$ Text inside the box

\begin{verbatim}
\node [$\textbf{\$FORM}$] ($\textbf{\$NAME}$) {$\textbf{\$TEXT}$};
\node [$\textbf{\$FORM}$,$\textbf{\$POS}$] ($\textbf{\$NAME}$) {$\textbf{\$TEXT}$};
\path [$\textbf{\$FORM}$] ($\textbf{\$NAME}$) -- ($\textbf{\$NAME}$);
\path [$\textbf{\$FORM}$] ($\textbf{\$NAME}$) -| node [$\textbf{\$FORM}$] {$\textbf{\$TEXT}$} ($\textbf{\$NAME}$);
\path [$\textbf{\$FORM}$] ($\textbf{\$NAME}$) |- $\textbf{\$POS}$ -- ($\textbf{\$NAME}$);
\end{verbatim}
\documentclass{minimal}
\usepackage{tikz}
\usetikzlibrary{shapes,arrows}
\begin{document}
\tikzstyle{decision} = [diamond, draw, fill=blue!20, text width=4.5em, text badly centered, node distance=3cm, inner sep=0pt]
\tikzstyle{block} = [rectangle, draw, fill=blue!20, text width=5em, text centered, rounded corners, minimum height=4em]
\tikzstyle{line} = [draw, -latex']
\tikzstyle{cloud} = [draw, ellipse,fill=red!20, node distance=3cm, minimum height=2em]
\tikzstyle{call} = [draw, ellipse,fill=yellow!20, node distance=3cm, minimum height=2em]
\tikzstyle{answer} = [near start, color=black]
\begin{tikzpicture}[node distance = 3cm, auto]
% Nodes
\node [call] (update) { Update joint }; \\
\node [decision, below of=update] (act) {is active?}; \\
\node [decision, right of=act] (inv) {inv input?}; \\
\node [block, below of=inv] (plus) {angle += move}; \\
\node [block, right of=plus] (minus) {angle -= move}; \\
\node [decision, below of=plus] (high) {angle $\geq$ max}; \\
\node [decision, right of=high] (low) {angle $\leq$ min}; \\
\node [block, below of=high] (sethigh) {angle = max}; \\
\node [block, below of=low] (setlow) {angle = min}; \\
\node [call, below of=sethigh] (end) {End};
\end{tikzpicture}
\begin{tikzpicture}

\path [line] (update) -- (act);
\path [line] (act) |- node [answer] {no} (end);
\path [line] (act) -- node [answer] {yes} (inv);
\path [line] (inv) -- node [answer] {no} (plus);
\path [line] (inv) -| node [answer] {yes} (minus);
\path [line] (plus) -- (high);
\path [line] (minus) -| +(-1,-1) -| (high);
\path [line] (high) -- node [answer] {yes} (sethigh);
\path [line] (high) -- node [answer] {no} (low);
\path [line] (low) -- node [answer] {yes} (setlow);
\path [line] (low) -- +(2,0) |- node [answer] {no} (end);
\path [line] (sethigh) -- (end);
\path [line] (setlow) |- (end);

\end{tikzpicture} \end{document}
Figure: Tikz - flow diagram
Ways to create the graph

- Paper, graph paper
- Office suits
- Specialized/math software
- Tex/Tikz/PSTricks
Office suits nip

Use XY graph instead of line graph

Figure: OpenOffice XY graph with nonlinear ax X

Figure: OpenOffice line graph with nonlinear ax X
Use XY graph instead of line graph

Office suits are the best/fastest choice for ordinary/every day documents.
Specialized/math software

Octave/Matlab
- You can fill&process&output the data in one program
- Very flexible and technic-like style
- Better for custom/one-time measurement
- Better for 3d graph (slow, wait for the next slide)

GNUPlot
- You can collect the data and parse them directly into GNUPlot
- Even more flexible and technic-like style
- Better for automatic machine-processed measurement
Sometimes you don’t need the precise axes, but you just need to see the output.

- **Usage**
  - Robot workspace
  - More than 2D graph shape
  - ...

- **How to do it**
  - Use 3d program
  - Create the scene using custom parser

- **This example statistics**
  - Matlab: 3 days = 75% workspace
  - C: 6-30s = 100% workspace
  - Matlab: 1-10min draft; 1M years final graphical output
  - POV-Ray: 10-60s draft; 1-2 days final graphical output

**Figure:** 6 joints robot’s workspace generated using POV-Ray
Who know what mindmap is?
Some definitions

- A diagram used to represent words, ideas, tasks, or other items linked to and arranged around a central key word or idea [wikipedia]
- A creativity and structuring technique that focuses on the human mind and its assumed inner workings [mindmister]
- A way to take a notes from ⇔ to your brain [me]
Some definitions

- A diagram used to represent words, ideas, tasks, or other items linked to and arranged around a central key word or idea [wikipedia]
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So what is the mindmap? ←
Figure: Paper mindmap
Figure: Computer mindmap
3rd century BC Porphyry of Tyros made the first mind-map like picture to visualise Aristoteles’s concept of categories.

13th century Ramon Llull - “Tree of Knowledge”

15th century Leonardo da Vinci - non-linear way for note taking

20th century Developed the concept of semantic networks described the human learning, creativity and other functions of the brain.

1960-1974 Tony Buzan - 10 rules of mind mapping
Rules of Mind Mapping

1. Start in the centre with an image of the topic, using at least 3 colours.
2. Use images, symbols, codes and dimensions throughout your Mind Map.
3. Select key words and print using upper or lower case letters.
4. Each word/image must be alone and sitting on its own line.
5. The lines must be connected, starting from the central image. The central lines are thicker, organic and flowing, becoming thinner as they radiate out from the centre.
6. Make the lines the same length as the word/image.
7. Use colours – your own code – throughout the Mind Map.
8. Develop your own personal style of Mind Mapping.
9. Use emphasis and show associations in your Mind Map.
10. Keep the Mind Map clear by using radial hierarchy, numerical order or outlines to embrace your branches.
Figure: Freemind
Figure: Vym
Figure: http://bubbl.us/edit.php
Figure: http://mind42.com/about
Diagram and graph result

- Paper - great for thought sorting
- Office suits - one-time works
- Specialized software - easier to use
- Latex addons - hard to learn, very fast, organized and technical
Diagram and graph result

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- Paper + Latex - every day work
- Specialized software - once per year
- Office suits - secretarry, unstructuralized work
Mindmaps result

- Paper - very passionate, depends on your writing/painting skills
- Web-based - accessible, mostly passionate, less organized
- Vym-like - only on your computer, more passionate, less organized
- Freemind-like - only on your computer, less passionate, very nice structuralized
Mindmaps result

- Paper - very passionate, depends on your writing/painting skills
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- Freemind-like - notes taking, learning, planing, brainstorming
- Paper - thought sorting, every day planing, note taking
- Web-based - thought sharing, basic mindmaps creating
- Vym-like - Learning, abstract thoughts sorting...
Thank you for your attention
Graphs/diagrams
- http://www.texample.net/tikz/examples
- http://gnuplot.sourceforge.net/demo
- http://tug.ctan.org/tex-archive/macros/latex/contrib/timing
- wikipedia

Mind maps
- http://www.mindtools.com
- http://www.mindmeister.com/content/mindmapping
- http://www.mindmapinspiration.com/top-10
- wikipedia