Diagram, graph and mindmap software

Lukáš Doktor

2009-09-01

We are going to talk about diagrams like this

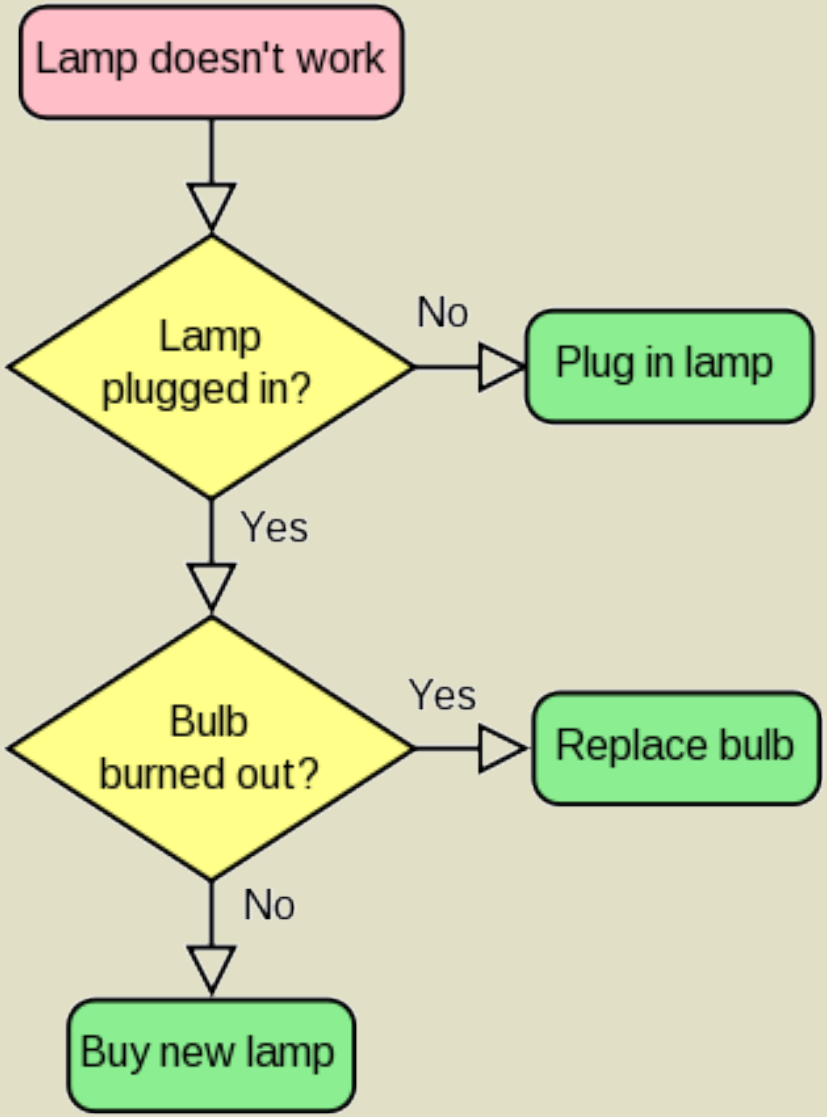


Figure: Flowchart

.. this

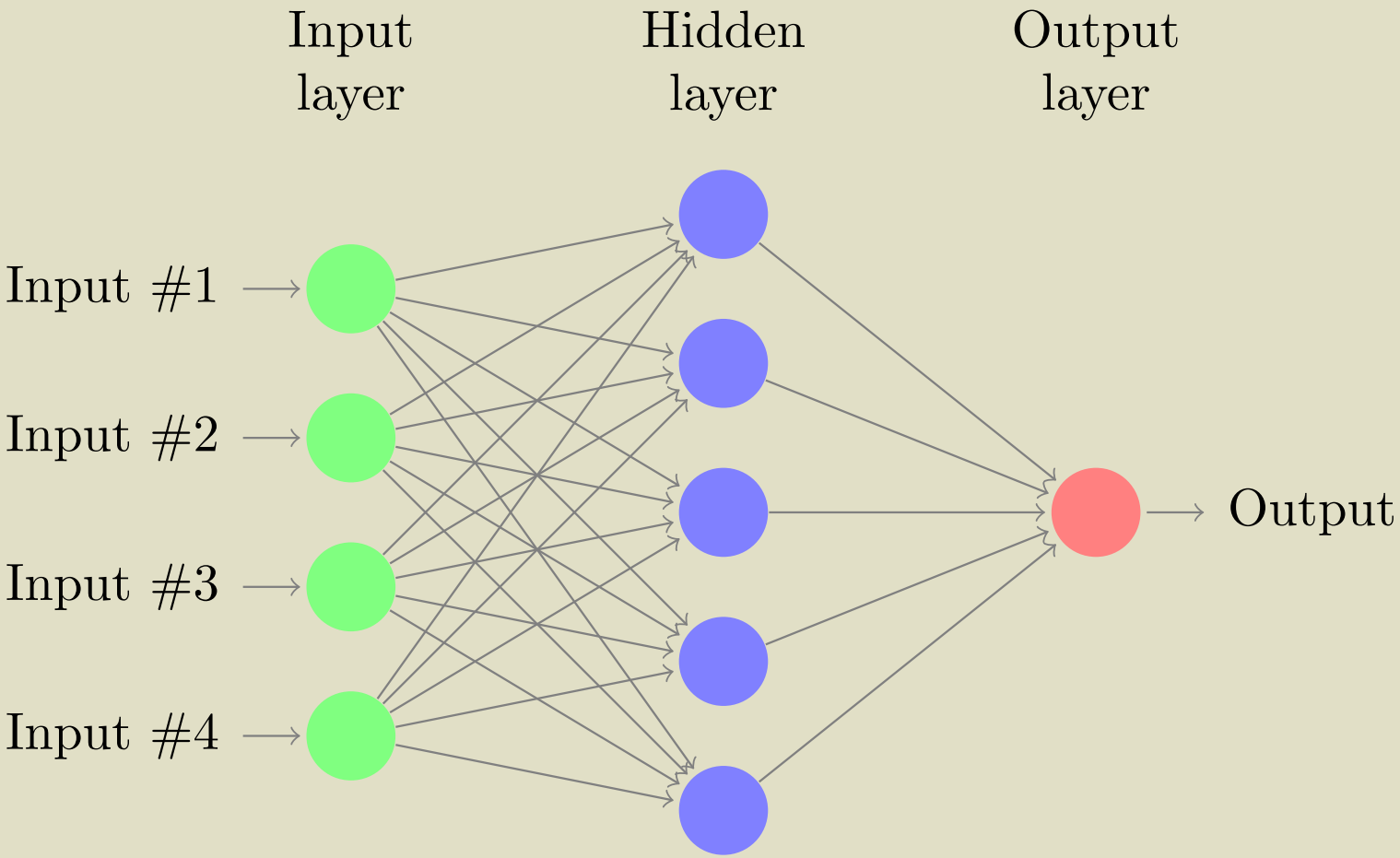


Figure: Neural network

.. this

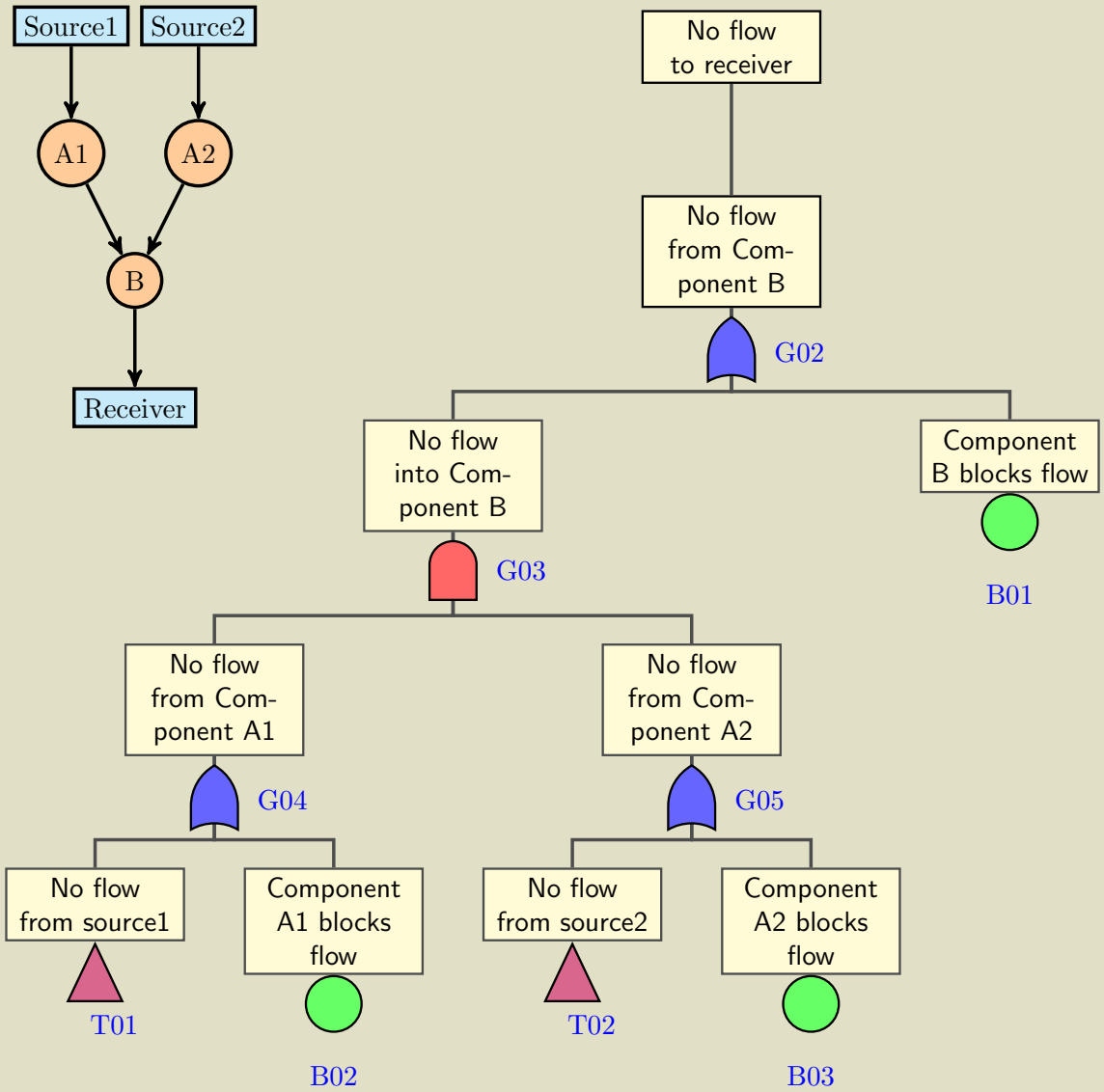


Figure: Fault-tree

And also this

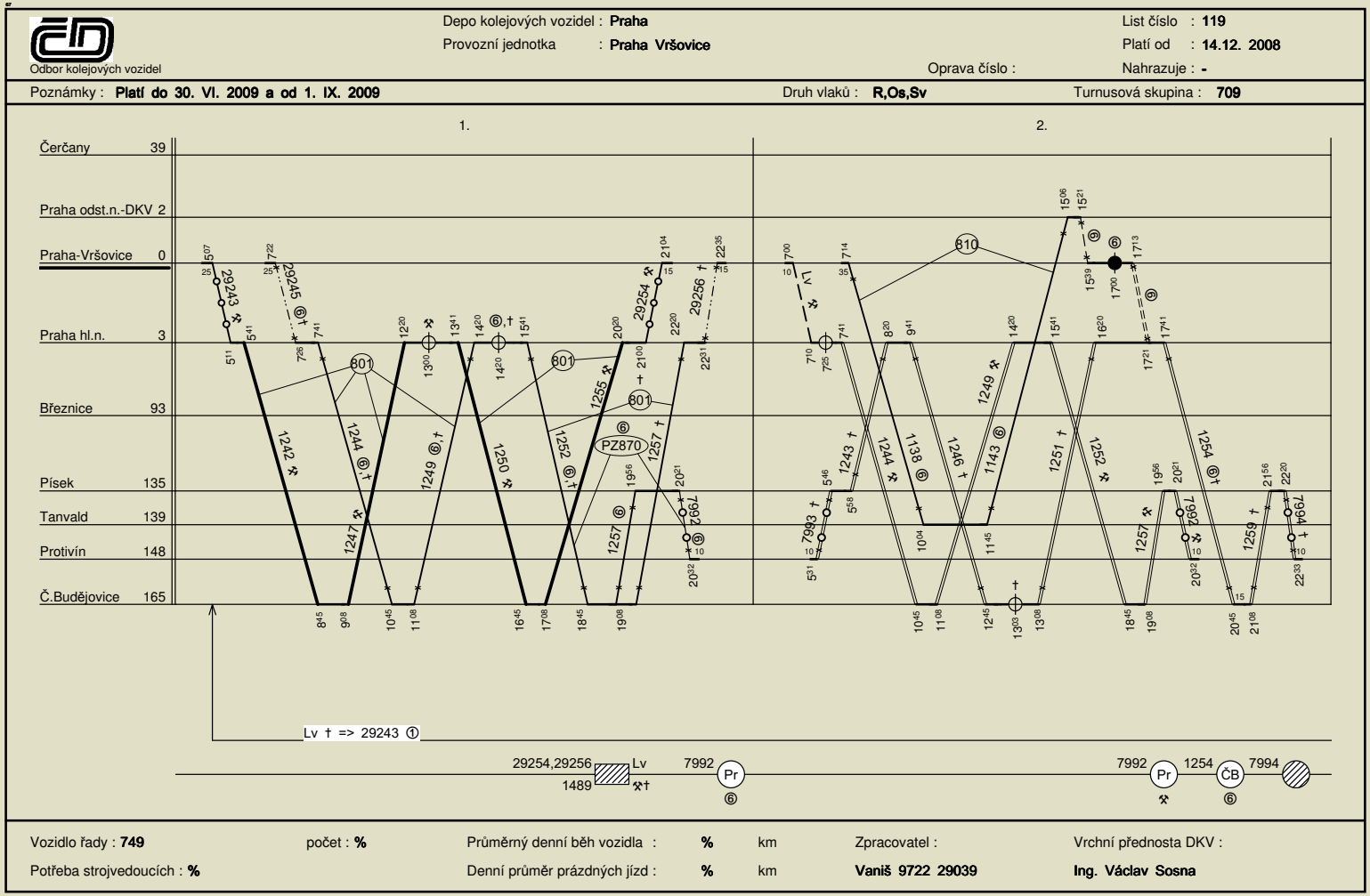


Figure: Train diagram

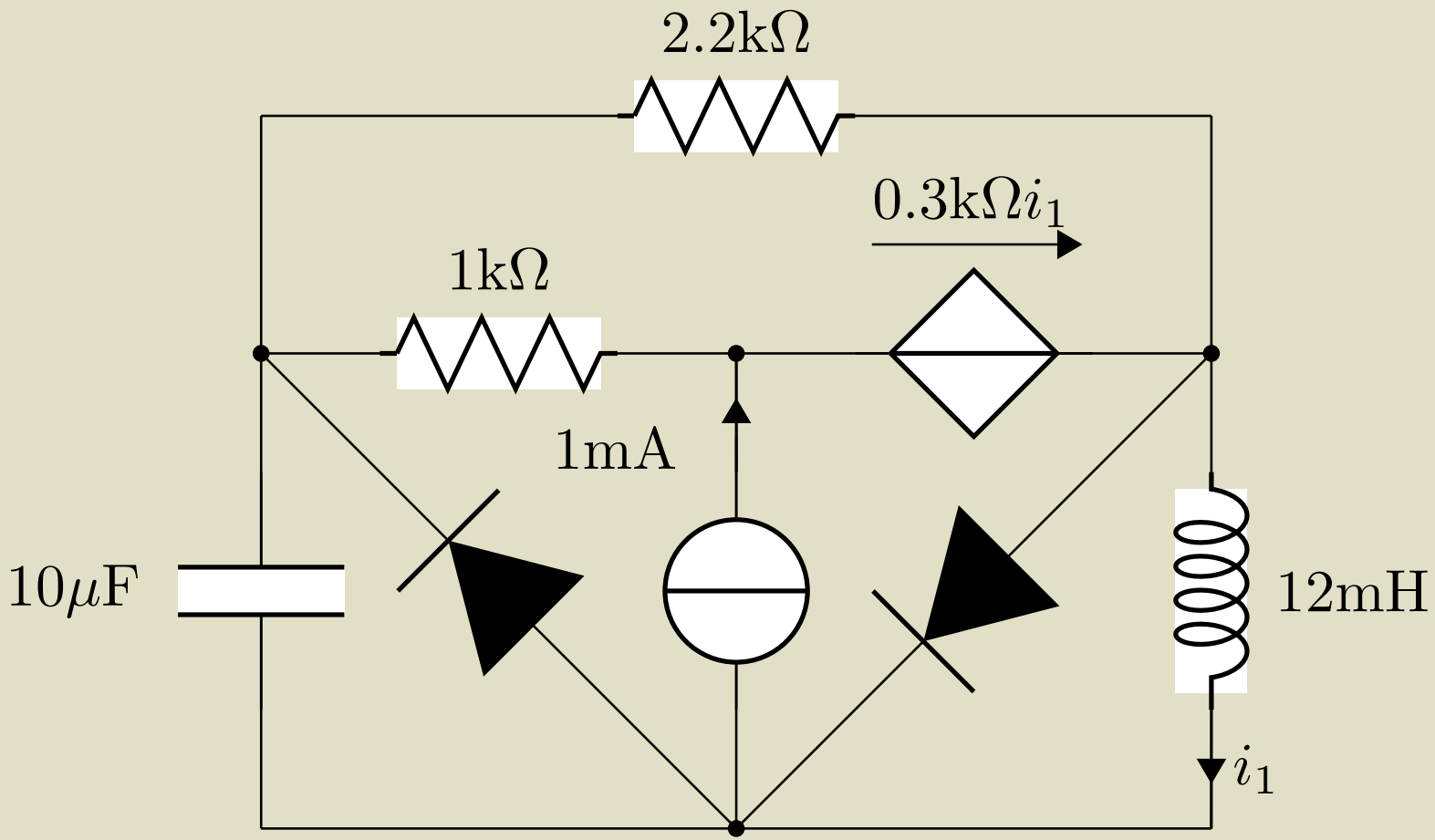


Figure: Electrical circuit

.. this and much mooore

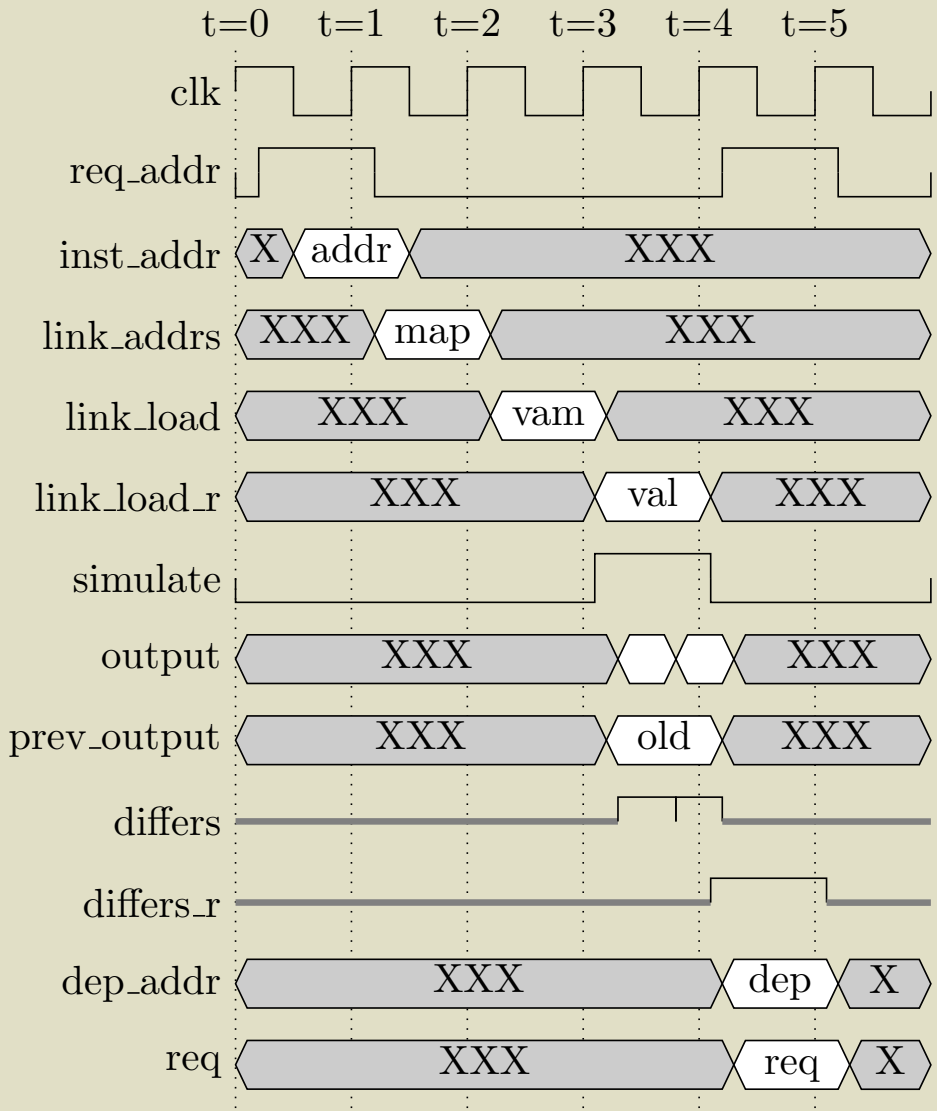


Figure: Timing diagram

Than we are going to talk about graphs

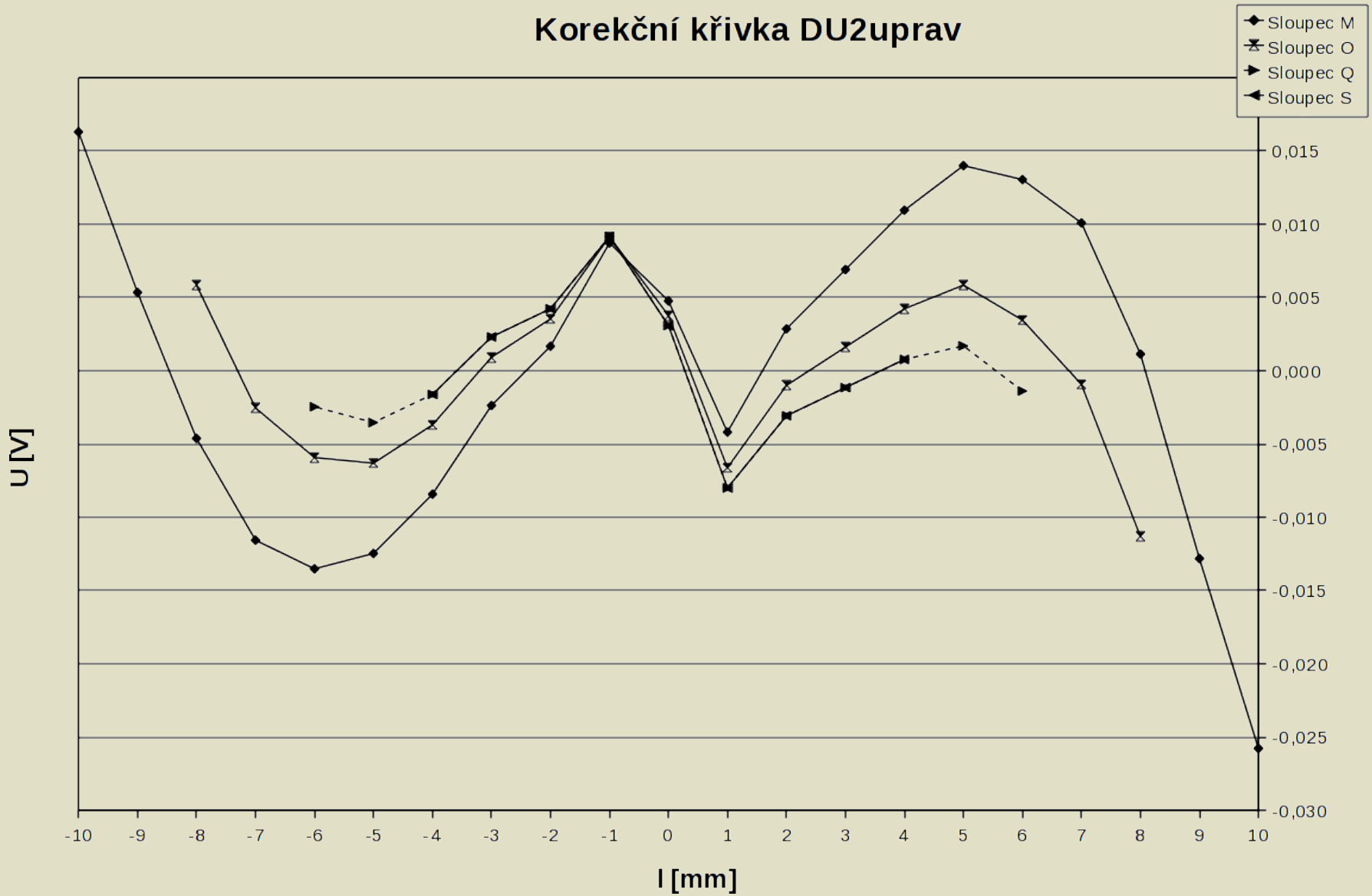


Figure: XY graph

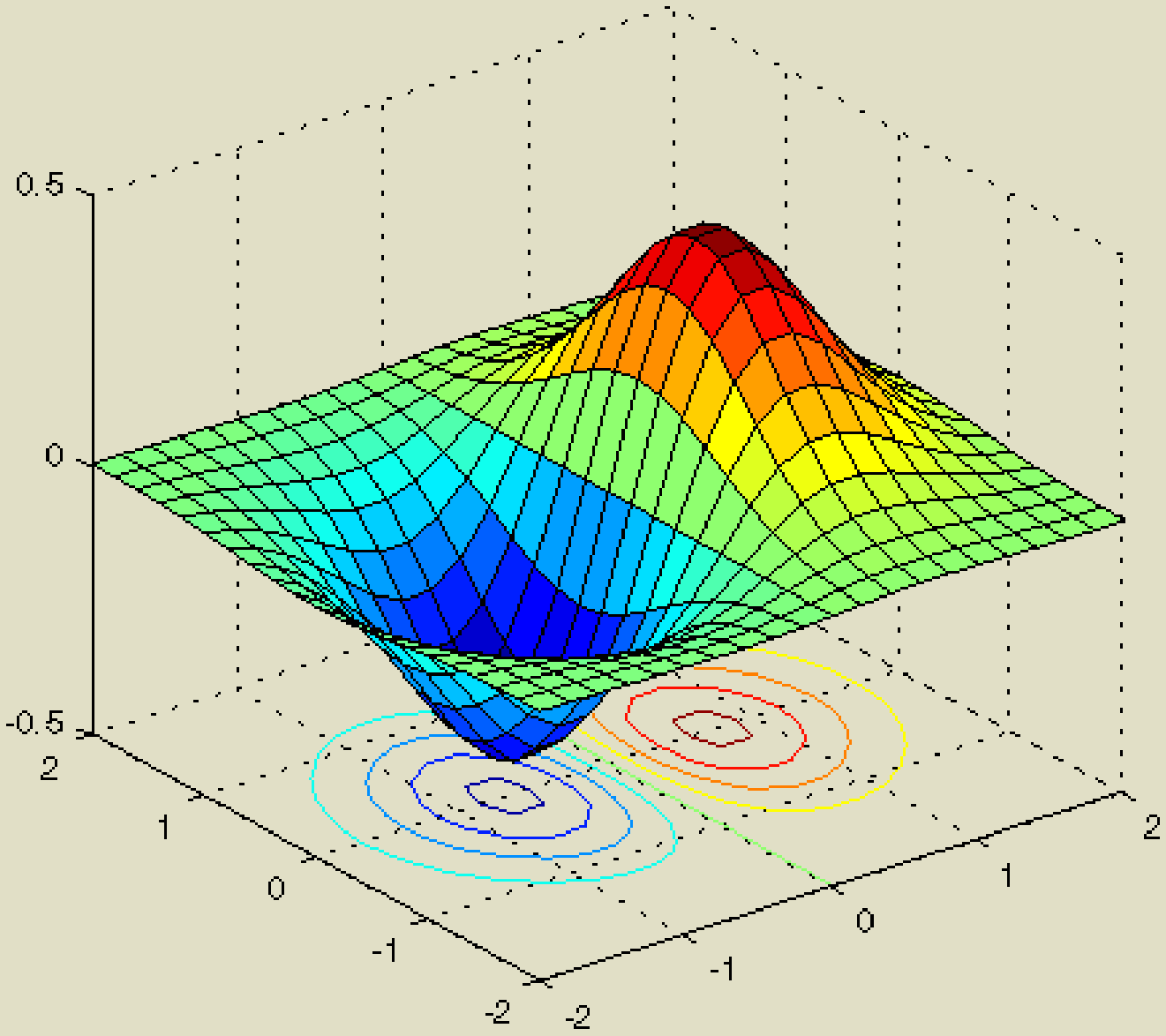


Figure: 3d graph

.. and even more graphs

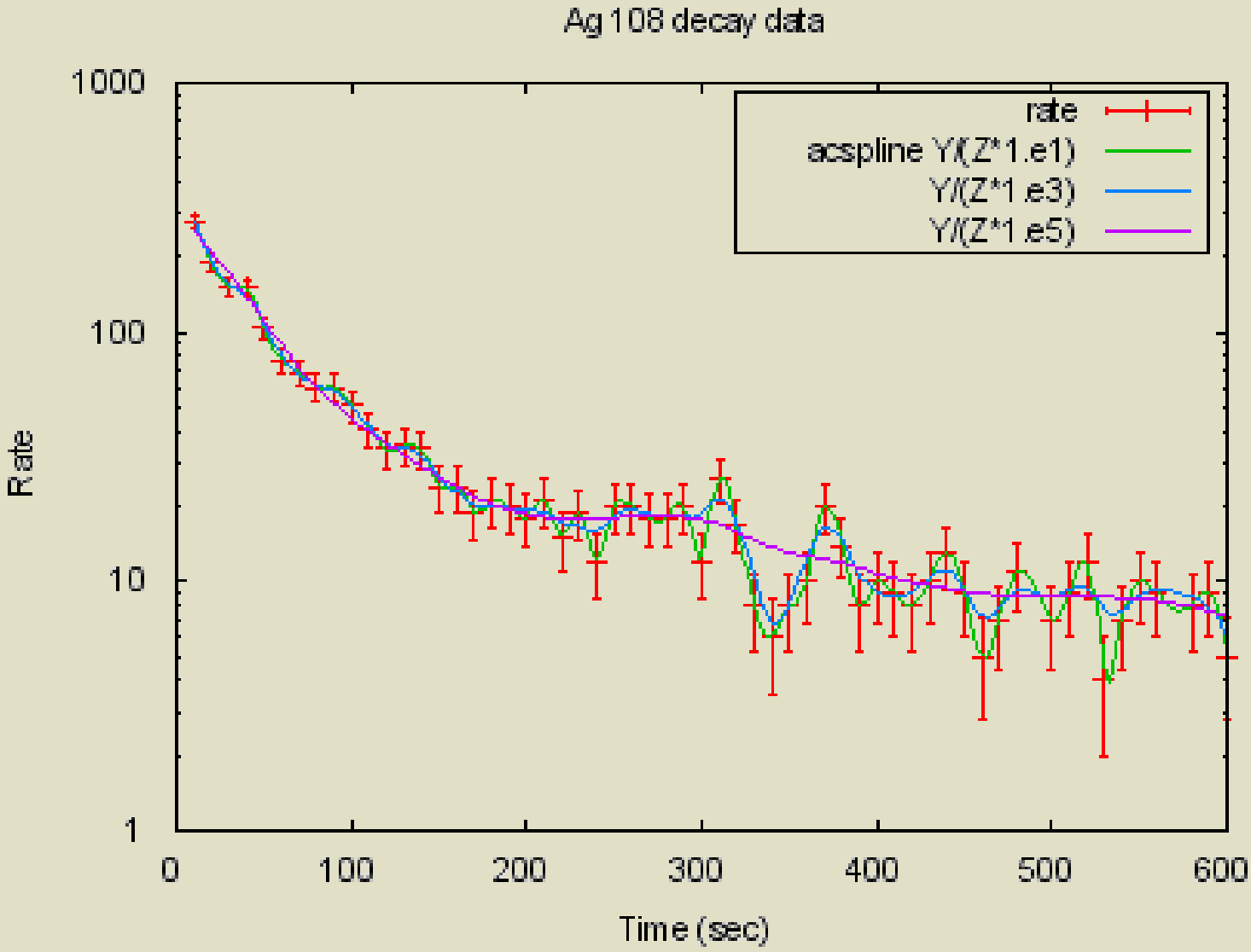


Figure: Error bar

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)

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)

OOffice Usable for drafts of flow diagrams

KOffice Usable for network or other unaligned diagrams

OpenOffice vs. KOffice

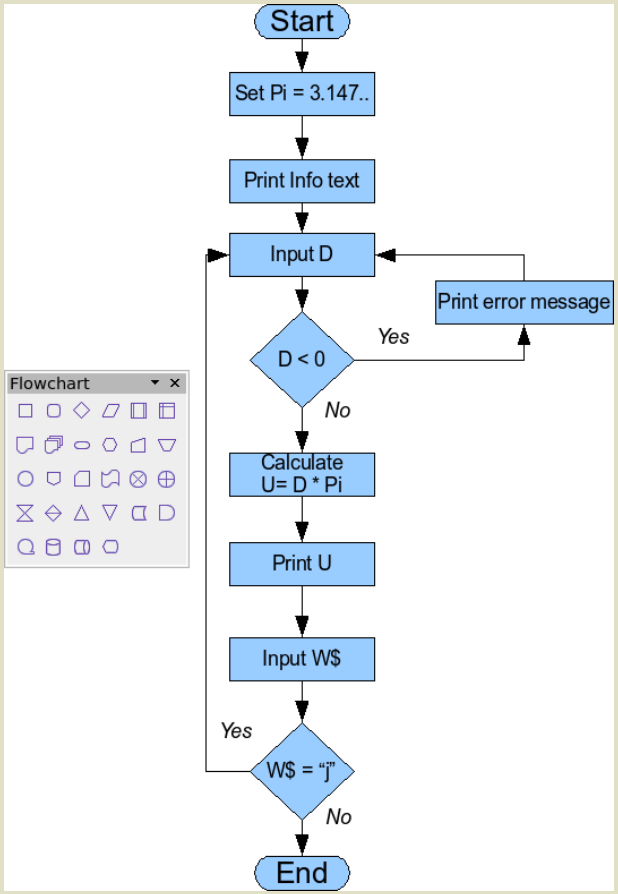


Figure: OpenOffice Draw diagram

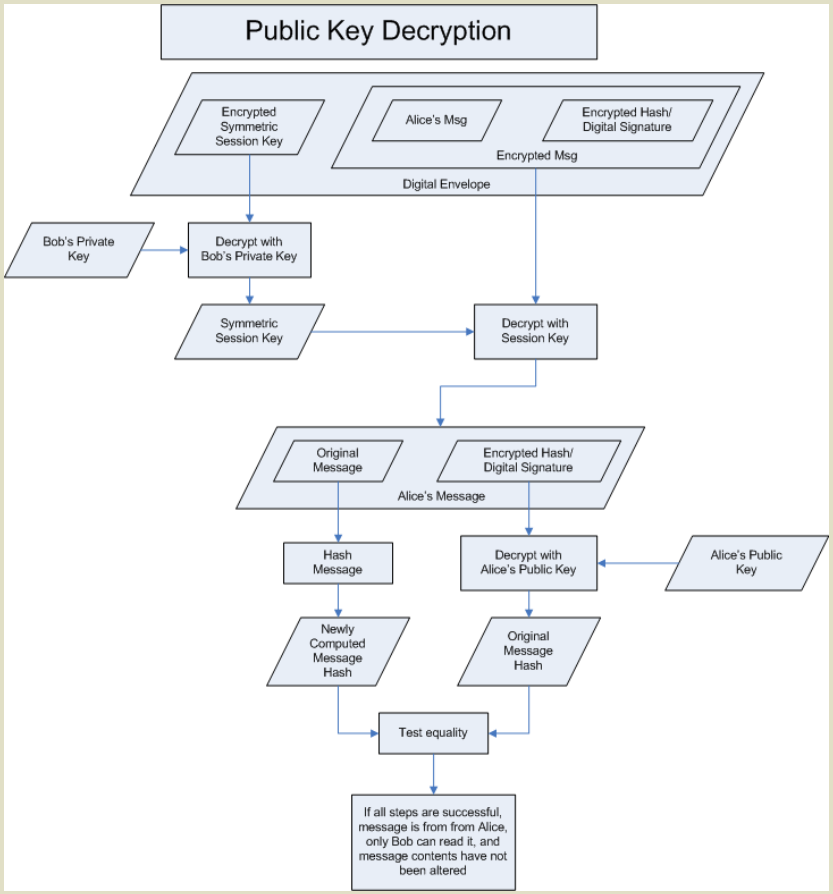
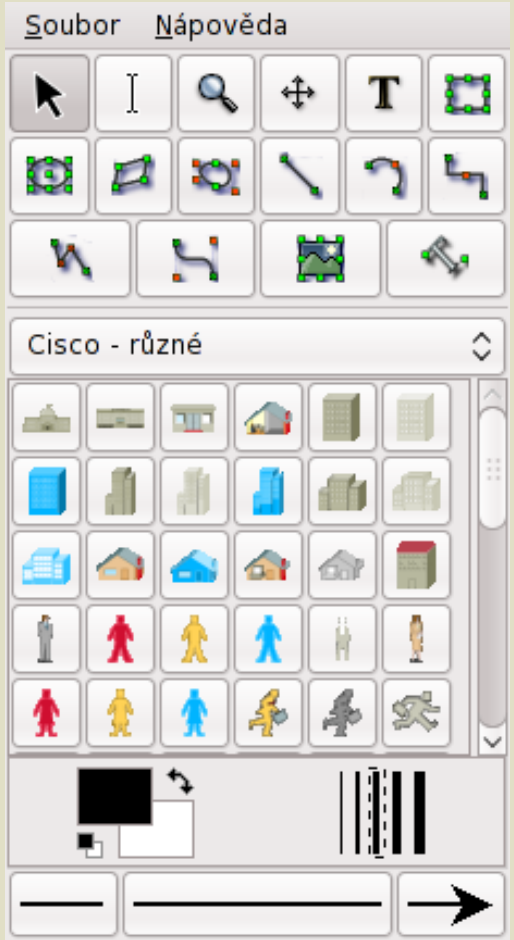


Figure: KOffice Kivio diagram

Dia

+ Fast
+ Easy to start with
+ A lot of box types
+ Good aligment & distribution
+ Connection points
  - Aligment with existing connections
  - No symbols in the text
  - Old and new box types together
  - Hard to insert own box



Dia

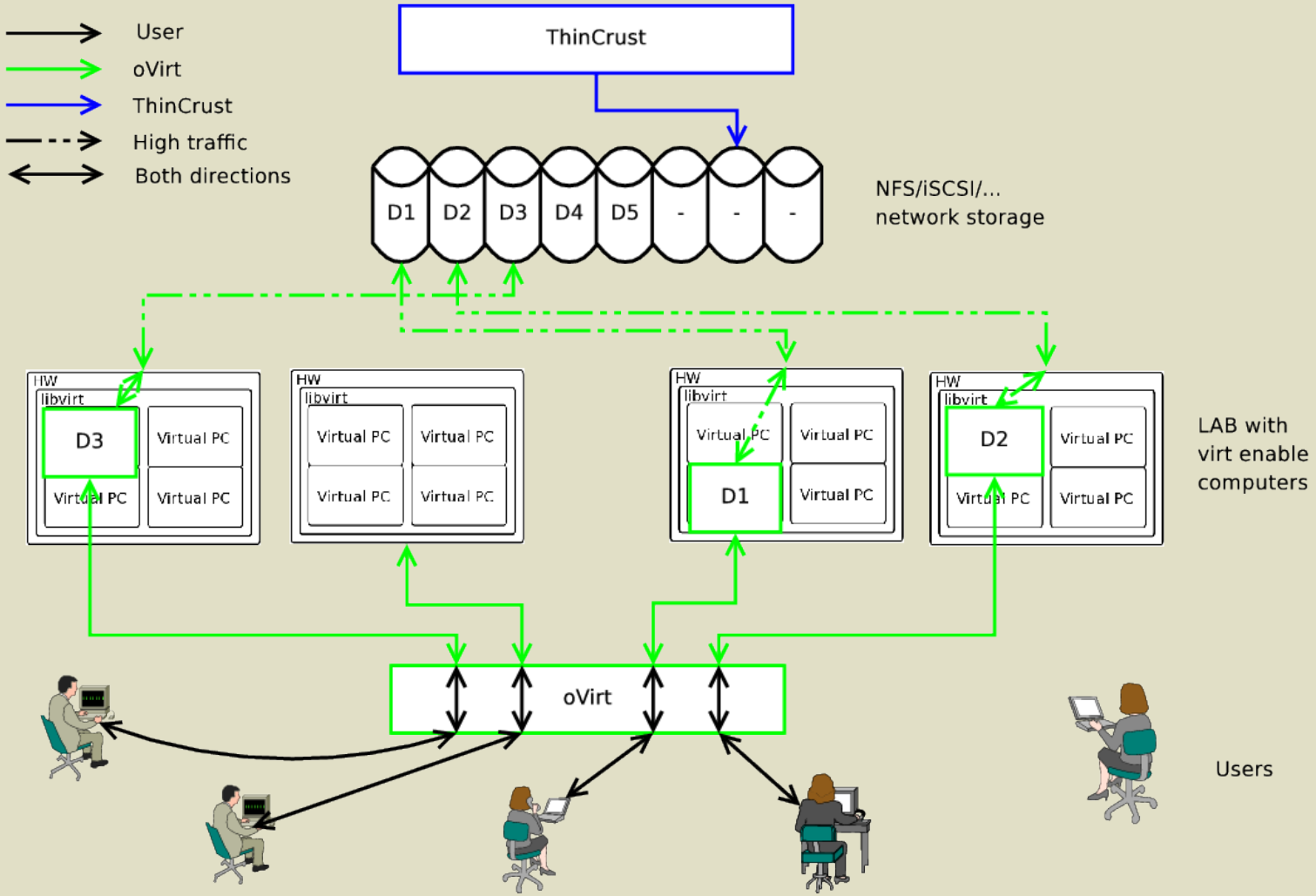


Figure: Dia

Dia

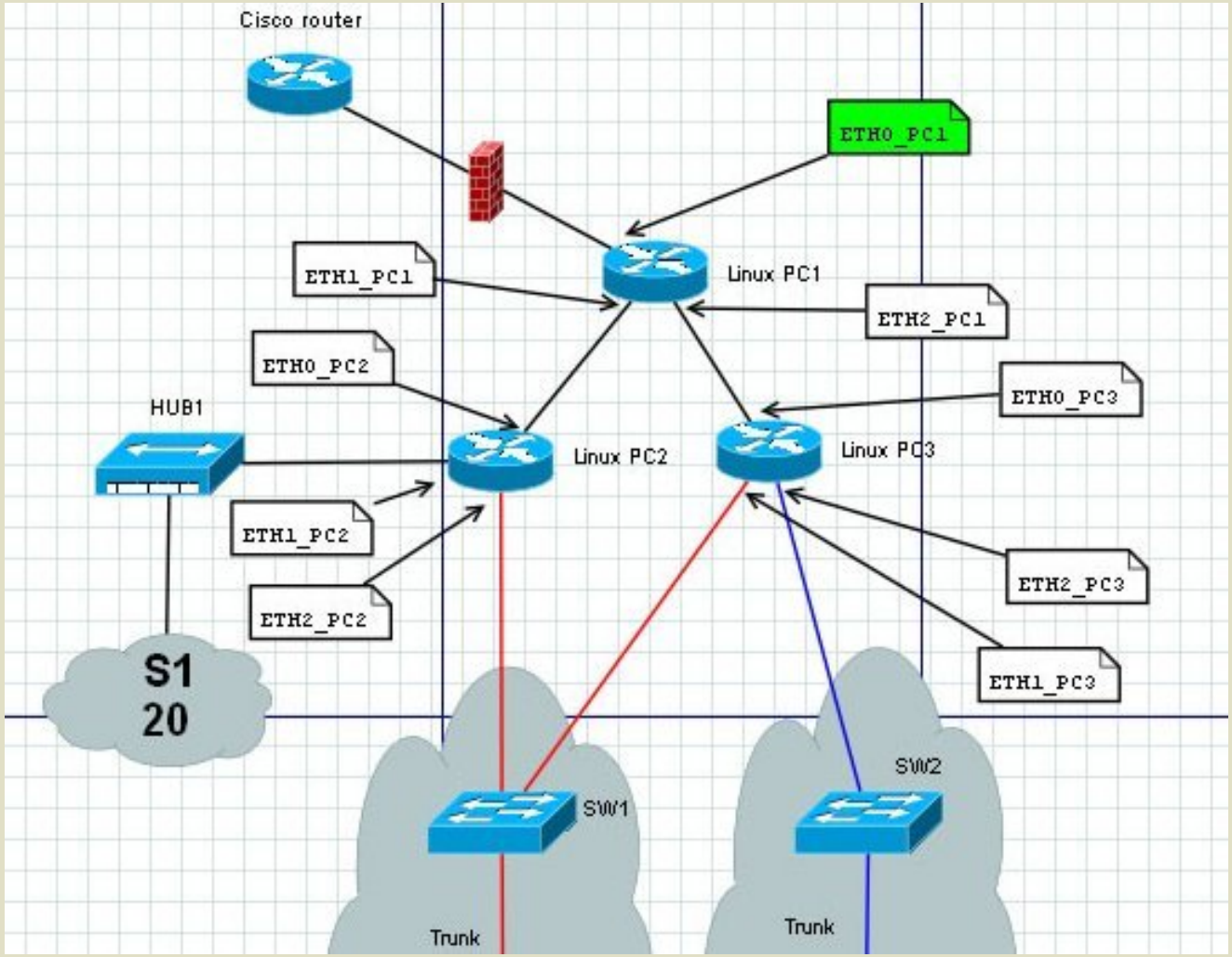


Figure: Dia - network diagram

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
+ Amaizingly quick
+ A lot of box types
+ The best aligment & 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

$FORM Defines the style of the box. You should probably start with the shape, color, text format, ... You can predefine them as shown in the example using
(`\tikzstyle{$NAME} = [$FORM]`)

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

$NAME Node name - used for bonds and position specification

$TEXT Text inside the box

```
\node [$FORM]          ($NAME)    {$TEXT};
\node [$FORM,$POS]     ($NAME)    {$TEXT};

\path [$FORM]    ($NAME) --                                  ($NAME);
\path [$FORM]    ($NAME) -| node [$FORM] {$TEXT} ($NAME);
\path [$FORM]    ($NAME) |- $POS --                          ($NAME);
```

Tikz: Example on flow diagram

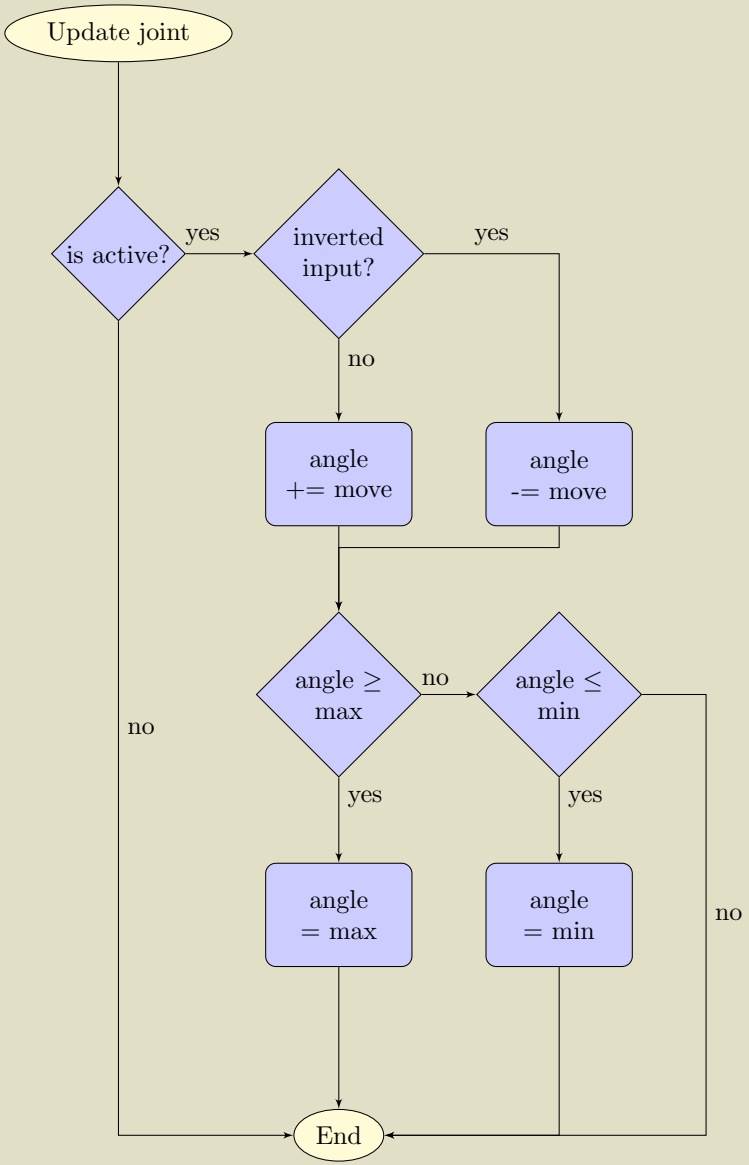


Figure: Tikz - flow diagram

Tikz: Example on flow diagram 1/4

```
\documentclass{minimal}

\usepackage{tikz}
\usetikzlibrary{shapes,arrows}
\begin{document}
```

Tikz: Example on flow diagram 2/4

```
\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]
```

Tikz: Example on flow diagram 3/4

```
\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};
```

Tikz: Example on flow diagram 4/4

```
    \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}
```

Tikz: Example on flow diagram

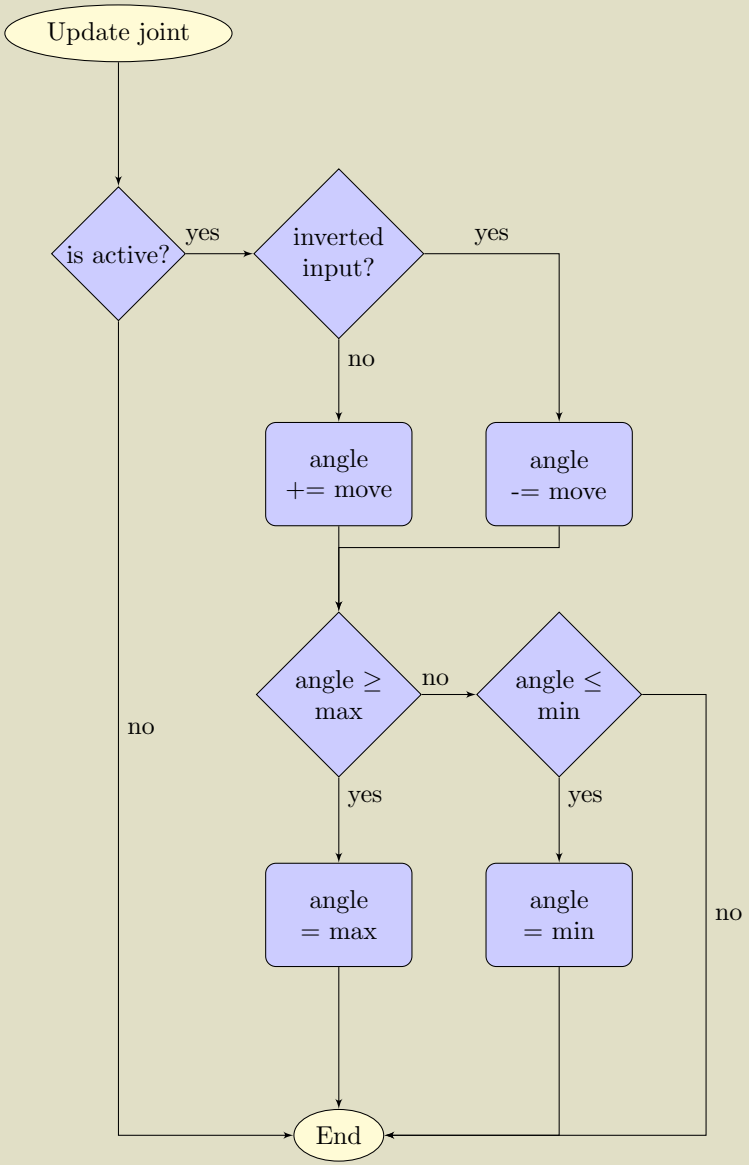


Figure: Tikz - flow diagram

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

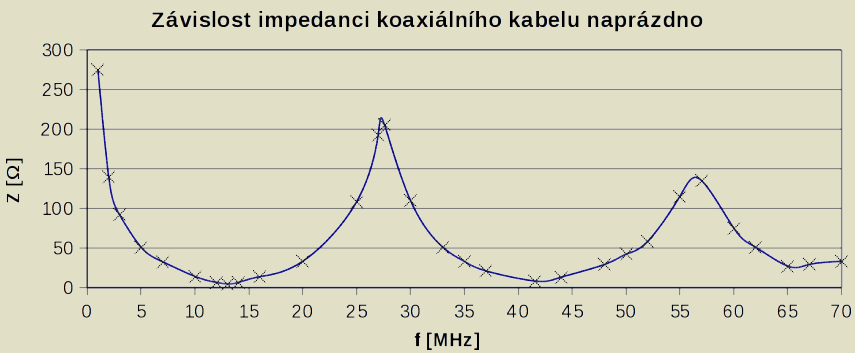


Figure: OpenOffice XY graph with nonlinear ax X

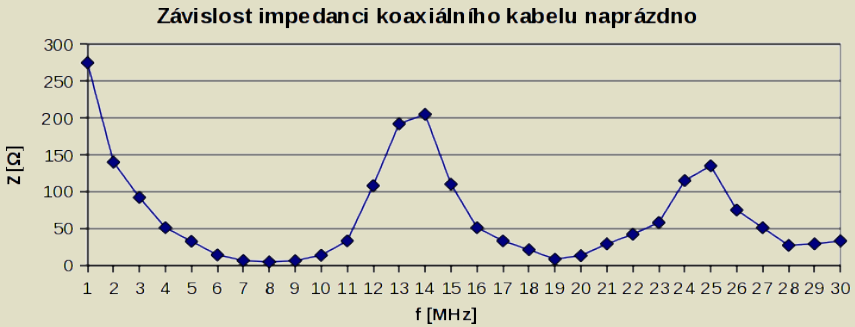


Figure: OpenOffice line graph with nonlinear ax X

Office suits nip

Use XY graph instead of line graph

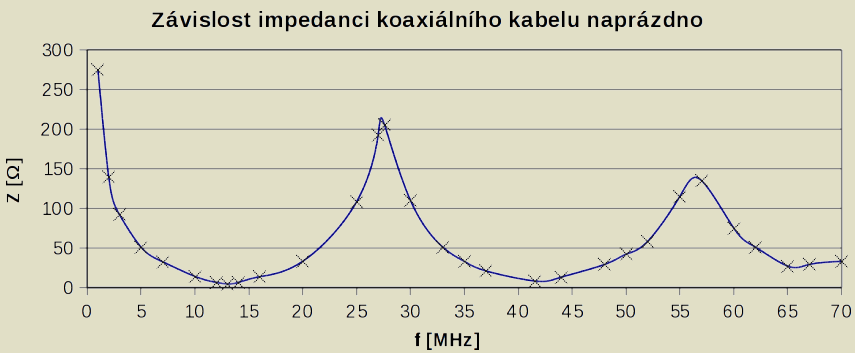


Figure: OpenOffice XY graph with nonlinear ax X

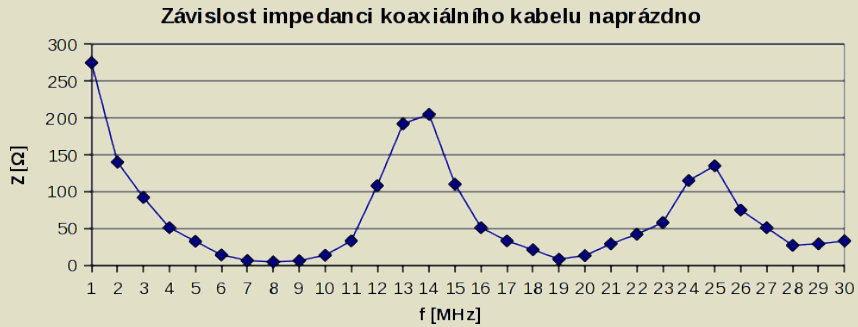


Figure: OpenOffice line graph with nonlinear ax X

- 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

3d graphs nip

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
  - POVRay: 10-60s draft; 1-2 days final graphical output

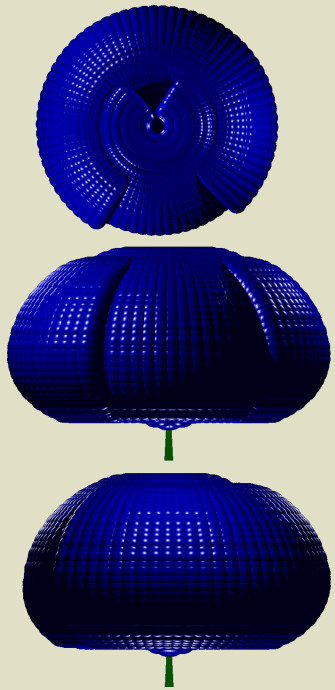


Figure: 6 joints robot's workspace generated using POVRay

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 $\Leftrightarrow$ 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]
- A creativity and structuring technique that focuses on the human mind and its assumed inner workings [mindmister]
- A way to take a notes from $\Leftrightarrow$ to your brain [me]

So what is the mindmap? $\hookrightarrow$

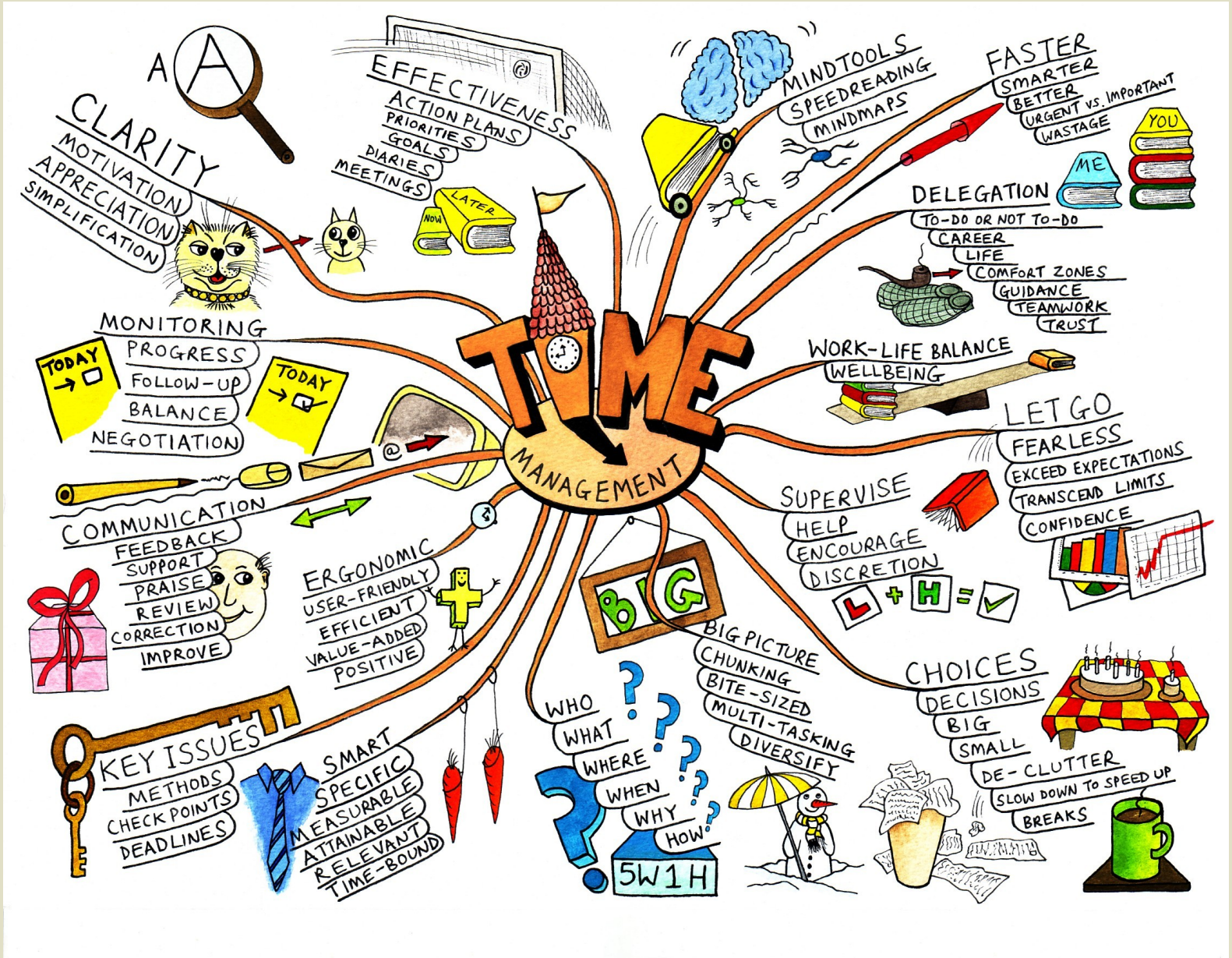


Figure: Paper mindmap

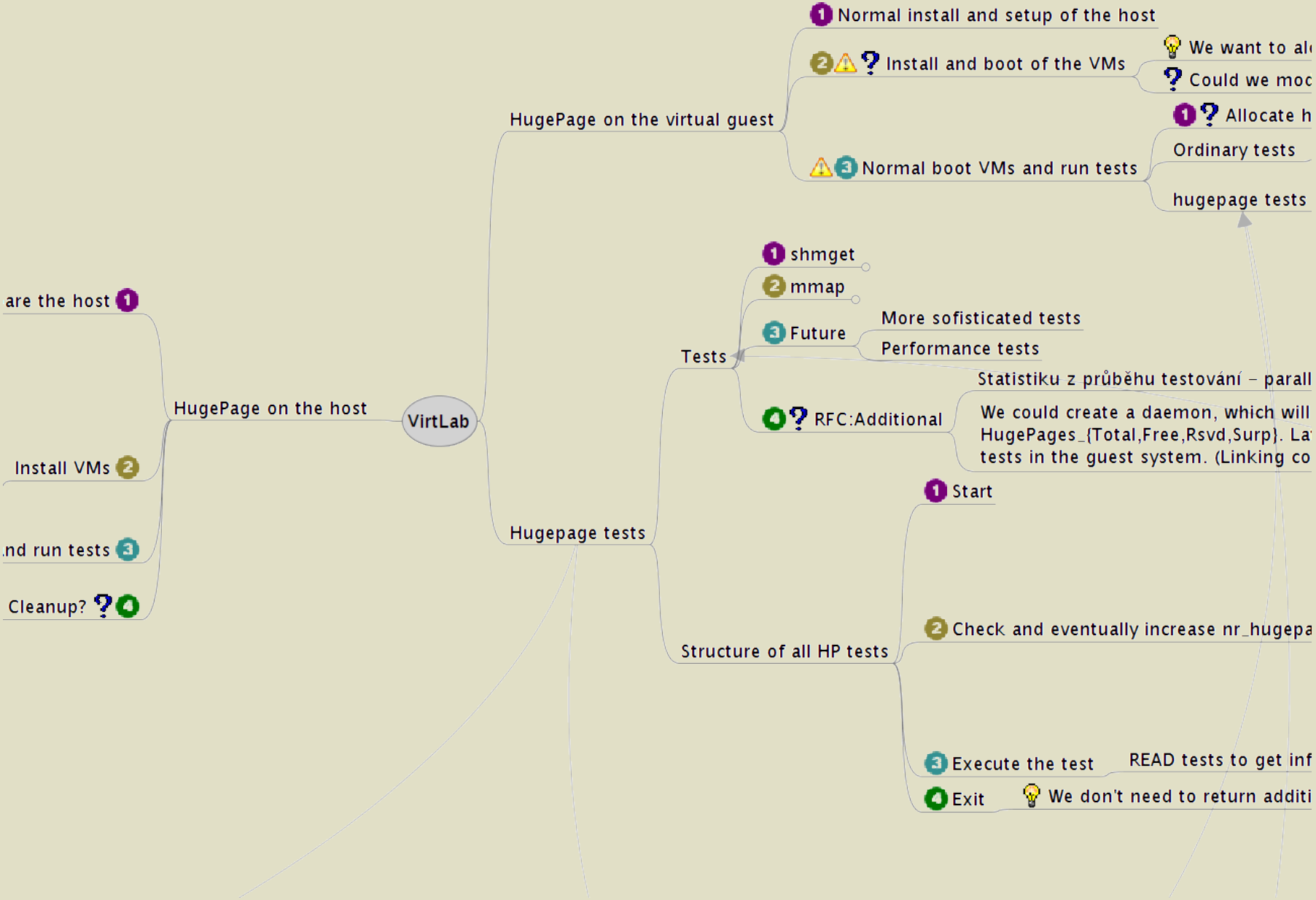


Figure: Computer mindmap

Figure: Porphyry of Tyros's 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 sematic 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.

Freemind

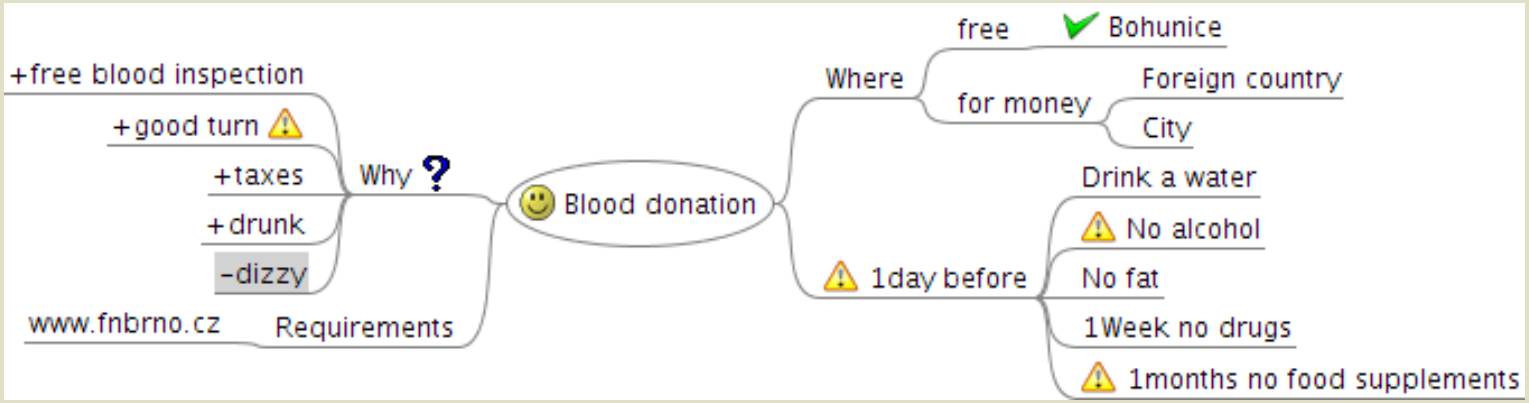


Figure: Freemind

Vym

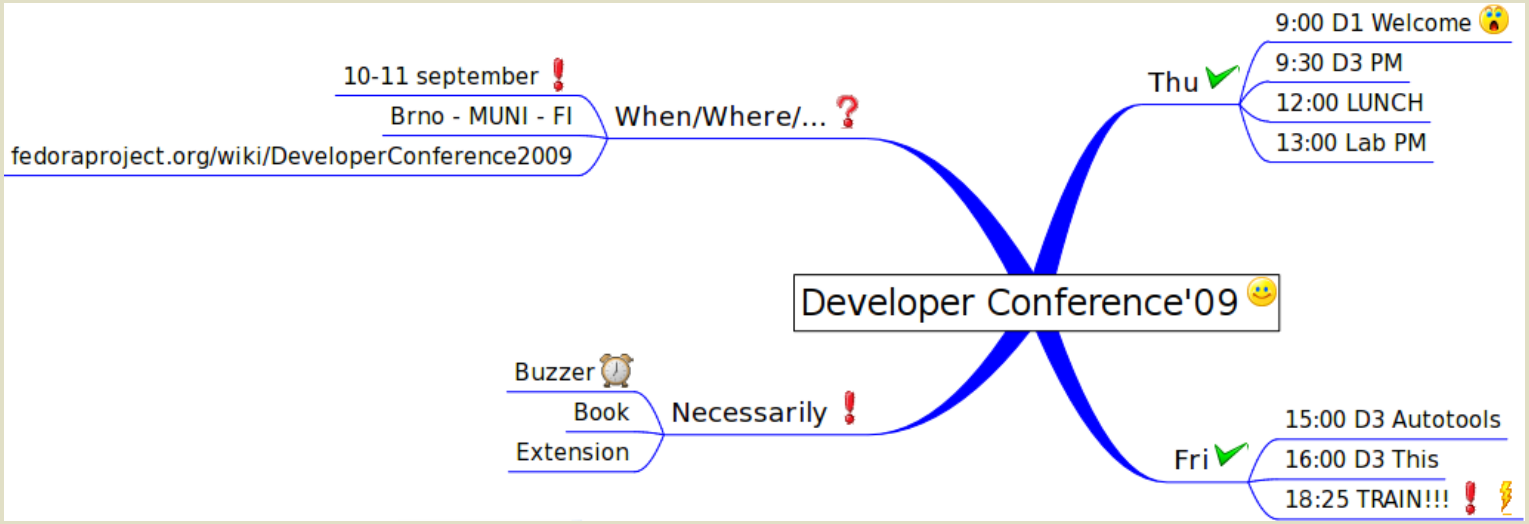


Figure: Vym

Bubbl.us

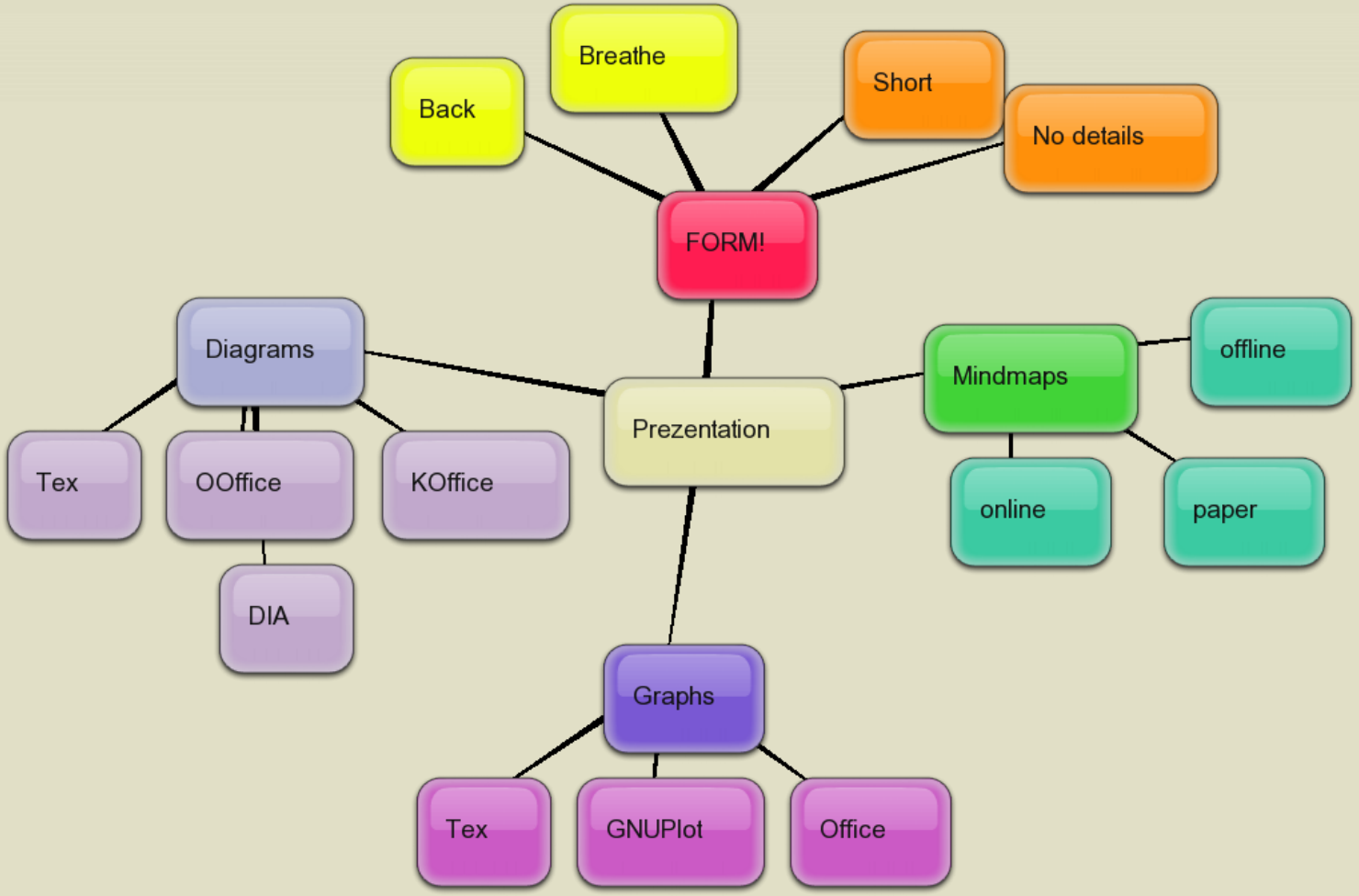


Figure: http://bubbl.us/edit.php

Mind42

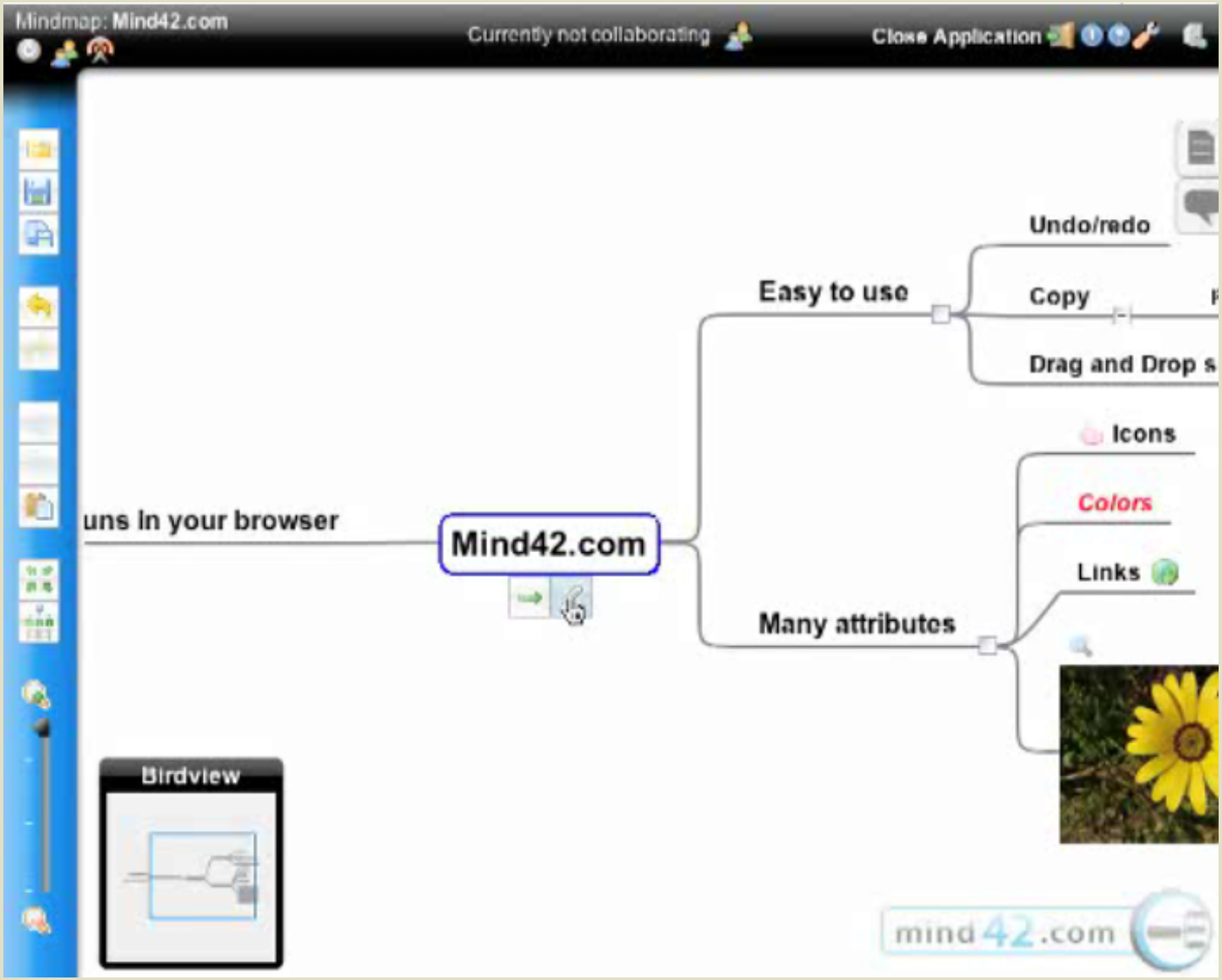


Figure: http://mind42.com/about

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

- 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

- **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
- 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

- **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...**

Good bye

Thank you for your attention

Links

- 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