CS-213 : Software systems Lab : Latex Advanced

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Latex : Recap

- document preparation system
- books, reports, articles, presentations
- Containing lot of mathematics
- based on TEX by Donald Knuth
- Leslie Lamport

Latex Recap: basic features

1. positioning of text
2. fonts and sizes
3. paragraphs
4. lists
5. sections, subsections
6. tables
7. bibliography
8. packages
9. figures

Typesetting Mathematics in Latex

Typesetting mathematics

A mathematical formula can be type-set in two ways:

1. in-line within a pargraph (small formulas)
2. display, separated from paragraph (big formulas)

Typesetting mathematics: in-line

Add a and b squared to get c squared.
Mathematically, $a^2 + b^2 = c^2$.

Typesetting mathematics: in-line

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Source code

```
Add $a$ and $b$ squared to get $c$ squared.
Mathematically, $a^2+b^2=c^2$.
```

Typesetting mathematics: display mode

Add a and b squared to get c squared.
Mathematically,

$$a^2 + b^2 = c^2 \tag{1}$$

Typesetting mathematics: display mode

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Mathematically,

$$a^2 + b^2 = c^2 \tag{1}$$

Source code

```
Add $a$ and $b$ squared to get $c$ squared.
Mathematically,
\begin{equation}
        a^2+b^2=c^2
\end{equation}
```

Typesetting mathematics: display mode

$$x^2 + y^2 = z^2 \tag{2}$$

Here we refer to equation (2).

Typesetting mathematics: display mode

$$x^2 + y^2 = z^2 \tag{2}$$

Here we refer to equation (2).

Source code

```
\begin{equation}
      x^2+y^2=z^2
\{label}{xyz}
\end{equation}
Here we refer to equation \eqref{xyz}.
```

Typesetting mathematics: display mode

$$x^2 + y^2 = z^2 \tag{2}$$

Here we refer to equation (2).

Source code

```
\begin{equation}
        x^2+y^2=z^2
\{label}{xyz}
\end{equation}
Here we refer to equation \eqref{xyz}.
```

notice equation numbering and reference to equation no (2).

Typesetting mathematics: display mode

$$q^2 + w^2 = e^2$$

Typesetting mathematics: display mode

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Source code

```
\begin{equation*}
        q^2+w^2=e^2
\end{equation*}
```

Typesetting mathematics: display mode

$$q^2 + w^2 = e^2$$

Source code

```
\begin{equation*}
        q^2+w^2=e^2
\end{equation*}
```

Use equation* to not use numbering.

Examples : square root, fraction, binomial, spacing

$$\sqrt{\frac{x^2}{k+1}\quad\binom{n}{k}}$$

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$$\sqrt{\frac{x^2}{k+1} \quad \binom{n}{k}}$$

```
\begin{equation*}
        \sqrt{\frac{x^2}{k+1}
        \quad
        \binom{n}{k}}
\end{equation*}
```

typesetting mathematics: arrays

$$\mathbf{X} = \begin{pmatrix} x_1 & x_2 & \cdots \\ x_3 & x_4 & \cdots \\ \vdots & \vdots & \ddots \end{pmatrix} \tag{3}$$

typesetting mathematics: arrays

$$\mathbf{X} = \left(\begin{array}{ccc} x_1 & x_2 & \ldots \\ x_3 & x_4 & \ldots \\ \vdots & \vdots & \ddots \end{array} \right) \tag{3}$$

```
\begin{equation}
\mathbf{X} = \left(
\begin{array}{ccc}
        x_1 & x_2 & \ldots
         x_3 & x_4 & \ldots
         \ vdots & \vdots & \ddots
\end{array}
\right)
\end{equation}
```

Theorem

Given $\cdots$ *prove that* $\cdots$

Proof.

We prove this by contradiction.. $\square$

Theorem

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```
\begin{theorem}
Given \cdots prove that \cdots
\end{theorem}


\begin{proof}
We prove this by contradiction \cdots
\end{proof}
```

Typesetting mathematics: packages

How do you get Greek letters like α, β?
Or define new environments like *theorem*?

Typesetting mathematics: packages

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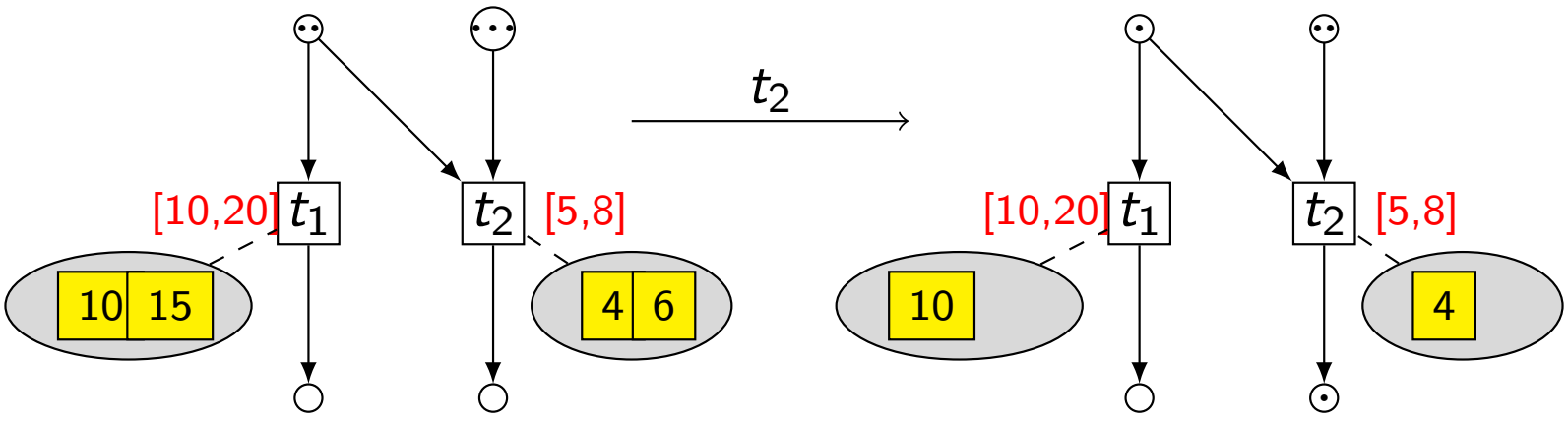
Packages to include, websites to visit

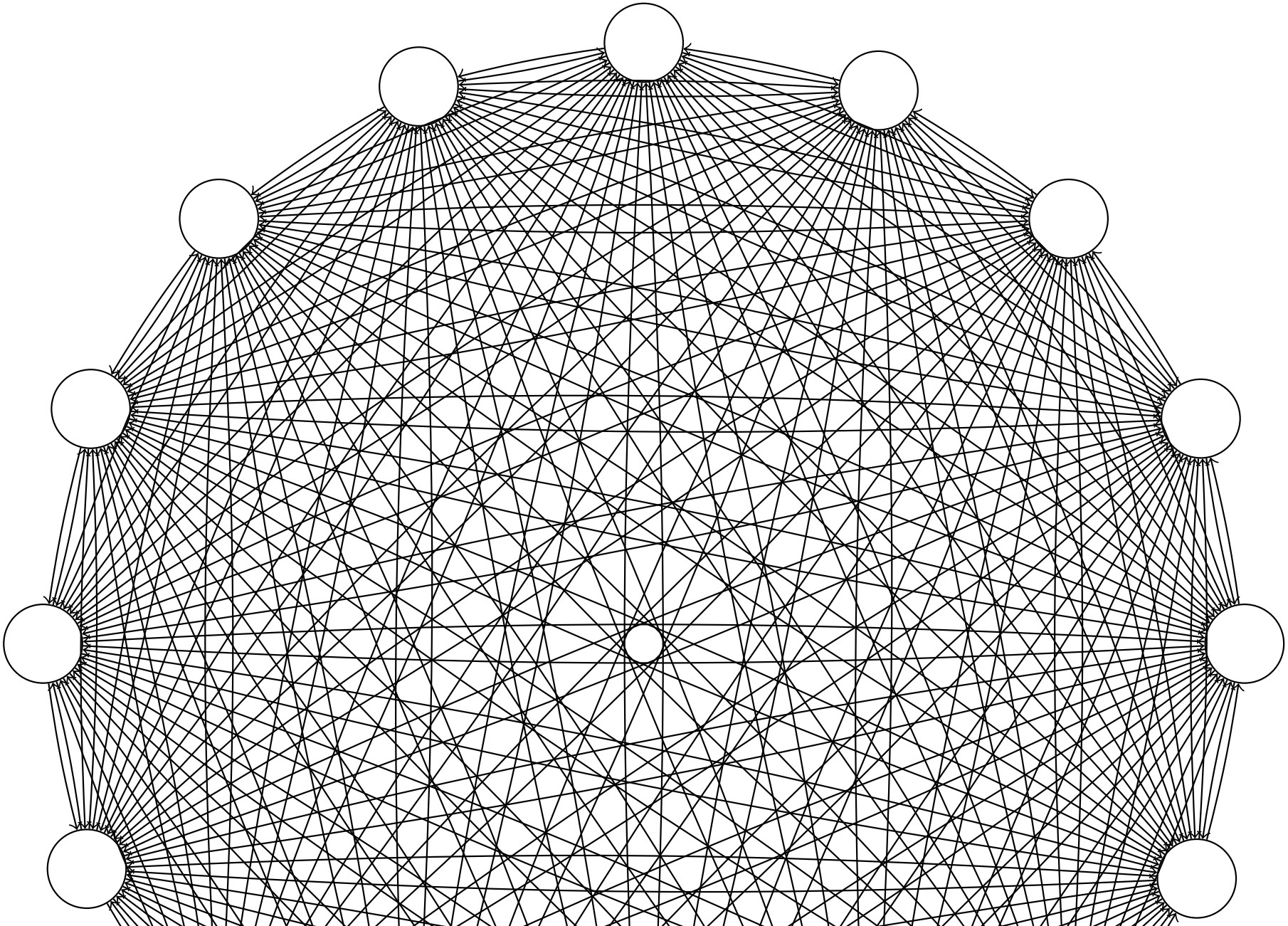
- amsmath, amssymb, amsthm, amsfonts
- https//www.detexify.kirelabs.org/classify.html
- symbols-letter.pdf in resources folder by Scott Pakin

Drawing Figures in Latex

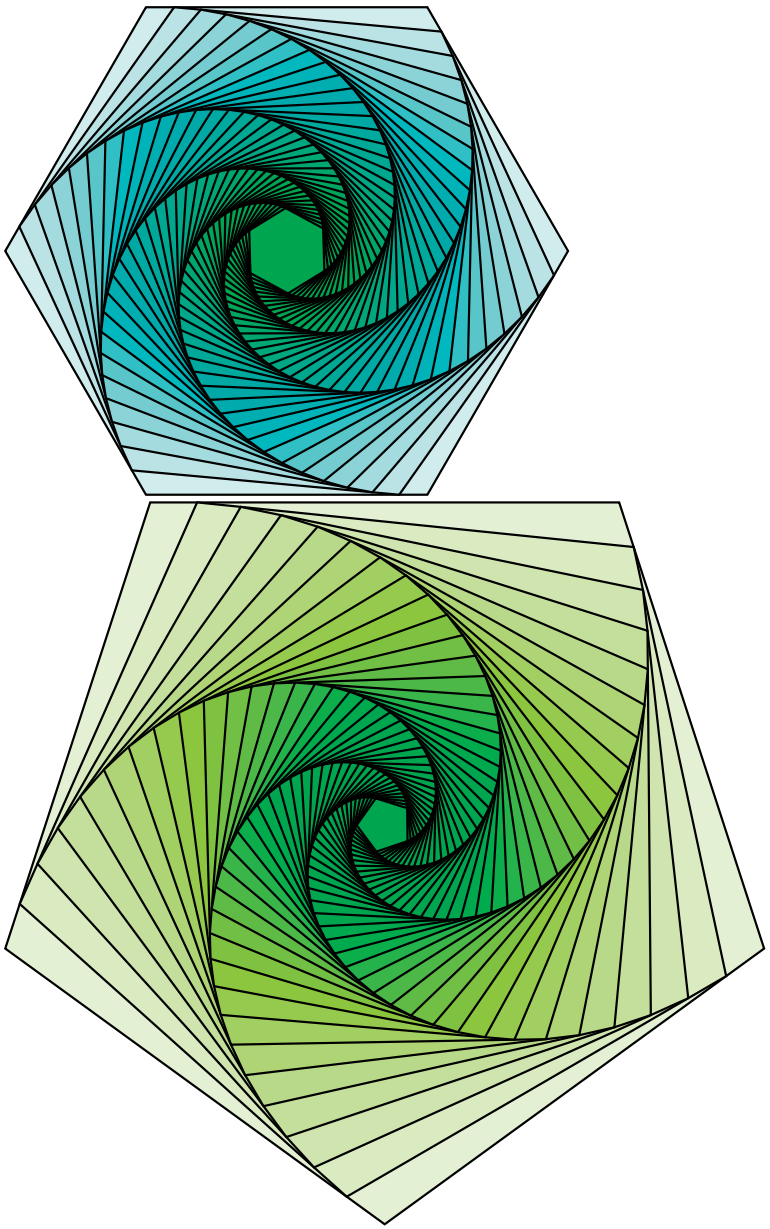
Drawing Figures in Latex



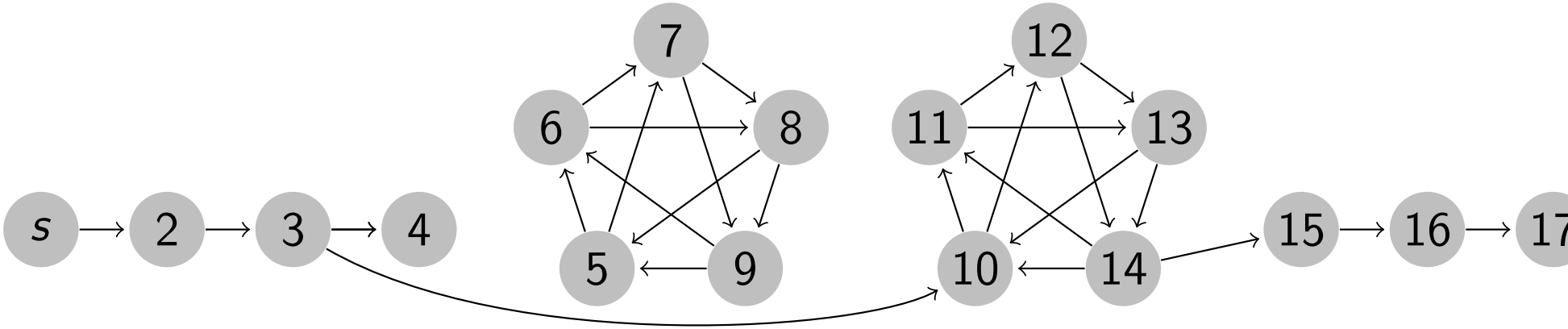
Drawing Figures in Latex



Another figure



A directed graph or state machine



PGF/TikZ

1. PGF - basic layer – Portable Graphics Format
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2. Tikz – TikZ Ist Kien Zeichenprogramm

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1. PGF - basic layer – Portable Graphics Format
   we rarely use that directly.
2. Tikz – TikZ Ist Kien Zeichenprogramm
   - TikZ is not a drawing program.
   - developed by Till Tantau
   - We use this frontend

Examples

1. Diamond –using cartesian coordinates
2. Pentagon –using polar coordinates
3. Shapes – circles, rectangles etc.
4. Nodes – use them instead of co-ordinates.

Making presentation in Latex

Making presentation in Latex

See *presentation-beamer.pdf* in the resources !