

# L<sup>A</sup>T<sub>E</sub>X-cursus

## 5th<sup>e</sup> session: thesis in L<sup>A</sup>T<sub>E</sub>X

T<sub>E</sub>XniCie

A-Eskwadraat

17 november 2014



# Previous week

Last week, we talked about:

- Importing vector images (.pdf instead of .jpg)
- Making presentation with the beamer-class
- Using other packages, like the A-Eskwadraat-package



# This week

- 1 Document structure
- 2 Theorems & Listings
- 3 Bibliography
- 4 BibTeX
- 5 Samenwerken



# Document classes

- Every tex file starts with `\documentclass{..}`
- We've only covered *article* and *beamer* classes
- For bigger documents: *report* and *book*





# Document classes: report

- `\documentclass{report}`
- Ideal for papers and thesis
- Document structure now starts with `\chapter{}` instead of `\section{}`.
- New page for chapters and title page



# Document classes: book

- `\documentclass{book}`
- Ideaal voor PhD-thesis or books
- Structure also begins with `\chapter{}`
- By default: header with page number and chapter title / section title
- And by default *two sided*

should point in the direction tangent to its orbital circle. The speed profiles are given by so called Galaxy Rotation Curves, giving the speed as function of distance from the centre. If the speed is too high at some point, the particles will be thrown away, drifting apart and never coming back again. On the other hand, if the speed is too slow, everything will collapse to the centre, and ejected because of slingshot effects.

The actual speed profile needs to take into account that there is 5 times more dark matter in a galaxy than visible normal matter. This dark matter is distributed almost uniformly in a Dark Matter Halo. We used as rotational velocity the velocity derived in [1]:

$$v(r) = \sqrt{\frac{GM}{r}} \left( \frac{r}{r_0 + r} \right)^{\frac{3}{2}} \left( 1 + \sqrt{\frac{M_0}{M}} \left[ 1 - \exp(-r/r_0) \left( 1 + \frac{r}{r_0} \right) \right] \right)^{1/2}, \quad (1.7)$$

## 1.5 Results

Before proceeding to the actual galaxy simulations, we conducted a few timing experiments to determine the speed differences between serial CPU execution, serial GPU and parallel GPU simulators. To avoid singularities when stars approach each other too much, we have to use a softness factor  $\epsilon$  in the force calculation. This force becomes:

$$\mathbf{F}_j = \sum_i G \frac{m_i m_j}{|\mathbf{x}_i - \mathbf{x}_j|^2 + \epsilon^2} \frac{\mathbf{x}_i - \mathbf{x}_j}{|\mathbf{x}_i - \mathbf{x}_j|}, \quad (1.9)$$

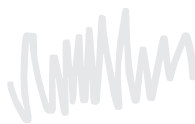
with  $\epsilon = \left( \frac{3}{4\pi n} \right)^{1/3} \approx 10^3$ ,

where  $n$  is the average density of stars in the nucleus.

You can reproduce the following results with the code available at my git

# Document classes: options

- `\documentclass[opt1,opt2,..]{..}`
- `10pt`, `11pt`, `12pt`: font size
- `a4paper`, `a5paper`, `letterpaper`, ...: page size
- `fleqn`, `leqno`: align equations on the left, numbering on the left
- `twocolumn`: style document with two column layout
- `twoside`, `oneside`: switches to two or one sided mode
- `landscape`: landscape instead of portrait mode



# Table of contents, list of figures, list of tables

- `\tableofcontents`
- `\listoffigures`
- `\listoftables`
- Don't forget to compile your tex multiple times!

| Contents |  |
|----------|--|
| 1        | Introduction <span style="float: right;">2</span>                      |
| 2        | Integration schemes <span style="float: right;">2</span>               |
| 2.1      | Euler Forward method <span style="float: right;">2</span>              |
| 2.2      | Velocity Verlet method <span style="float: right;">2</span>            |
| 2.3      | Runge Kutta 4 method <span style="float: right;">3</span>              |
| 2.4      | Stability and energy conservation <span style="float: right;">3</span> |
| 3        | CUDA and massive parallelism <span style="float: right;">4</span>      |
| 4        | Galaxies <span style="float: right;">4</span>                          |
| 4.1      | Units and sizes <span style="float: right;">4</span>                   |
| 4.2      | Initial conditions <span style="float: right;">4</span>                |



# Appendices

- Appendices always at the end
- Separate normal chapters from appendix chapters with `\appendix`
- Can also be used in *articles* with appendix sections

## Example

```
\chapter{Last chapter}
...
\appendix
\chapter{First appendix}
...
\chapter{Second appendix}
```

# Hyperlinks

- Package `hyperref` necessary
- Internal link: `\hyperref[label_name]{Text for the link}`  
(Same as `\ref` but with different text)
- External link: `\href{http://www.a-es2.nl}{Text for the link}`
- URL: `\url{http://www.a-es2.nl}`

# Proofs and definitions

- Package `amsthm` necessary
- First, define which *types* of theorems will be used in the document (Proof, Definition, Corollary...):

```
\newtheorem{theoremtype}{Proof}
```

- L<sup>A</sup>T<sub>E</sub>X defines a new environment named `theoremtype`:

```
\begin{theoremtype}... \end{theoremtype}
```



# Proofs and definitions

## Example

```

\newtheorem{proof}{Proof}
\newtheorem{definition}{Definition}
\begin{proof} (proof 1) \end{proof}
\begin{definition} (definition 1) \end{definition}
\begin{definition} (definition 2) \end{definition}

```

*Proof*

*Proof.* I think therefore I am □

**Definition 1.** A **symplectic integrator** is a numerical integration scheme for a specific group of differential equations related to classical mechanics which conserves the total energy.

**Definition 2.** A **Hamiltonian** is a follower or adherent of Alexander Hamilton or his doctrines.

# Listings

- Used to list programming source code in LaTeX
- Package `listings` necessary
- Two methods:

- 1 Typing the source code directly in the tex file:

```
\begin{lstlisting}...source code...\end{lstlisting}
```

- 2 Importing source code from an external file:

```
\lstinputlisting{sourcecode.c}
```

- Options:

```
language:\lstinputlisting[language=C]{sourcecode.c}
```

(or `language={ [Sharp]C }` for C#, or Python for Python...)

```
firstline=.., lastline=.. when importing source code
```

# The bibliography

## Example

Instead of WYSIWYG editors, typesetting systems like  $\text{T}_{\text{E}}\text{X}$  [1] or  $\text{L}^{\text{A}}\text{T}_{\text{E}}\text{X}$  [2] can be used.

## References

- [1] Paul W. Abrahams, Kathryn A. Hargreaves, and Karl Berry. *T<sub>E</sub>X for the Impatient*. 2003.
- [2] Leslie Lamport. *L<sup>A</sup>T<sub>E</sub>X: A Document Preparation System*. Addison-Wesley, second Edition, 1994.

# The bibliography

## thebibliography-environment

- Available in the default  $\LaTeX$  distribution.
- Ideal for:
  - short documents;
  - or adding a few short descriptions.
- The style **has to be** defined.



# thebibliography

Use the `thebibliography`-environment where the bibliography has to come (usually at the end of your document).

## Example

[1] Author(s), *Title*,  
Editor, Location,  
*Edition*, Year

[La] Leslie Lamport, *LaTeX: A  
Document Preparation System*  
Addison Wesley, Massachusetts,  
*2nd Edition*, 1994

```
\begin{thebibliography}{La}
\bibitem{citation01}
Author(s),
\textit{Title}, \\
Editor, Location, \\
\textsl{Edition}, \texttt{Year}
\bibitem[La]{lamport94}
...
\end{thebibliography}
```



# thebibliography

```
\begin{thebibliography}{La}
```

Longest label of the bibliography. Here, La has the longest citation symbol.

```
\bibitem{citation01}
```

In the document, citations are done with this citation key (citation01).

Author(s),

```
\textit{Title},\
```

```
Editor, Location,\
```

```
\textsl{Edition},\texttt{Year}
```

```
\bibitem[La]{lampport94}
```

Text style has to be defined here

...

```
\end{thebibliography}
```

Optional argument ([La]) can change the citation symbol.

# Citations

Various ways to cite a source:

`\cite{citation01}` ⇒ This theory was discovered by author01 [1].

`\cite[p. 21]{lamport94}` ⇒ In 1994 Lamport used the word  $\text{\LaTeX}$  for the first time [La, p. 21].

`\cite{citaat01, lamport94}` ⇒ Author01 and Lamport discovered together ... [1, La].

`(\nocite{citation03})` ⇒ A book or article appears in the bibliography, but isn't referenced to in the document. **Only applicable when using BibTeX.**

# BibTeX

- Uses a **separate** file for the bibliography
- Using the .bib file extension.
- De 'bibitems' look very different.



# The .bib-file

## Example

```
@article{greenwade93,  
author = "George D. Greenwade",  
title = "The {C}omprehensive {T}ex {A}rchive {N}etwork  
({CTAN})",  
year = "1993",  
journal = "TUGBoat",  
volume = "14",  
number = "3",  
pages = "342-351"  
}
```

# The .bib-file

## Example

```
@book{goossens93,  
author = {Michel Goossens and Frank Mittlebach and Alexander  
Samarin},  
title = {The LaTeX Companion},  
year = {1993},  
publisher = {Addison-Wesley},  
address = {Reading, Massachusetts}  
}
```

Other forms:

@phdthesis, @masterthesis, @conference and even @unpublished.

# Loading the bibliography

Loading the external bibliography in your document:

## Example

```
\bibliography{bibliographyfile}  
\bibliographystyle{plain}
```

Your bibliography has to be stored in `bibliographyfile.bib`!



# Styles

BibTeX knows the following styles:

**plain** With numbers. Sorted alphabetically.

**unsrt** With numbers. Sorted in the order of appearance.

**alpha** With name and year. Sorted alphabetically.

and many, many more. . .



# Why compile 3 times?!

In order to get proper references, the following steps need to be taken.

```
pdflatex document.tex
bibtex document
```

L<sup>A</sup>T<sub>E</sub>X gives errors

**Note:** this is the name of the .tex document, without file extension, and **not** the .bib file.

```
pdflatex document.tex
pdflatex document.tex
```

L<sup>A</sup>T<sub>E</sub>X still gives errors

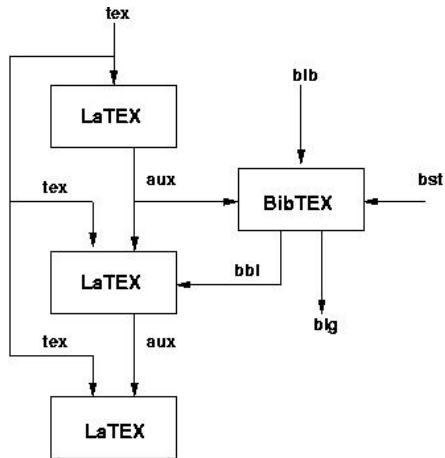
All done! (at least, it should be)

T<sub>E</sub>XMaker and T<sub>E</sub>XStudio should do this automatically.





# Why compile 3 times?!



# Importing BibTeX

- Many websites offer the possibility to export BibTeX
  - <http://scholar.google.com/scholar?q=Document%20Preparation%20System>
- Manage your sources with a *Reference Manager*
  - JabRef (<http://jabref.sourceforge.net/>)
  - Mendeley (<http://www.mendeley.com/>)
  - ...



# The natbib package

In preamble `\usepackage{natbib}`

Change the bibliography style to `\bibliographystyle{plainnat}`.

## Example

|                                       |   |
|---------------------------------------|---|
| <code>\citet{goossens93}</code>       | Goossens et al. (1993)                    |
| <code>\citep{goossens93}</code>       | (Goossens et al., 1993)                   |
| <code>\citet*{goossens93}</code>      | Goossens, Mittlebach, and Samarin (1993)  |
| <code>\citep*{goossens93}</code>      | (Goossens, Mittlebach, and Samarin, 1993) |
| <code>\citeauthor{goossens93}</code>  | Goossens et al.                           |
| <code>\citeauthor*{goossens93}</code> | Goossens, Mittlebach, and Samarin         |
| <code>\citeyear{goossens93}</code>    | 1993                                      |
| <code>\citeyearpar{goossens93}</code> | (1993)                                    |
| <code>\citealt{goossens93}</code>     | Goossens et al. 1993                      |
| <code>\citealp{goossens93}</code>     | Goossens et al., 1993                     |

# The natbib package

In preamble `\usepackage{natbib}`

Change the bibliography style to `\bibliographystyle{plainnat}`.

Other styles are `unsrtnat`, `abbrvnat`, `apsrev`, etc..

You can change these styles with `\bibpunct{[ ]}{;}{a}{,}{,}`  
(see wikibooks [2])

# Bibliography

- [1] Goossens, M. ,Mittelbach, F. and Samarin, A.  
*The LATEX companion*,  
Addison-Wesley Reading, MA,1993
- [2] [http://en.wikibooks.org/wiki/LaTeX/Bibliography\\_  
\Management](http://en.wikibooks.org/wiki/LaTeX/Bibliography_\Management),  
date: 7 december 2014



# Modular tex files

- When using big projects, it's recommended to split your tex file: `main.tex` for all the packages and styling function, and `chapterX.tex` for each and every chapter
- Package `subfiles` necessary



# Moduler tex files: example

## Example

Main.tex:

```
\documentclass{book}
\usepackage{subfiles}
(Rest of preamble)
\begin{document}
  \subfile{chapter1}
  \subfile{chapter2}
\end{document}
```

## Example

Main.tex:

```
\documentclass[main.tex]{subfiles}
\begin{document}
  \chapter{First chapter}
  ...
\end{document}
```

# Collaboration in L<sup>A</sup>T<sub>E</sub>X

A “Google Drive”-like environment for L<sup>A</sup>T<sub>E</sub>X

- ShareL<sup>A</sup>T<sub>E</sub>X ([www.sharelatex.com](http://www.sharelatex.com))
  - Free version for teams with up to 2 users
- WriteL<sup>A</sup>T<sub>E</sub>X ([www.writelatex.com](http://www.writelatex.com))
  - Everyone with the URL can edit the file

Both products have very similar functionalities and custom packages can be uploaded.

