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May 2018

Abstract

Abstract in the first language

Keywords

Keywords, in English, language

Introduction

This is a small overview how to write papers at the IVT in LaTeX. This paper is located at `ivt/doc/papers/exampleConference/2007/example/example.tex` of the SVN repository at `svn+ssh://svn.ivt.ethz.ch/var/lib/svn`. On one hand, it is a description of how to write such a paper, on the other hand it is also the example / template for writing LaTeX papers at the IVT. Hence, some parts of this document are only understandable if you simultaneously look at the source files (`.tex` extension).

If you see bugs and errors in the layout please contact kirill.mueller@ivt.baug.ethz.ch.

Structuring

To structure you paper you can define several headings and subheadings: “\section”, “\subsection”, “\subsubsection”, “\paragraph” and “\subparagraph”. The first three will be numbered and will show up in the content. The layout defines the style of the headings.

Examples of sections and subsections:

A subsubsection

Some text. Some text. Some text. Some text. Some text. Some text. Some text. Some text. Some text. Some text. Some text. Some text. Some text. Some text. Some text. Some text.

A paragraph

Some text. Some text. Some text. Some text. Some text. Some text. Some text. Some text. Some text. Some text. Some text. Some text. Some text. Some text. Some text. Some text.

A subparagraph

Some text. Some text. Some text. Some text. Some text. Some text. Some text. Some text. Some text. Some text. Some text. Some text. Some text. Some text. Some text. Some text.

Page Break

There are three ways of performing a manual page break.

- "\clearpage": omits the remaining space of the current page and starts the new one. Inserting two or more times that command does NOT produce follow up empty pages.
- "\cleardoublepage": It does the same than the command above, but for a report LaTeX type that define different layouts for the odd and even pages (i.e. dissertation layouts), it sometimes produces a complete follow up empty page such that the next sections will occur always on the even page (odd page, resp.)
- "\include": This is another way to start on a new page. If you use the "\include" command for separating a paper into different `.tex` files, "\include" will always start on top of the next page. If you do not want that, but still want to separate the paper into different files, use the "\input" command instead.

Text Blocks

A newline (one time “Return”) does NOT produce a new Block. You have to separate blocks with a COMPLETE EMPTY line.

Hence, it is a good idea to insert hard line breaks frequently, e.g. after commas or full stops. Most version control systems such as SVN are line-based; changes can be tracked easier if a paragraph is split over several lines. By the same token, it is not a good idea to let your text editor manage the line breaks for you.

This is a block. This is a block. This is a block. This is a block. This is a block. This is a block. This is a block. This is a block. This is a block. This is a block. This is a block. This is a block. This is a block. This is a block. This is a block.

This is another block. This is another block. This is another block. This is another block. This is another block. This is another block. This is another block. This is another block. This is another block. This is another block. This is another block. This is another block. This is another block. This is another block.

Lists

There are three ways of making lists:

Items

- Item one
  - Item one
  - Item two Item two Item two Item two Item two Item two Item two Item two Item two Item two Item two Item two Item two Item two Item two Item two
  - Item three
- Item two Item two Item two Item two Item two Item two Item two Item twoItem two Item two Item two Item two Item two Item two Item two Item two
- Item three

Enumerations

1. Item one
    a) Item one
    b) Item two Item two Item two Item two Item two Item two Item two Item twoItem two Item two Item two Item two Item two Item two Item two Item two
    c) Item three
2. Item two Item two Item two Item two Item two Item two Item two Item twoItem two Item two Item two Item two Item two Item two Item two Item two
3. Item three

Descriptive list

Desc one Item one

Desc one Item one

Desc two Item two

Desc three Item three

Desc two Item two

Desc three Item three

Sub-Lists

List can be nested in any fashion you like:

- Item one
    - Item one
    - Item two
    - Item three
- Item three
    1. Item one

        Desc one Item one

Desc two Item two Item two Item two Item two Item two Item two Item two Item two Item two Item two Item two Item two Item two Item two Item two Item two Item two Item two Item two

- Item one
- Item two Item two Item two Item two Item two Item two Item two Item two Item two Item two Item two Item two Item two Item two Item two Item two Item two Item two Item twoItem two
- Item three

Desc three Item three

a) Item one
b) Item two
c) Item three

2. Item two
3. Item three

- Item four

In-paragraph lists

This is if you want to spend less space in your paper, provided by the "paralist" package. These cannot be nested, but converting them to a proper list later is easy:

(a) Item one (b) Item two (c) Item three

Text appearance

There are also more commands to change the appearance of text. However, underlining and letter-spacing is not recommended when writing papers. Some even consider bold-face as bad practice, as it changes the "average greyness" of the text (as does underlining and letter-spacing).

Bold, etc.

Emphasis (instead of italic), **Bold**, SMALL CAPS, ***Bold italics***, `Teletype`, Sans serif.

URL

To write an url type: `www.ivt.ethz.ch`. The PDF will contain a link to that URL.

Special Characters

Large Space

Two sentence are separated with a large empty space. For dots used in acronyms (“i.e.” or “e.g.”) followed by an empty space, you do not want this extra large space. In this case you should add a backslash after the dot or use non-breaking space (see below). Example:

A fact, e.g. an example.

Quotation Mark

Quotation marks: “text to be quoted”, also in ‘single quotes’.

Dashes

There are three types of dashes:

Hyphen Dash agent-based
Range Dash page 123–138
em Dash bla bla—thinking—bla bla

Predefined special characters

Some characters are used for special functions. If you want to write them use the following substitutions:

$ & % # { } § £ \ ~ ^ ¿ ¡

There are a lot more special characters, especially for formulas. You will find a fairly good overview in `http://www.ctan.org/tex-archive/info/lshort/english/lshort.pdf`. This is by the way a good reference for many questions concerning LaTeX.

Non-breaking space

Sometimes, you do not want that two words are split at a line ending. To prevent this use the "tilde" character. Example:

6 AM 6 AM 6 AM 6 AM 6 AM 6 AM 6 AM 6 AM 6 AM 6 AM 6 AM 6 AM 6 AM 6 AM 6 AM 6 AM

versus

6 AM 6 AM 6 AM 6 AM 6 AM 6 AM 6 AM 6 AM 6 AM 6 AM 6 AM 6 AM 6 AM 6 AM 6 AM 6 AM

Ligatures

Take a closer look at the words "affluent", "effective" and "flow". The joining of the f and l letters happens automatically; however in rare occasions you may want to suppress this, like for "shelfful".

Complex Structures

Here you can find how to use labeling, cross-references, footnotes, etc. Some of them are standard LaTeX commands, described in this section. Commands available only in the IVT environment will be explained in the next section.

Labels and Cross-Refs

Anywhere you want you can add a label (see above for this subsection). Wherever you want you can refer (cross-ref) to this label by using the "\ref" command. Example: Labels and Cross-Refs

can be found in Section 2.1.

Labels can also be used in lists:

1. Step one
2. Step two
3. Feedback (Goto 1)

Labels are very important in Figures and Tables. It is used to refer to them in the written text (see Sections 3.1 and 3.2).

Clever referencing

The "cleveref" package provides the "\cref" command to conveniently reference any type of object[1]. For example:

- This is a reference to a single section: Labels are described in Section 2.1.
- This is a reference to multiple sections: This document contains, among others, Sections 2.1 to 2.3.
- This is a reference to multiple subsequent sections: This document contains, among others, Sections 2.1, 2.3 and 3.1.
- One can summarize refs to different types of objects. This becomes clear when taking a look at this sentence with references to Section 2.1, Figs. 5(a) and 5(b), and Table 1.
- Figure 1—this is how a reference to a figure should look like at the beginning of a sentence. Compare this with the following: Fig. 2.

Note how "cleveref" automatically adds the object type. One does not have to write it anymore. But remember using the "\Cref" command instead at the beginning of the sentence!

Footnotes

Footnotes are directly embedded in the text where you want to refer to them. Depending on the layout, they will appear at the bottom of the current page or at the end of the Section. Example:

[1] See `http://www.ctan.org/tex-archive/help/Catalogue/entries/cleveref.html`, accessed on May 28th, 2010.

This is a text[2] with a footnote[3].

Formulas

To write formulas in LaTeX you can describe it as plain text. You can either embed a formula into the text or add it on a separate line. In the second version formula numbers will be automatically added. With labels you are able to refer to the formulas.

Formula embedded in text

The formula part is enclosed by $. Examples:

bla bla bla $[-30min, +30min]$ bla bla bla.

bla bla bla bla bla bla $P > N$ bla bla bla S_j bla j bla bla bla β bla bla bla.

Formula as separate line

Using the "equation" environment the formulas will be placed on a separate line with a number. Examples:

$$S = (1 - \alpha) \cdot S_{\text{old}} + \alpha \cdot S_{\text{new}}\,, \tag{1}$$

$$U_{\text{total}} = \sum_{i=1}^{n} U_{\text{perf},i} + \sum_{i=1}^{n} U_{\text{late},i} + \sum_{i=1}^{n} U_{\text{travel},i}\,, \tag{2}$$

[2]more information about "text"
[3]more information about "footnote"

$$U_{\text{perf},i}(t_{\text{perf},i}) = \max\left[0, \beta_{\text{perf}} \cdot t_i^* \cdot \ln\left(\frac{t_{\text{perf},i}}{t_{0,i}}\right)\right], \tag{3}$$

$$t_{0,i} = t_i^* \cdot e^{-\zeta/(p \cdot t_i^*)}, \tag{4}$$

$$U_{\text{perf},i}(t_{\text{perf},i}) = \max\left[0, \beta_{\text{perf}} \cdot t_i^* \cdot \left(\ln\left(\frac{t_{\text{perf},i}}{t_i^*}\right) + \frac{\zeta}{p \cdot t_i^*}\right)\right]. \tag{5}$$

$$U_{\text{late},i} = \begin{cases} \beta_{\text{late}} \cdot t_{\text{late},i} & : t_{\text{late},i} \geq 0 \\ 0 & : \text{otherwise} \end{cases} \tag{6}$$

$$\begin{aligned} U_{\text{travel},i} &= \beta_{\text{travel}} \cdot t_{\text{travel},i} \\ &= \beta_{\text{travel}} \cdot \dots \end{aligned} \tag{7}$$

With the labels you can refer to an equation with the “ref” command. Examples:

As shown in Eq. (2), the total utility is… See Eq. (7) for the definition of the travel-utility.

Text mode

Text in math mode looks ugly, and spaces are ignored: $baffl inglyugly$. Anything that consists of more than one letter should be surrounded by the “\text” command: bafflingly ugly. If you need italics, use “\text{\emph{…}}” or simply “\mathit”; the latter still eats spaces: *bafflinglyugly*.

Citations and References

By using the IVT bibliography database you can refer to a reference by using the command "\citep" (citation in parentheses) or "\citet" (citation embedded in the sentence). With the unique key of the bib-entry you will automatically refer to that reference and the reference will automatically be added to the reference list. The way the references will be sorted depends on the layout you use.

Examples for "\citet":

bla bla Hensher (2001) and Gärling and Axhausen (2004) bla bla bla bla bla bla bla bla bla bla Bowman *et al.* (1999), Vovsha *et al.* (2002), Jonnalagadda *et al.* (2001), Bhat *et al.* (2004), Axhausen (1990) bla bla bla bla bla bla bla bla.

Examples for "\citep":

bla bla bla bla bla bla (e.g., Sheffi, 1985, Ortúzar and Willumsen, 2001, 2011).

bla bla bla bla bla bla (see also Wardrop, 1952, pp. 325-378).

bla bla bla bla bla bla (Wardrop, 1952).

Just like with the clever referencing commands (cf. Section 2.2) you should use "\Citet" or "\Citep" instead at the beginning of a sentence. De Jong *et al.* (2005) would be otherwise shown as de Jong *et al.* (2005) in your paper.

IVT-specific commands

This section defines the special commands that are available only at the IVT environment. Those special commands react on different layouts defined in the environment, thus making it convenient to switch between paper layouts.

Figures

There are three commands for including Figures. One for a single Figure and one for a Multi-Figure. The position of the Figure is chosen by LaTeX, but a hint can be provided.

Single Figures

A single figure as shown in Fig. 1 has the following construct:

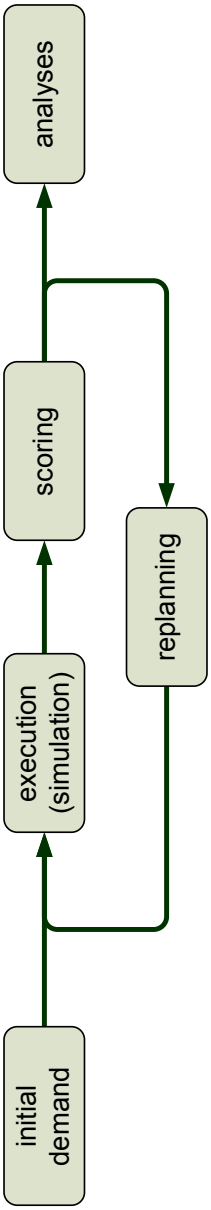
\createfigure[1]{2}{3}{4}{5}{6}

1. the placement modifier (optional)
2. the short caption for the content List
3. the long caption shown next to the figure
4. the label of the figure
5. the figure
6. the source with other additional comments

The placement modifier (item 1) specifies where the figure appears in the final document. It can be “tp”, “htp” or “hp”; “t” means “at the top of this or a following page”, “h” means “at the place where the command appears”, and “p” means “on a separate page”. If you leave out this parameter (including the square brackets), “tp” is the default. Usually a figure will appear on the next suitable location after it has been declared. The placement on a separate page will be used as a last resort if the figure does not fit anywhere else, even if you do not include it.

If the short and the long caption (item 2&3) should say the same, just add the same text twice. Item 4 ALWAYS defines a label (as shown in Section 2.1). Item 5 always contains the “\includegraphics” command. The parameter “width” defines the size of the Figure (respecting width and length ratio). If “width” is equal to 1.0\textwidth the Figure has width of the text area width. With “angle” you can rotate the Figure (+/-180). With Item 6 you can add a source. If you do not want to add a source, just leave it empty. If not, “Source: ” or “Quelle: ” will be added followed by your text.

Figure 1: Single Figure: Here you can add the long Caption of the Figure. This Caption apprears only in the paper and NOT in the Content. With that, the content list is much better to read. The Caption for the Content can be added above.



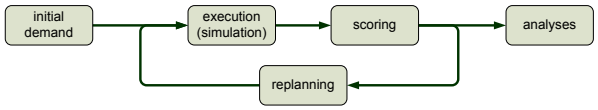
Source: Christoph Dobler

Multi-Figures

Multi-Figures uses the same command as for single Figures. But instead of adding one "\includegraphics" command in Item 5 you can add as many "\createsubfigure" commands as you want.

Figure 2: Multi-Figure1: Long Caption

(a) Caption of the first Sub-Figure



(b) Caption of the second Sub-Figure

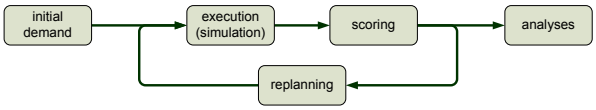
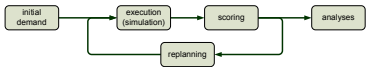
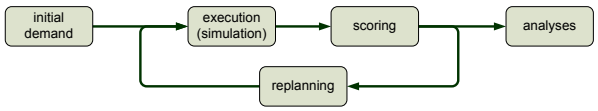


Figure 4: Multi-Figure2: Long Caption

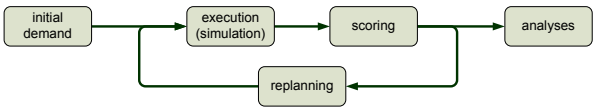
(a) Caption of the first Sub-Figure



(b) Caption of the second Sub-Figure



(c) Caption of the third Sub-Figure



Source: my source

The structure of the "\createsubfigure" command is:

1. the caption for the sub-figure
2. the figure (again by using the "\includegraphics" command)
3. the label of the sub-figure
4. either \\ or leave it empty

The last item defines, if you want a line break between this sub-figure and the following one. By using \\ the following figure will be on the next line. The last Sub-Figure should not use \\.

Figure 2 contains two sub-figures (Figs. 3(a) and 3(b)) put on the same line.

Figure 4 contains three sub-figures (Figs. 5(a) to 5(c)). The first one is set on the first line, while the other two are set to the second line.

Table 1: A Tables long Caption

Bias / Error	Routes Only	Times and Routes
Mean Abs. Bias:	+331.40	+306.32
Mean Rel. Bias:	+19.62%	+25.27%
Mean Abs. Error:	533.55	503.77
Mean Rel. Error:	37.50%	35.38%

Source: my source

Landscape figures

Oversize figures in landscape orientation can be put rotated on a separate page using the "\createsidewaysfigure" command, only that no placement specifier is available. The syntax is identical to that of the "\createfigure" command (cf. Section 3.1.1). The page is rotated for on-screen display, too. The result can be seen in Fig. 6.

Tables

A table has the same structure as the single Figure (see above). But instead of including a graphic in item 4 you add the "tabular" construct. Unfortunately it is not that easy to understand and edit such a table. One has to get used to it. However, quite a few tools can help converting the data to the LaTeX format, see `http://tex.stackexchange.com/q/49414/8057` for an overview.

If you do not like it you can still add the table as a graphic (with the "\includegraphics") command. But you still need to use the "\createtable" command, otherwise your table will appear in the list of figures instead of the list of tables. Table 1 shows an example of a table.

There is an analogous command "\createsubtable" for multi-tables.

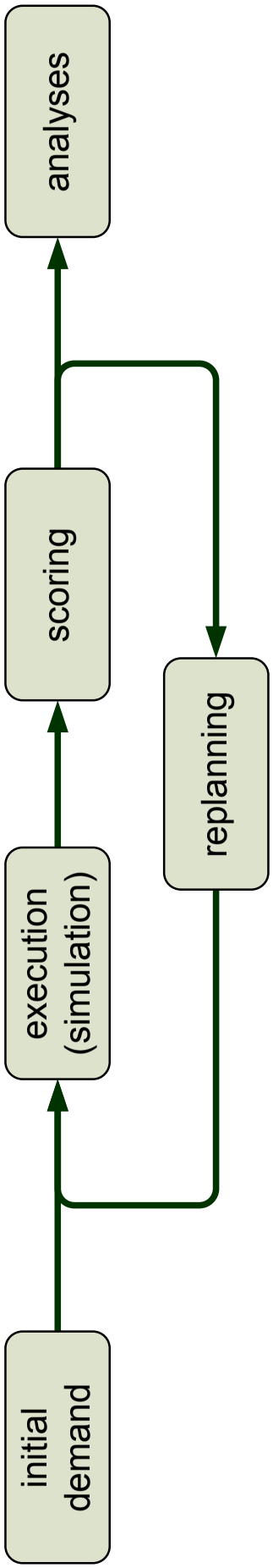


Figure 6: The MATSim simulation loop

Source: Christoph Dobler

Pretty Printing

LaTeX provides several functionalities for printing nice code, data and so on. At the moment the layout features a nice way of printing XML code. You do not have to copy XML into this paper, instead you can include an XML file. The command is similar to the Figure (it also will be included into the list of figures). Figure 7 shows an example.

If you want other pretty printing options, please ask kirill.mueller@ivt.baug.ethz.ch.

Summary and Important Notes

This example paper gives you a short overview of how to write a paper in LaTeX inside the IVT LaTeX-BibTeX environment. Some of the concepts are general while other are made for the use at the IVT using the IVT LaTeX environment.

If you want to know more about LaTeX, there is a pretty good and not too long introduction under `http://www.ctan.org/tex-archive/info/lshort/english/lshort.pdf`. Even more can be found under `http://www.ctan.org/`. Also using Google search engine helps a lot.

At last, there are some very important notes about writing in LaTeX: Since it is not a WYSIWYG way of writing papers, you always need to "compile" it to pdf. Unfortunately, if you do something wrong (i.e. forgetting a closing bracket, using non ISO characters, or using special character that TeX will interpret in another way) then error messages will appear that are very very hard to understand. Therefore, if you add something special, i.e. a figure, a table, a new BibTeX entry or a formula, compile the paper right before and right after you added such stuff. If errors occurs, then you will at least know that the produced error is caused by the last thing you did. That helps a lot!

And something helps a lot, too: There are already many papers, dissertations, CVs, misc stuff, etc., that you can find under `ivt/doc`, that shows you very good examples what you can do with LaTeX.

If you have questions do not hesitate to ask someone at the IVT with a bit of experience (Kirill, Basil, . . .).

Figure 7: A typical plan in XML. This agent, id 393241, leaves home (on link id 5834 of the given network) at 7:00 AM (performing home activity for 7 hours), and drives to work via a four-node route (five links) which it expects to take 25 minutes to traverse. The agent stays at work for 9 hours, then drives home again via a two-node route and stays at home until midnight. Therefore, it describes a complete day-plan for person number 393241.

```
<plans name="example plans file" xml:lang="de-CH"> ...
  <person id="393241" age="37" income="50000">
    <knowledge>
      <activity type="work">
        <location type="link" id="844">
          <capacity value="180" />
          <opentime day="wkday" start_time="07:00:00"
            end_time="20:00:00" />
          <opentime day="sat" start_time="07:00:00"
            end_time="16:00:00" />
        </location>
        ...
      </activity>
      ...
    </knowledge>
    <plan>
      <act type="home" link="58" start_time="00:00" dur="07:00"
        end_time="07:00" />
      <leg mode="car" dept_time="07:00" trav_time="00:25"
        arr_time="07:25">
        <route>1932 1933 1934 1947</route>
      </leg>
      <act type="work" link="844" start_time="07:25" dur="09:00"
        end_time="16:25" />
      <leg mode="car" dept_time="16:25" trav_time="00:14"
        arr_time="16:39">
        <route>1934 1933</route>
      </leg>
      <act type="home" link="58" start_time="16:39" dur="07:21"
        end_time="24:00" />
    </plan>
  </person>
  ...
</plans>
```

Acknowledgement

State your acknowledgements here.

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Bowman, J. L., M. A. Bradley, Y. Shiftan, T. K. Lawton and M. E. Ben-Akiva (1999) Demonstration of an activity-based model for Portland, *World Transport Research*, **3**, 171–184.

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Vovsha, P., E. Petersen and R. Donnelly (2002) Microsimulation in travel demand modeling: Lessons learned from the New York best practice model, *Transportation Research Record*, **1805**, 68–77.

Wardrop, J. G. (1952) Some theoretical aspects of road traffic research, *Proceedings of the Institution of Civil Engineers*, **1** (3) 325–362.

First section in the appendix

The appendix starts with the “appendix” command. the rest is the same as in the sections.

A subsection in the appendix

bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla bla

bla bla

Second section in the appendix

bla bla