

Subject

Master Thesis

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1 Some Helpful Remarks

The `mathpazo` font has a special property regarding numbers and context: Text 1234 1234. An Example: In the year 1996 it was decided that π shall be exactly 3. This way, numbers outside of a mathematical context will not draw any attention to them as they look like letters (1996), while math related numbers will (\$1996\$ will result in 1996). If you don't want this feature, remove the `osf` option from the `mathpazo` package.

1.1 On Citations

The following was taken from the wikibook page on citations (margin)].

Sidenote Consider using QR codes, if you want to link to something, in addition to `urls`. Another good practice is the use of the `hyperref` package. Note, that you can click on the `url` in the margin if you are viewing this on screen.



For any academic/research writing, incorporating references into a document is an important task. Fortunately, LaTeX has a variety of features that make dealing with references much simpler, including built-in support for citing references. However, a much more powerful and flexible solution is achieved thanks to an auxiliary tool called BibTeX (which comes bundled as standard with LaTeX).

BibTeX provides for the storage of all references in an external, flat-file database. This database can be linked to any LaTeX document, and citations made to any reference that is contained within the file. This is often more convenient than embedding them at the end of every document written. There is now a centralized bibliography source that can be linked to as many documents as desired (write once, read many!). Of course, bibliographies can be split over as many files as one wishes, so there can be a file containing references concerning General Relativity and another about Quantum Mechanics. When writing about Quantum Gravity (QG), which tries to bridge

the gap between these two theories, both of these files can be linked into the document, in addition to references specific to QG.

To actually cite a given document is very easy. Go to the point where you want the citation to appear, and use the following:

```
\cite{cite_key},
```

where the `cite_key` is that of the bibitem you wish to cite. When LaTeX processes the document, the citation will be cross-referenced with the bibitems and replaced with the appropriate number citation. The advantage here, once again, is that LaTeX looks after the numbering for you. If it were totally manual, then adding or removing a reference would be a real chore, as you would have to re-number all the citations by hand.

I have previously introduced the idea of embedding references at the end of the document, and then using the `\cite{}` command to cite them within the text. In this tutorial, I want to do a little better than this method, as it's not as flexible as it could be. Which is why I wish to concentrate on using BibTeX.

A BibTeX database is stored as a .bib file. It is a plain text file, and so can be viewed and edited easily. The structure of the file is also quite simple. An example of a BibTeX entry:

```
@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"  
}
```

Each entry begins with the declaration of the reference type, in the form of `@type`. BibTeX knows of practically all types you can think of, common ones are: `book`, `article`, and for papers presented at conferences, there is `inproceedings`. In this example, I have referred to an article within a journal.

After the type, you must have a left curly brace '`{`' to signify the beginning of the reference attributes. The first one follows immediately after the brace, which is the citation key, or the BibTeX key. This key must be unique for all entries in your bibliography. It is this identifier that you will use within

your document to cross-reference it to this entry. It is up to you as to how you wish to label each reference, but there is a loose standard in which you use the author's surname, followed by the year of publication. This is the scheme that I use in this tutorial.

Next, it should be clear that what follows are the relevant fields and data for that particular reference. The field names on the left are BibTeX keywords. They are followed by an equals sign (=) where the value for that field is then placed. BibTeX expects you to explicitly label the beginning and end of each value. I personally use quotation marks ("), however, you also have the option of using curly braces ('{', '}'). But as you will soon see, curly braces have other roles, within attributes, so I prefer not to use them for this job as they can get more confusing. A notable exception is when you want to use characters with umlauts (ü, ö, etc), since their notation is in the format `\"o`, and the quotation mark will close the one opening the field, causing an error in the parsing of the reference. Using `\usepackage[utf8]{inputenc}` in the preamble to the .tex source file can get round this, as the accented characters can just be stored in the .bib file without any need for special markup. This allows a consistent format to be kept throughout the .bib file, avoiding the need to use braces when there are umlauts to consider.

Remember that each attribute must be followed by a comma to delimit one from another. You do not need to add a comma to the last attribute, since the closing brace will tell BibTeX that there are no more attributes for this entry, although you won't get an error if you do.

It can take a while to learn what the reference types are, and what fields each type has available (and which ones are required or optional, etc). So, look at this entry type reference and also this field reference for descriptions of all the fields. It may be worth bookmarking or printing these pages so that they are easily at hand when you need them.

1.2 Math Symbols

A fraction is created using the `\frac{numerator}{denominator}` command. Likewise, the binomial coefficient (aka the Choose function) may be written using the `\binom` command:

$$\binom{n}{k} = \frac{n!}{k!(n-k)!}, \quad \sum_{k=1}^n \binom{n}{k} \alpha^k \beta^k = (\alpha + \beta)^n. \quad (1.1)$$

The full command set for (1.1):

```

\begin{align}
\binom{n}{k}&=\frac{n!}{k!(n-k)!}\,,\, &
\sum_{k=1}^n \binom{n}{k} \alpha^k \beta^{n-k}&=(\alpha+\beta)^n\,,. \\
\label{eq:binomials}
\end{align}

```

Examples for matrices:

$$\dot{x} = \begin{pmatrix} \gamma & \beta \\ -\beta & \gamma \end{pmatrix} x + \delta \qquad \dot{y} = \begin{bmatrix} \gamma & \beta \\ -\beta & \gamma \end{bmatrix} y + \eta$$

```

\begin{align*}
\dot{x}&= \\
\begin{pmatrix} \gamma & \beta \\ -\beta & \gamma \end{pmatrix} x &+ \delta \\
\dot{y}&= \\
\begin{bmatrix} \gamma & \beta \\ -\beta & \gamma \end{bmatrix} y &+ \eta
\end{align*}

```

To round things up, a drawing in tikz without using the figure environment, so that the figure doesn't float:

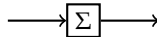


Figure 1.1: a TikZ example.

```

\begin{center}
\begin{tikzpicture}[thick]
\node (S) at (0,0) [draw,rectangle] {$\Sigma$};
\draw[->] (-1,0) -- (S);
\draw[->] (S) -- ++(1,0);
\end{tikzpicture}
\captionof{figure}{a TikZ example.}
\label{fig:system}
\end{center}

```

Finally, a reference to the figure, to see whether it worked: see Figure 1.1.

Eigenständigkeitserklärung

Ich versichere hiermit, dass ich, Student 123, die vorliegende Arbeit selbstständig angefertigt, keine anderen als die angegebenen Hilfsmittel benutzt und sowohl wörtliche, als auch sinngemäß entlehnte Stellen als solche kenntlich gemacht habe. Die Arbeit hat in gleicher oder ähnlicher Form noch keiner anderen Prüfungsbehörde vorgelegen. Weiterhin bestätige ich, dass das elektronische Exemplar mit den anderen Exemplaren übereinstimmt.

Ort, Datum

Unterschrift