

5-2004

The Power of LATEX

Kenneth James Keefe

Follow this and additional works at: http://opensiuc.lib.siu.edu/uhp_theses

Recommended Citation

Keefe, Kenneth James, "The Power of LATEX" (2004). *Honors Theses*. Paper 267.

This Dissertation/Thesis is brought to you for free and open access by the University Honors Program at OpenSIUC. It has been accepted for inclusion in Honors Theses by an authorized administrator of OpenSIUC. For more information, please contact opensiuc@lib.siu.edu.

The Power of L^AT_EX

A Senior Honors Thesis

Kenneth James Keefe

Spring 2004

Before I begin my report of my work over the last semester, I'd like to thank Professor Ronald Grimmer of the Math Department. Without his guidance over the last five years, in and out of the classroom, I would not be half the student I am today. His open door and friendly advice were priceless to me. I can truly say he has been my mentor at SIUC. Professor Grimmer, I am forever indebted to you. Thank you.

1 Introduction

During the Spring semester of 2004, I worked on an independent study project with Professor Ronald Grimmer of the Department of Mathematics at Southern Illinois University at Carbondale. The goal of our project was to investigate the power of a typesetting markup language that is used by most scientists to write papers and journal articles. This language is called $\LaTeX$ (pronounced lah-tek) and is extremely effective in not only creating complicated documents, but also writing mathematical symbols in a simple, straightforward way, both of which will be demonstrated in the paper to come.

1.1 A Brief History

In 1977 Donald Knuth set out to write a book on Computer Programming. He quickly discovered that there was no typesetting system available that allowed easy creation of complex documents, such as a book. He diverted his attention to writing a markup language and eight years later it published $\TeX$.

While $\TeX$ was a major achievement and very powerful, it was also clumsy and difficult to use. Many people wrote variations to Knuth's $\TeX$, but the best and most frequently used today is $\LaTeX$. Created by Leslie Lamport, $\LaTeX$ was literally $\TeX$ for laymen although the name actually originates from Lamport. $\LaTeX$ used the power of $\TeX$, but used a simpler command system that many people compare to the difficulty of simple *HTML*.

2 Basic Abilities

As described earlier, $\LaTeX$ is an excellent language to create complicated documents with. Most scientific articles and papers are written using $\LaTeX$. Some authors have even written entire books with $\LaTeX$. What makes $\LaTeX$ so powerful is that it not only is extremely customizable, but its commands are also very intuitive. For example, in order to create this section I am writing, I simply wrote the command `\section{Basic Abilities}`. Further sectioning commands are that easy, also.

For users of WYSIWYG (What You See Is What You Get) word processors, the text effects that are available in those processors are also possible in $\LaTeX$, they are just achieved in a different manner. For example, I can make **my words** stand out by adding a command to make them bold: `\textbf{my words}`. In a similar fashion, users can achieve *italics*, SMALL CAPS, and underline.

2.1 Lists

Lists are also an easy task in $\LaTeX$. There are many kinds of list styles:

- | | | |
|----------|-------------|-----------|
| • Item 1 | I. Item 1 | 1. Item 1 |
| • Item 2 | II. Item 2 | 2. Item 2 |
| • Item 3 | III. Item 3 | 3. Item 3 |

All of these lists are implemented in the same fashion, which makes changing from one style to another a matter of changing a single word in the list command.

2.2 Tables

Like lists, tables are also easy to do and the command structure is very straightforward. Simply declare a table and the justification for each of the columns (left, right, center). Look at the following code example on the left and its result on the right:

```
\begin{tabular}{l|rc}
Name & Percent & Letter Grade \\
\hline
Ken Keefe & 100 & A \\
Fred Williams & 88 & B \\
Walter Wendler & 70 & C
\end{tabular}
```

Name	Percent	Letter Grade
Ken Keefe	100	A
Fred Williams	88	B
Walter Wendler	70	C

3 Working With Mathematics

Probably the most attractive feature of $\text{\LaTeX}$ to most scientists is its ability to typeset mathematics in a convenient manner. Regardless of the field of science, at some point in a scientist's publishing career, they will need to write some form of mathematical equation, whether it be a simple polynomial or a complicated integral. With $\text{\LaTeX}$, all the author has to do is look up the correct command. Although writing complicated equations are not impossible in a WYSIWYG word processor, it is often very problematic to get exactly what you want.

With $\text{\LaTeX}$, scientists are able to write practically any mathematical expressions. Here are a few examples that start with the code and then what it produces:

$$(x + 2)^2 = x^2 + 4x + 4$$

$$(x + 2)^2 = x^2 + 4x + 4$$

$$\sum_{i=1}^n i^2 = 1^2 + 2^2 + 3^2 + \cdots + n^2 = \frac{n(n+1)(2n+1)}{6}$$

$$\sum_{i=1}^n i^2 = 1^2 + 2^2 + 3^2 + \cdots + n^2 = \frac{n(n+1)(2n+1)}{6}$$

```
L = \int_a^b \sqrt{\left[f'(t)\right]^2 + \left[g'(t)\right]^2} dt
= \int_a^b \sqrt{\left(\frac{dx}{dt}\right)^2 + \left(\frac{dy}{dt}\right)^2} dt
```

$$L = \int_a^b \sqrt{[f'(t)]^2 + [g'(t)]^2} dt = \int_a^b \sqrt{\left(\frac{dx}{dt}\right)^2 + \left(\frac{dy}{dt}\right)^2} dt$$

4 Choosing An Output

Once an author has written their document in the $\text{\LaTeX}$ markup language, the only thing that remains is for the code to be compiled into a document format that can be read by others in the way the author intended. With $\text{\LaTeX}$, there are several options. The document can be saved as either a *postscript* file or a *pdf* file, both of which were created by the Adobe company and are very popular. Alternatively, the document can be saved in an open source, free format called *DVI*. This format is readable by many applications, but has not yet become as prevalent as Adobe formats. If the author desires, the document can be saved as an *RTF* (Rich Text Format) file. This file is useful for those who wish to continue editing the file using a WYSIWYG word processor.

The newest and most interesting format to compile one's $\text{\LaTeX}$ document is by translating it to another *very* popular markup language called *HTML*. *HTML* allows documents to be viewed via the world wide web. Using a simple application called *latex2html*, authors can take entire documents and create a fully functional website based off of their document, complete with a navigable hierarchy based on the sectioning commands set up by the author.

5 The Final Straw

As if the ease and power of this language wasn't attractive enough, did I mention that it is completely free? Yes, there are commercial versions of $\text{\LaTeX}$ that come with all sorts of neat bells and whistles, but the underlying system can be downloaded off of the Internet by anyone, for free! The best way to learn about $\text{\LaTeX}$ is to buy a beginner book, available at any sizeable bookstore and try it out. Why continue to pay hundreds of dollars for some WYSIWYG word processor when a simpler, more powerful system is readily available?

In this report, I have merely scratched the surface of $\text{\LaTeX}$. Everything that you can do with some of the most advanced word processors of today, you can also do with $\text{\LaTeX}$. There are ways of drawing graphs and even writing musical scores using preexisting libraries. With $\text{\LaTeX}$, the sky truly is the limit.

References

- [1] Griffiths, David F. and Higham, Desmond J., *Learning L^AT_EX*, SIAM Publishing, Philadelphia, 1997.
- [2] Lipkin, Bernice Sacks, *L^AT_EX for Linux*, Springer Publishing, New York, 1999.
- [3] Thompson, Skylar, *The History of T_EX and L^AT_EX*,
http://www.earlham.edu/~thompsk/final_project/latex/node4.html, 2002.