How to write a dissertation in \LaTeX

Computer Science Tripos – Part II

St John’s College

October 23, 2014
Proforma

Name: Martin Richards
College: St John’s College
Project Title: How to write a dissertation in \LaTeX
Examination: Computer Science Tripos – Part II, July 2001
Word Count: 15871 (well less than the 12000 limit)
Project Originator: Dr M. Richards
Supervisor: Dr Markus Kuhn

Original Aims of the Project

To write a demonstration dissertation2 using \LaTeX to save student’s time when writing their own dissertations. The dissertation should illustrate how to use the more common \LaTeX constructs. It should include pictures and diagrams to show how these can be incorporated into the dissertation. It should contain the entire \LaTeX source of the dissertation and the makefile. It should explain how to construct an MSDOS disk of the dissertation in Postscript format that can be used by the book shop for printing, and, finally, it should have the prescribed layout and format of a diploma dissertation.

Work Completed

All that has been completed appears in this dissertation.

Special Difficulties

Learning how to incorporate encapsulated postscript into a \LaTeX document on both Ubuntu Linux and OS X.

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1This word count was computed by `detex diss.tex | tr -cd '0-9A-Za-z \n' | wc -w`

2A normal footnote without the complication of being in a table.
Declaration

I, [Name] of [College], being a candidate for Part II of the Computer Science Tripos [or the Diploma in Computer Science], hereby declare that this dissertation and the work described in it are my own work, unaided except as may be specified below, and that the dissertation does not contain material that has already been used to any substantial extent for a comparable purpose.

Signed [signature]
Date [date]
List of Figures

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Acknowledgements

This document owes much to an earlier version written by Simon Moore [2]. His help, encouragement and advice was greatly appreciated.
Chapter 1

Introduction

1.1 Overview of the files

This document consists of the following files:

- makefile — The makefile for the dissertation and Project Proposal
- diss.tex — The dissertation
- proposal.tex — The project proposal
- figs — A directory containing diagrams and pictures
- refs.bib — The bibliography database

1.2 Building the document

This document was produced using \LaTeX\ which is based upon \TeX\[1\]. To build the document you first need to generate diss.aux which, amongst other things, contains the references used. This is done by executing the command:

```
pdflatex diss
```

Then the bibliography can be generated from refs.bib using:

```
bibtex diss
```

Finally, to ensure all the page numbering is correct run \pdflatex\ on diss.tex until the .aux files do not change. This usually takes 2 more runs.

1.2.1 The makefile

To simplify the calls to \pdflatex\ and \bibtex, a makefile has been provided, see Appendix B.1. It provides the following facilities:

```
make
    Display help information.
```
make proposal.pdf
Format the proposal document as a PDF.

make view-proposal
Run make proposal.pdf and then display it with a Linux PDF viewer (preferably “okular”, if that is not available fall back to “evince”).

make diss.pdf
Format the dissertation document as a PDF.

make count
Display an estimate of the word count.

make all
Construct proposal.pdf and diss.pdf.

make pub
Make diss.pdf and place it in my public_html directory.

make clean
Delete all intermediate files except the source files and the resulting PDFs. All these deleted files can be reconstructed by typing make all.

1.3 Counting words

An approximate word count of the body of the dissertation may be obtained using:
wc diss.tex
Alternatively, try something like:
detex diss.tex | tr -cd '0-9A-Z a-z\n' | wc -w
Chapter 2

Preparation

This chapter is empty!
Chapter 3

Implementation

3.1 Verbatim text

Verbatim text can be included using \begin{verbatim} and \end{verbatim}. I normally use a slightly smaller font and often squeeze the lines a little closer together, as in:

GET "libhdr"
GLOBAL { count:200; all }
LET try(ld, row, rd) BE TEST row=all
  THEN count := count + 1
  ELSE { LET poss = all & ~(ld | row | rd)
    UNTIL poss=0 DO
      { LET p = poss & -poss
        poss := poss - p
        try(ld+p << 1, row+p, rd+p >> 1)
      }
  }
LET start() = VALOF
  { all := 1
    FOR i = 1 TO 12 DO
      { count := 0
        try(0, 0, 0)
        writef("Number of solutions to %i2-queens is %i5*n", i, count)
        all := 2*all + 1
      }
    RESULTIS 0
  }
3.2 Tables

Here is a simple example\footnote{A footnote} of a table.

<table>
<thead>
<tr>
<th>Left Justified</th>
<th>Centred</th>
<th>Right Justified</th>
</tr>
</thead>
<tbody>
<tr>
<td>First</td>
<td>A</td>
<td>XXX</td>
</tr>
<tr>
<td>Second</td>
<td>AA</td>
<td>XX</td>
</tr>
<tr>
<td>Last</td>
<td>AAA</td>
<td>X</td>
</tr>
</tbody>
</table>

There is another example table in the proforma.

3.3 Simple diagrams

Simple diagrams can be written directly in \LaTeX. For example, see figure 3.1 on page 14 and see figure 3.2 on page 15.

3.4 Adding more complicated graphics

The use of \LaTeX format can be tedious and it is often better to use encapsulated postscript (EPS) or PDF to represent complicated graphics. Figure 3.3 and 3.5 on page 16 are...
3.4. ADDING MORE COMPLICATED GRAPHICS

Figure 3.2: A diagram composed of circles, lines and boxes.

examples. The second figure was drawn using xfig and exported in .eps format. This is my recommended way of drawing all diagrams.

Figure 3.3: Example figure using encapsulated postscript
CHAPTER 3. IMPLEMENTATION

Figure 3.4: Example figure where a picture can be pasted in

Figure 3.5: Example diagram drawn using \texttt{xfig}
Chapter 4

Evaluation

4.1 Printing and binding

Use a “duplex” laser printer that can print on both sides to print two copies of your dissertation. Then bind them, for example using the comb binder in the Computer Laboratory Library.

4.2 Further information

See the Unix Tools notes at

Chapter 5

Conclusion

I hope that this rough guide to writing a dissertation is \LaTeX{} has been helpful and saved you time.
Bibliography


Appendix A

Latex source

A.1 diss.tex

% Template for a Computer Science Tripos Part II project dissertation
\documentclass[12pt,a4paper,twoside,openright]{report}
\usepackage[pdfborder={0 0 0}]{hyperref} % turns references into hyperlinks
\usepackage[margin=25mm]{geometry} % adjusts page layout
\usepackage{graphicx} % allows inclusion of PDF, PNG and JPG images
\usepackage{verbatim}
\usepackage{docmute} % only needed to allow inclusion of proposal.tex
\raggedbottom % try to avoid widows and orphans
\sloppy
\clubpenalty1000%
\widowpenalty1000%
\renewcommand{\baselinestretch}{1.1} % adjust line spacing to make
\% more readable
\begin{document}
\bibliographystyle{plain}

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% Title
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% Proforma, table of contents and list of figures
\pagestyle{plain}
\chapter*{Proforma}

---

23
\begin{tabular}{ll}
Name: & \bf Martin Richards \\
College: & \bf St John's College \\
Project Title: & \bf How to write a dissertation in \LaTeX \\
Examination: & \bf Computer Science Tripos -- Part II, July 2001 \\
Word Count: & \bf 1587
\footnotemark[1] (well less than the 12000 limit) \\
Project Originator: & Dr M. Richards \\
Supervisor: & Dr Markus Kuhn
\end{tabular}

\footnotetext[1]{This word count was computed by \texttt{detex diss.tex | tr -cd '0-9A-Za-z $\tt\backslash\text{n}' | wc -w}}

\section*{Original Aims of the Project}

To write a demonstration dissertation\footnote{A normal footnote without the complication of being in a table.} using \LaTeX\ to save student's time when writing their own dissertations. The dissertation should illustrate how to use the more common \LaTeX\ constructs. It should include pictures and diagrams to show how these can be incorporated into the dissertation. It should contain the entire \LaTeX\ source of the dissertation and the makefile. It should explain how to construct an MSDOS disk of the dissertation in Postscript format that can be used by the book shop for printing, and, finally, it should have the prescribed layout and format of a diploma dissertation.

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\section*{Special Difficulties}

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\section*{Declaration}

I, [Name] of [College], being a candidate for Part II of the Computer Science Tripos (or the Diploma in Computer Science), hereby declare that this dissertation and the work described in it are my own work, unaided except as may be specified below, and that the dissertation does not contain material that has already been used to any substantial extent for a comparable purpose.

\bigskip
\leftline{Signed [signature]}

\medskip
\leftline{Date [date]}

\section*{Acknowledgements}

This document owes much to an earlier version written by Simon Moore \cite{Moore95}. His help, encouragement and advice was greatly
This document consists of the following files:

\begin{itemize}
\item \texttt{makefile} --- The makefile for the dissertation and Project Proposal
\item \texttt{diss.tex} --- The dissertation
\item \texttt{proposal.tex} --- The project proposal
\item \texttt{figs} --- A directory containing diagrams and pictures
\item \texttt{refs.bib} --- The bibliography database
\end{itemize}

\section{Building the document}

This document was produced using \LaTeX which is based upon \LaTeXcite{Lamport86}. To build the document you first need to generate \texttt{diss.aux} which, amongst other things, contains the references used. This if done by executing the command:

\texttt{pdflatex diss}

Then the bibliography can be generated from \texttt{refs.bib} using:

\texttt{bibtex diss}

Finally, to ensure all the page numbering is correct run \texttt{pdflatex} on \texttt{diss.tex} until the \texttt{diss.aux} files do not change. This usually takes 2 more runs.

\subsection{The makefile}

To simplify the calls to \texttt{pdflatex} and \texttt{bibtex}, a makefile has been provided, see Appendix~\ref{makefile}. It provides the following facilities:

\begin{description}
\item \texttt{make} \ \ Display help information.
\item \texttt{make proposal.pdf} \ \ Format the proposal document as a PDF.
\item \texttt{make view-proposal} \ \ Run \texttt{make proposal.pdf} and then display it with a Linux PDF viewer (preferably 'okular',' if that is not available fall back to 'evince').
\item \texttt{make diss.pdf} \ \ Format the dissertation document as a PDF.
\item \texttt{make count} \ \ Display an estimate of the word count.
\item \texttt{make all} \ \ Construct \texttt{proposal.pdf} and \texttt{diss.pdf}.
\texttt{make pub} \ Make \texttt{diss.pdf} and place it in my \texttt{public.html} directory.

\texttt{make clean} \ Delete all intermediate files except the source files and the resulting PDFs. All these deleted files can be reconstructed by typing \texttt{make all}.

\section{Counting words}

An approximate word count of the body of the dissertation may be obtained using:

\texttt{wc diss.tex}

Alternatively, try something like:

\verb/detex diss.tex | tr -cd '0-9A-Z a-z\n' | wc -w/

\chapter{Preparation}

This chapter is empty!

\chapter{Implementation}

\section{Verbatim text}

Verbatim text can be included using \verb|\begin{verbatim}| and \verb|\end{verbatim}|. I normally use a slightly smaller font and often squeeze the lines a little closer together, as in:

{\renewcommand{\baselinestretch}{0.8}\small
\begin{verbatim}
GET "libhdr"
GLOBAL { count=200; all }
LET try(ld, row, rd) BE TEST row=all
  THEN count := count + 1
  ELSE { LET poss = all & ~(ld | row | rd)
           UNTIL poss=0 DO
             { LET p = poss & ~poss
               poss := poss - p
               try(ld+p << 1, row+p, rd+p >> 1)
             }
           }

LET start() = VALOF
  { all := 1
    FOR i = 1 TO 12 DO
      { count := 0
        try(0, 0, 0)
        writef("Number of solutions to %i2-queens is %i5*n", i, count)
        all := 2*all + 1
      }
    RESULTIS 0
  }
\end{verbatim}

\section{Tables}
Here is a simple example of a table.

\begin{center}
\begin{tabular}{l|c|r}
Left & Centred & Right \\
\hline
Justified & & Justified \\
\hline
First & A & XXX \\
Second & AA & XX \\
Last & AAA & X \\
\end{tabular}
\end{center}

There is another example table in the proforma.

Simple diagrams can be written directly in \LaTeX. For example, see figure \ref{latexpic1} on page \pageref{latexpic1} and see figure \ref{latexpic2} on page \pageref{latexpic2}.

\begin{figure}
\setlength{\unitlength}{1mm}
\begin{center}
\begin{picture}(125,100)
\put(0,80){\framebox(50,10){AAA}}
\put(0,60){\framebox(50,10){BBB}}
\put(0,40){\framebox(50,10){CCC}}
\put(0,20){\framebox(50,10){DDD}}
\put(0,00){\framebox(50,10){EEE}}
\put(75,80){\framebox(50,10){XXX}}
\put(75,60){\framebox(50,10){YYY}}
\put(75,40){\framebox(50,10){ZZZ}}
\put(25,80){\vector(0,-1){10}}
\put(25,60){\vector(0,-1){10}}
\put(25,50){\vector(0,1){10}}
\put(25,40){\vector(0,-1){10}}
\put(25,20){\vector(0,-1){10}}
\put(100,80){\vector(0,-1){10}}
\put(100,70){\vector(0,1){10}}
\put(100,60){\vector(0,-1){10}}
\put(100,50){\vector(0,1){10}}
\end{picture}
\caption{A picture composed of boxes and vectors.}
\label{latexpic1}
\end{center}
\end{figure}

\begin{figure}
\setlength{\unitlength}{1mm}
\begin{center}
\begin{picture}(100,70)
\put(47,65){\circle{10}}
\put(45,64){abc}
\put(37,45){\circle{10}}
\put(37,51){\line(1,1){7}}
\end{picture}
\caption{A picture composed of boxes and vectors.}
\label{latexpic2}
\end{center}
\end{figure}
APPENDIX A. LATEX SOURCE

\begin{figure}
\centerline{\includegraphics{figs/cuarms.pdf}}
\caption{Example figure using encapsulated postscript}
\label{epsfig}
\end{figure}

\begin{figure}
\caption{Example figure where a picture can be pasted in}
\label{pastedfig}
\end{figure}

\begin{figure}
\centerline{\includegraphics{figs/diagram.pdf}}
\caption{Example diagram drawn using \texttt{xfig}}
\label{xfig}
\end{figure}

\chapter{Evaluation}

\section{Printing and binding}

Use a 'duplex' laser printer that can print on both sides to print two copies of your dissertation. Then bind them, for example using the comb binder in the Computer Laboratory Library.

\section{Further information}

See the Unix Tools notes at

\url{http://www.cl.cam.ac.uk/teaching/current-1/UnixTools/materials.html}

\chapter{Conclusion}
A.2 proposal.tex

I hope that this rough guide to writing a dissertation is \LaTeX\ has been helpful and saved you time.
Many students write their CST dissertations in \LaTeX\ and spend a fair amount of time learning just how to do that. The purpose of this project is to write a demonstration dissertation that explains in detail how it done.

This core proposal document will be augmented by a separately-printed cover sheet at the front and a resource form at the end. Additional sheets for risk assessment and human resources may also need to be included.

This document will repeat much of the material that is summarised on the additional sheets.

I am already able to write prose using the English language. I have an online dictionary, etc.

For this project I shall mainly use my own quad-core computer that runs Fedora Linux. Backup will be to github and/or to an SVN repository on an external hard disk that is dumped to writable CD/DVD media. I have another similar computer to hand should my main machine suddenly fail. I require no other special resources.

The project breaks down into the following sub-projects:

\begin{enumerate}
\item The construction of a skeleton dissertation with the required structure. This involves writing the Makefile and making dummy files for the title page, the proforma, chapters 1 to 5, the appendices and the proposal.
\item Filling in the details required in the cover page and proforma.
\item Writing the contents of chapters 1 to 5, including examples of common \LaTeX\ constructs.
\item Adding a example of how to use floating figures and encapsulated postscript diagrams.
\end{enumerate}
\section*{Success Criterion for the Main Result}

The project will be a success if I have a completed dissertation with the correct chapter titles and I have achieved my other success criterion, which is to blah \dots

\section*{Possible Extensions}

\em Potential further envisaged evaluation metrics or extensions.\)

If I achieve my main result early I shall try the following alternative experiment or method of evaluation \dots

\section*{Timetable: Workplan and Milestones to be achieved.}

\em Perhaps list ten or so two-week work-packages.\)

Planned starting date is 16/10/2011.

\begin{enumerate}
\item \bf Michaelmas weeks 2--4\) Learn to use X. Read book Y. Read papers Z.
\item \bf Michaelmas weeks 5--6\) Do preliminary test of Q.
\item \bf Michaelmas weeks 7--8\) Start implementation of main task A.
\item \bf Michaelmas vacation\) Finish A and start main task B.
\item \bf Lent weeks 0--2\) Write progress report. Generate corpus of test examples. Finish task B.
\item \bf Lent weeks 3--5\) Run main experiments and achieve working project.
\item \bf Lent weeks 6--8\) Second main deliverable here.
\item \bf Easter vacation\) Extensions and writing dissertation main chapters.
\item \bf Easter term 0--2:\) Further evaluation and complete dissertation.
\item \bf Easter term 3:\) Proof reading and then an early submission so as to concentrate on examination revision.
\end{enumerate}
Appendix B

Makefile

B.1 makefile

# This is the makefile for the Part II demonstration dissertation
#
# Note that continuation lines require '\\' and
# that a TAB character preceeds any shell command line

.DELETE_ON_ERROR:

# Rules for building LaTeX documents (see Unix Tools course)
%.pdf %.aux %.idx: %.tex
  pdflatex -halt-on-error $<
  while grep 'Rerun to get ' $*.log ; do pdflatex $< ; done
%.ind: %.idx
  makeindex $*
%.bbl: %.aux
  bibtex $*

# Rules for exporting xfig diagrams into PDF or EPS
%.pdf: %.eps
  epstopdf --outfile=.$< $<
%.eps: %.fig
  fig2dev --L eps $< $<
%.pdf\t%.pdf\t%.pdf\t%.pdf\t%.pdf\t%.pdf\t%.pdf\t%.pdf\t%.pdf\t%.pdf\t%.pdf\t%.pdf\t%.pdf\t%.pdf\t%.pdf
  fig2dev --L pdftex_t -p $*.pdf\t*.pdftex\t$< $*.pdftex\t*.pdftex\t*.pdftex

help:
  @echo
  @echo "USAGE:"
  @echo "make display help information"
  @echo "make proposal.pdf format the proposal as PDF"
  @echo "make diss.pdf format the dissertation as PDF"
  @echo "make all format proposal.pdf and diss.pdf"
  @echo "make view-proposal format and view the proposal"
  @echo "make view-diss format and view the dissertation"
  @echo "make count display an estimated word count"
  @echo "make pub put demodiss.pdf onto your homepage"
  @echo "make clean delete all intermediate files"
  @echo

view-%: %.pdf
  ( okular --unique $< || evince $< ) &

diss.pdf: figs/cuarms.pdf figs/diagram.pdf makefile.txt proposal.tex diss.bbl

makefile.txt: makefile
APPENDIX B. MAKEFILE

expand makefile >makefile.txt

count:
detex diss.tex | tr -cd '0-9A-Za-z \n' | wc -w

all: proposal.pdf diss.pdf

pub: diss.pdf
    rsync -t $* $(HOME)/public_html/demodiss.pdf

clean:
    rm -f *.aux *.log *.err *.out
    rm -f *~ *.lof *.toc *.blg *.bbl
    rm -f makefile.txt

B.2 refs.bib

@BOOK{Lamport86,
    TITLE = "(LaTeX) --- a document preparation system --- user's guide and reference manual",
    AUTHOR = "Lamport, L.",
    PUBLISHER = "Addison-Wesley",
    YEAR = "1986"
}

@REPORT{Moore95,
    TITLE = "How to prepare a dissertation in LaTeX",
    AUTHOR = "Moore, S.W.",
    YEAR = "1995"
}
Appendix C

Project Proposal

Computer Science Project Proposal

How to write a dissertation in \LaTeX

M. Richards, St John’s College

Originator: Dr M. Richards

14 October 2011

Project Supervisor: Dr M. Richards

Director of Studies: Dr M. Richards

Project Overseers: Dr F. H. King & Dr A. W. Moore

Introduction, The Problem To Be Addressed

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Starting Point

Describe existing state of the art, previous work in this area, libraries and databases to be used. Describe the state of any existing codebase that is to be built on.

I am already able to write prose using the English language. I have an online dictionary, etc.

Resources Required

A note of the resources required and confirmation of access.

For this project I shall mainly use my own quad-core computer that runs Fedora Linux. Backup will be to github and/or to an SVN repository on an external hard disk that is dumped to writable CD/DVD media. I have another similar computer to hand should my main machine suddenly fail. I require no other special resources.

Work to be done

Describe the technical work.

The project breaks down into the following sub-projects:

1. The construction of a skeleton dissertation with the required structure. This involves writing the Makefile and makeing dummy files for the title page, the proforma, chapters 1 to 5, the appendices and the proposal.

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