Philip Yeeles

Nico: An Environment for Mathematical Expression in Schools

Computer Science Tripos

Selwyn College

March 25, 2012

Proforma

Name:	Philip Yeeles
College:	Selwyn College
Project Title:	Nico: An Environment for Mathematical Expression in Schools
Examination:	Computer Science Tripos, May 2012
Word Count:	TBC[1] (well less than the 12000 limit)
Project Originator:	P. M. Yeeles (`pmy22`)
Supervisors:	Dr S. J. Aaron (`sja55`), A. G. Stead (`ags46`)

Original Aims of the Project

The aim of the project was to develop an application in the Clojure programming language which would allow users to express mathematical calculations using a graphical notation. The software was to be able to generate an abstract syntax tree from the graphical notation, evaluate it and pass the results back to the application in under 300ms. An extension to the project was to conduct a user study to evaluate the utility of the software.

Work Completed

I have successfully designed and implemented the application detailed in the previous section. That is, I have developed an application in which it is possible to express calculations using a graphical notation, that generates an abstract syntax tree from the language and that is able to parse the tree and return the results in under 300ms. I have also conducted a user study to assess whether or not the software is actually of use with regard to mathematics education.

---

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

Special Difficulties

Learning the Clojure programming language.

Declaration of Originality

I, Philip Michael Yeeles of Selwyn College, being a candidate for Part II of the Computer Science Tripos, 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

Date March 25, 2012

Contents

List of Figures

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

- `propbody.tex` — Appendix C – the project proposal

- `proposal.tex` — A LaTeX main file for the proposal

- `figs` – A directory containing diagrams and pictures

- `refs.bib` — The bibliography database

1.2 Building the document

This document was produced using LaTeX 2_ε which is based upon LaTeX[1]. To build the document you first need to generate `diss.aux` which, amongst other things, contains the references used. This if done by executing the command:

    latex diss

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

    bibtex diss

Finally, to ensure all the page numbering is correct run `latex` 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 `latex` and `bibtex`, a makefile has been provided, see Appendix B.1. It provides the following facilities:

- `make`
  Display help information.

- `make prop`
  Run `latex proposal; xdvi proposal.dvi`.

- `make diss.ps`
  Make the file `diss.ps`.

- `make gv`
  View the dissertation using ghostview after performing `make diss.ps`, if necessary.

- `make gs`
  View the dissertation using ghostscript after performing `make diss.ps`, if necessary.

- `make count`
  Display an estimate of the word count.

- `make all`
  Construct `proposal.dvi` and `diss.ps`.

- `make pub`
  Make a `.tar` version of the `demodiss` directory and place it in my `public_html` directory.

- `make clean`
  Delete all files except the source files of the dissertation. All these deleted files can be reconstructed by typing `make all`.

- `make pr`
  Print the dissertation on your default printer.

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[1] of a table.

Left Justified	Centred	Right Justified
First	A	XXX
Second	AA	XX
Last	AAA	X

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 9 and see figure 3.2 on page 9.

3.4   Adding more complicated graphics

The use of LaTeX format can be tedious and it is often better to use encapsulated postscript to represent complicated graphics. Figure 3.3 and 3.5 on page 11 are examples. The second figure was drawn using `xfig` and exported in `.eps` format. This is my recommended way of drawing all diagrams.
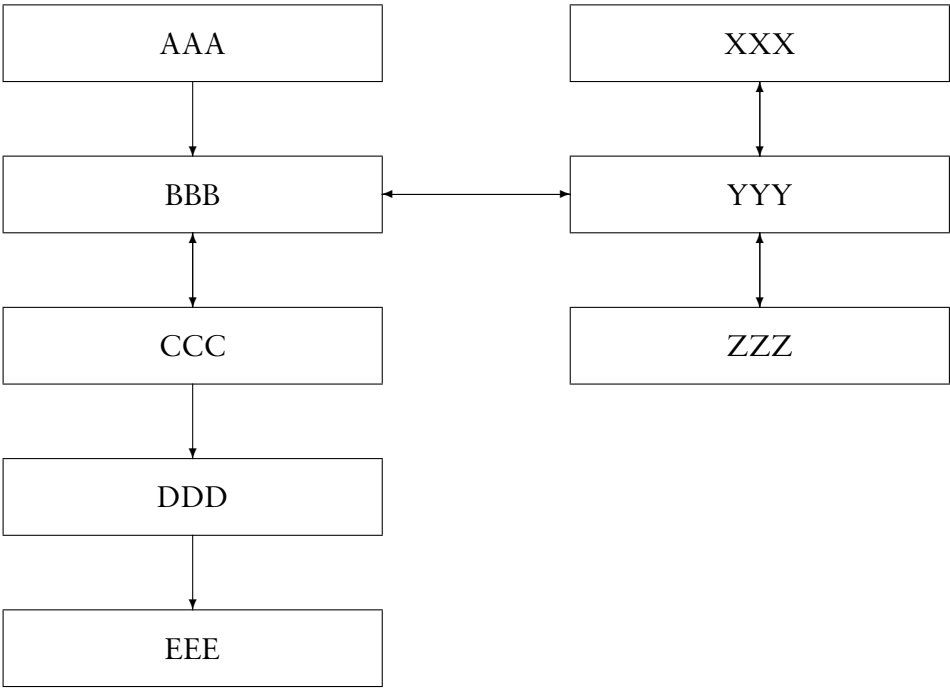
---

[1]A footnote

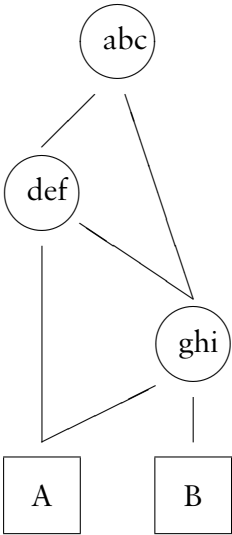Figure 3.1: A picture composed of boxes and vectors.

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

Figure 3.3: Example figure using encapsulated postscript

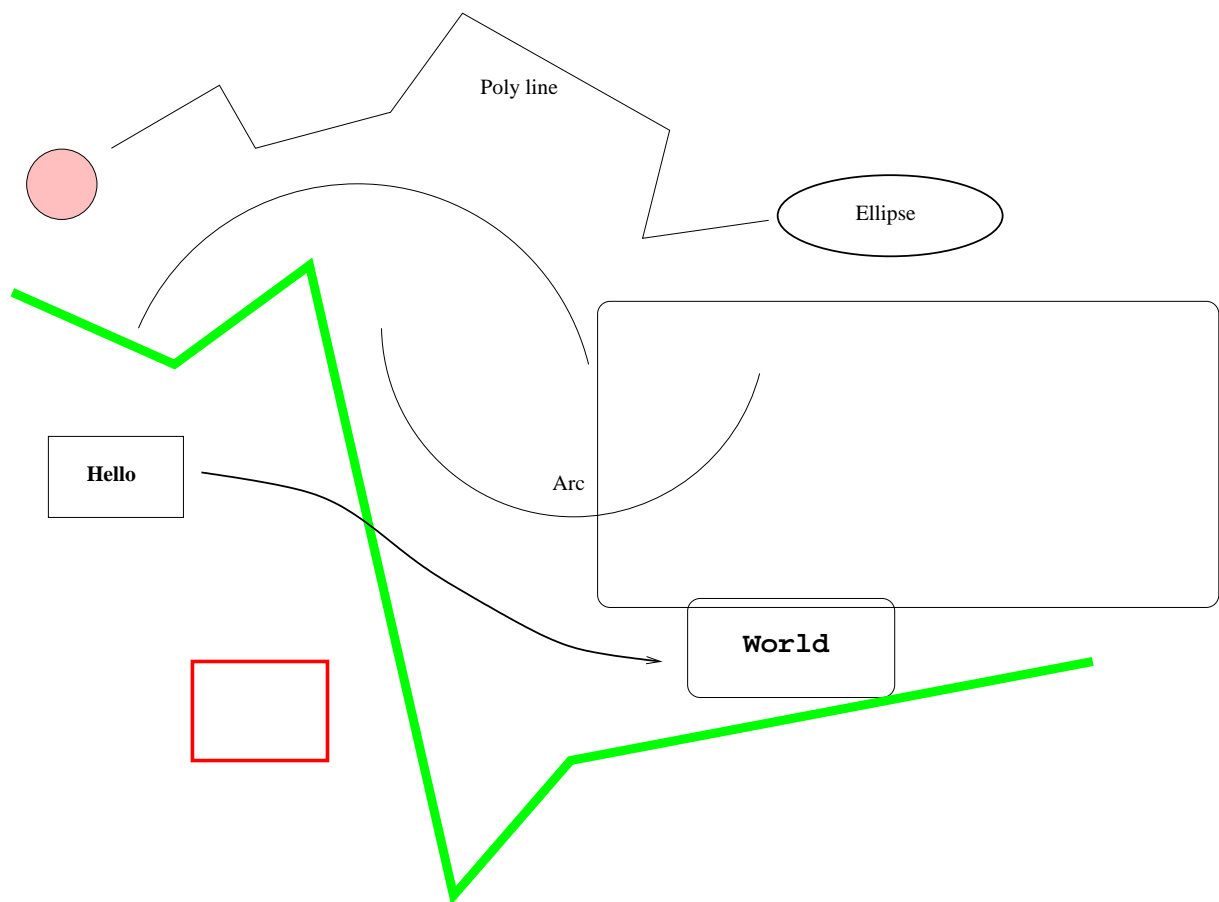Figure 3.4: Example figure where a picture can be pasted in

Figure 3.5: Example diagram drawn using xfig

Chapter 4

Evaluation

4.1 Printing and binding

If you have access to a laser printer that can print on two sides, you can use it to print two copies of your dissertation and then get them bound by the Computer Laboratory Bookshop. Otherwise, print your dissertation single sided and get the Bookshop to copy and bind it double sided.

Better printing quality can sometimes be obtained by giving the Bookshop an MS-DOS 1.44 Mbyte 3.5" floppy disc containing the Postscript form of your dissertation. If the file is too large a compressed version with `zip` but not `gnuzip` nor `compress` is acceptable. However they prefer the uncompressed form if possible. From my experience I do not recommend this method.

4.1.1 Things to note

- Ensure that there are the correct number of blank pages inserted so that each double sided page has a front and a back. So, for example, the title page must be followed by an absolutely blank page (not even a page number).

- Submitted postscript introduces more potential problems. Therefore you must either allow two iterations of the binding process (once in a digital form, falling back to a second, paper, submission if necessary) or submit both paper and electronic versions.

- There may be unexpected problems with fonts.

4.2 Further information

See the Computer Lab's world wide web pages at URL:

http://www.cl.cam.ac.uk/TeXdoc/TeXdocs.html

Chapter 5

Conclusion

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

Bibliography

[1] L. Lamport. *LaTeX — a document preparation system — user's guide and reference manual.* Addison-Wesley, 1986.

[2] S.W. Moore. How to prepare a dissertation in latex, 1995.

Appendix A

Latex source

A.1   diss.tex

```
% The master copy of this demo dissertation is held on my filespace
% on the cl file serve (/homes/mr/teaching/demodissert/)

% Last updated by PMY on 3 March 2012

\documentclass[12pt,twoside,notitlepage]{report}

\usepackage{a4}
\usepackage{verbatim}
\usepackage{epsf}
\usepackage{sectsty}

\usepackage[xetex]{graphicx}
\usepackage{fontspec,xunicode}
\defaultfontfeatures{Mapping=tex-text,Scale=MatchLowercase}% , Numbers=OldStyle}
\setmainfont[Scale=1]{Sabon MT Std}% {Linux Libertine O}
\setsansfont{Myriad Pro Light}
\setmonofont{Monaco}
\allsectionsfont{\sffamily}

\newfontinstance\bigsf[Color=000000,Scale=1.25]{Myriad Pro Light}

\input{epsf}                     % to allow postscript inclusions
% On thor and CUS read top of file:
%     /opt/TeX/lib/texmf/tex/dvips/epsf.sty
% On CL machines read:
%     /usr/lib/tex/macros/dvips/epsf.tex

\raggedbottom                    % try to avoid widows and orphans
\sloppy
\clubpenalty1000%
\widowpenalty1000%

\addtolength{\oddsidemargin}{6mm}    % adjust margins
\addtolength{\evensidemargin}{-8mm}

\renewcommand{\baselinestretch}{1.1}    % adjust line spacing to make
                                        % more readable
```

19

```
\begin{document}

\bibliographystyle{plain}


%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% Title


\pagestyle{empty}

\hfill{\LARGE \bf \sffamily Philip Yeeles}

\vspace*{60mm}
\begin{center}
\Huge
{\bf \bigsf Nico: An Environment for Mathematical Expression in Schools} \\
\vspace*{5mm}
{\sffamily Computer Science Tripos} \\
\vspace*{5mm}
{\sffamily Selwyn College} \\
\vspace*{5mm}
{\sffamily \today}  % today's date
\end{center}

\cleardoublepage

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% Proforma, table of contents and list of figures

\setcounter{page}{1}
\pagenumbering{roman}
\pagestyle{plain}

\chapter*{Proforma}

{\large
\begin{tabular}{ll}
\bf Name:              & Philip Yeeles                                        \\
\bf College:           & Selwyn College                                       \\
\bf Project Title:     & Nico: An Environment for Mathematical\\
                       & Expression in Schools \\
\bf Examination:       & Computer Science Tripos, May 2012                    \\
\bf Word Count:        & TBC\footnotemark[1]
(well less than the 12000 limit) \\
\bf Project Originator: & P.~M.~Yeeles (\verb¬pmy22¬)                          \\
\bf Supervisors:       & Dr S.~J.~Aaron (\verb¬sja55¬), A.~G.~Stead (\verb¬ags46¬)    \\
\end{tabular}
}
\footnotetext[1]{This word count was computed
by {\tt detex diss.tex | tr -cd '0-9A-Za-z $\tt\backslash$n' | wc -w}
}
\stepcounter{footnote}


\section*{Original Aims of the Project}

The aim of the project was to develop an application in the Clojure programming
```

language which would allow users to express mathematical calculations using a
graphical notation. The software was to be able to generate an abstract syntax
tree from the graphical notation, evaluate it and pass the results back to the
application in under 300ms. An extension to the project was to conduct a user
study to evaluate the utility of the software.
%
% 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.

\section*{Work Completed}

I have successfully designed and implemented the application detailed in the
previous section. That is, I have developed an application in which it is
possible to express calculations using a graphical notation, that generates an
abstract syntax tree from the language and that is able to parse the tree and
return the results in under 300ms. I have also conducted a user study to assess
whether or not the software is actually of use with regard to mathematics
education.
%
% All that has been completed appears in this dissertation.

\section*{Special Difficulties}

Learning the Clojure programming language.
%
% Learning how to incorporate encapulated postscript into a \LaTeX\
% document on both CUS and Thor.

\newpage
\section*{Declaration of Originality}

I, Philip Michael Yeeles of Selwyn College, being a candidate for Part
II of the Computer Science Tripos, 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}

\medskip
\leftline{Date \today}

\cleardoublepage

\tableofcontents

\listoffigures

```
%
% \newpage
% \section*{Acknowledgements}
%
% lol
% %
% % This document owes much to an earlier version written by Simon Moore
% % \cite{Moore95}.  His help, encouragement and advice was greatly
% % appreciated.

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% now for the chapters

\cleardoublepage          % just to make sure before the page numbering
                          % is changed

\setcounter{page}{1}
\pagenumbering{arabic}
\pagestyle{headings}

\chapter{Introduction}

\section{Overview of the files}

This document consists of the following files:

\begin{itemize}
\item {\tt Makefile} --- The Makefile for the dissertation and Project Proposal
\item {\tt diss.tex} --- The dissertation
\item {\tt propbody.tex} --- Appendix~C  -- the project proposal
\item {\tt proposal.tex}  --- A \LaTeX\ main file for the proposal
\item{\tt figs} -- A directory containing diagrams and pictures
\item{\tt refs.bib} --- The bibliography database
\end{itemize}

\section{Building the document}

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

{\tt latex diss}

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

{\tt bibtex diss}

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

\subsection{The makefile}

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

```
\begin{itemize}

\item{\tt make} \\
 Display help information.

\item{\tt make prop} \\
 Run {\tt latex proposal; xdvi proposal.dvi}.

\item{\tt make diss.ps} \\
 Make the file {\tt diss.ps}.

\item{\tt make gv} \\
 View the dissertation using ghostview after performing
{\tt make diss.ps}, if necessary.

\item{\tt make gs} \\
 View the dissertation using ghostscript after performing
{\tt make diss.ps}, if necessary.

\item{\tt make count} \\
Display an estimate of the word count.

\item{\tt make all} \\
Construct {\tt proposal.dvi} and {\tt diss.ps}.

\item{\tt make pub} \\ Make a {\tt .tar} version of the {\tt demodiss}
directory and place it in my {\tt public\_html} directory.

\item{\tt make clean} \\ Delete all files except the source files of
the dissertation. All these deleted files can be reconstructed by
typing {\tt make all}.

\item{\tt make pr} \\
Print the dissertation on your default printer.

\end{itemize}


\section{Counting words}

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

{\tt wc diss.tex}

\noindent
Alternatively, try something like:

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



\cleardoublepage



\chapter{Preparation}
```

```
This chapter is empty!


\cleardoublepage
\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}

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

\begin{center}
\begin{tabular}{l|c|r}
Left      & Centred & Right \\
Justified &         & Justified \\[3mm]
%\hline\\%[-2mm]
First     & A       & XXX \\
Second    & AA      & XX  \\
Last      & AAA     & X   \\
\end{tabular}
\end{center}

\noindent
There is another example table in the proforma.
\end{samepage}
```

```
\section{Simple diagrams}

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}}

\put(50,65){\vector(1,0){25}}
\put(75,65){\vector(-1,0){25}}
\end{picture}
\end{center}
\caption{\label{latexpic1}A picture composed of boxes and vectors.}
\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}}
\put(35,44){def}

\put(57,25){\circle{10}}
\put(57,31){\line(-1,3){9}}
\put(57,31){\line(-3,2){15}}
\put(55,24){ghi}

\put(32,0){\framebox(10,10){A}}
\put(52,0){\framebox(10,10){B}}
\put(37,12){\line(0,1){26}}
```

```
\put(37,12){\line(2,1){15}}
\put(57,12){\line(0,2){6}}
\end{picture}

\end{center}
\caption{\label{latexpic2}A diagram composed of circles, lines and boxes.}
\end{figure}
```

```
\section{Adding more complicated graphics}
```

```
The use of \LaTeX\ format can be tedious and it is often better to use
encapsulated postscript to represent complicated graphics.
Figure~\ref{epsfig} and ~\ref{xfig} on page \pageref{xfig} are
examples. The second figure was drawn using {\tt xfig} and exported in
{\tt.eps} format. This is my recommended way of drawing all diagrams.
```

```
\begin{figure}[tbh]
\centerline{\epsfbox{figs/cuarms.eps}}
\caption{\label{epsfig}Example figure using encapsulated postscript}
\end{figure}
```

```
\begin{figure}[tbh]
\vspace{4in}
\caption{\label{pastedfig}Example figure where a picture can be pasted in}
\end{figure}
```

```
\begin{figure}[tbh]
\centerline{\epsfbox{figs/diagram.eps}}
\caption{\label{xfig}Example diagram drawn using {\tt xfig}}
\end{figure}
```

```
\cleardoublepage
\chapter{Evaluation}
```

```
\section{Printing and binding}
```

```
If you have access to a laser printer that can print on two sides, you
can use it to print two copies of your dissertation and then get them
bound by the Computer Laboratory Bookshop. Otherwise, print your
dissertation single sided and get the Bookshop to copy and bind it double
sided.
```

```
Better printing quality can sometimes be obtained by giving the
Bookshop an MSDOS 1.44~Mbyte 3.5" floppy disc containing the
Postscript form of your dissertation. If the file is too large a
compressed version with {\tt zip} but not {\tt gnuzip} nor {\tt
compress} is acceptable. However they prefer the uncompressed form if
possible. From my experience I do not recommend this method.
```

```
\subsection{Things to note}
```

```
\begin{itemize}
\item Ensure that there are the correct number of blank pages inserted
so that each double sided page has a front and a back.  So, for
example, the title page must be followed by an absolutely blank page
(not even a page number).

\item Submitted postscript introduces more potential problems.
Therefore you must either allow two iterations of the binding process
(once in a digital form, falling back to a second, paper, submission if
necessary) or submit both paper and electronic versions.

\item There may be unexpected problems with fonts.

\end{itemize}

\section{Further information}

See the Computer Lab's world wide web pages at URL:

{\tt http://www.cl.cam.ac.uk/TeXdoc/TeXdocs.html}


\cleardoublepage
\chapter{Conclusion}

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




\cleardoublepage

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% the bibliography

\addcontentsline{toc}{chapter}{Bibliography}
\bibliography{refs}
\cleardoublepage

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% the appendices
\appendix

\chapter{Latex source}

\section{diss.tex}
{\scriptsize\verbatiminput{diss.tex}}

\section{proposal.tex}
{\scriptsize\verbatiminput{proposal.tex}}

\section{propbody.tex}
{\scriptsize\verbatiminput{propbody.tex}}


\cleardoublepage
```

```
\chapter{Makefile}

\section{\label{makefile}Makefile}
{\scriptsize\verbatiminput{makefile.txt}}

\section{refs.bib}
{\scriptsize\verbatiminput{refs.bib}}


\cleardoublepage

\chapter{Project Proposal}

\input{propbody}

\end{document}
```

A.2   proposal.tex

```
% This is a LaTeX driving document to produce a standalone copy
% of the project proposal held in propbody.tex.  Notice that
% propbody can be used in this context as well as being incorporated
% in the dissertation (see diss.tex).

\documentstyle[12pt,a4]{article}
\begin{document}

\include{propbody}

\end{document}
```

A.3   propbody.tex

```
% Draft #1 (final?)

\vfil

\centerline{\Large Diploma in Computer Science Project Proposal}
\vspace{0.4in}
\centerline{\Large How to write a dissertation in \LaTeX\ }
\vspace{0.4in}
\centerline{\large M. Richards, St John's College}
\vspace{0.3in}
\centerline{\large Originator: Dr M. Richards}
\vspace{0.3in}
\centerline{\large 21 November 2000}

\vfil

\subsection*{Special Resources Required}
File space on Thor -- 25Mbytes\\
Account on the DEC Workstations -- 15Mbytes\\
```

```
An account on Ouse\\
The use of my own IBM PC (1000GHz Pentium, 200Mb RAM and 40Gb Disk).
\vspace{0.2in}

\noindent
{\bf Project Supervisor:} Dr M. Richards
\vspace{0.2in}

\noindent
{\bf Director of Studies:} Dr M. Richards
\vspace{0.2in}
\noindent

\noindent
{\bf Project Overseers:} Dr~F.~H.~King  \& Dr~S.~W.~Moore

\vfil
\pagebreak

% Main document

\section*{Introduction}

Many students write their CST and Diploma dissertations in \LaTeX\ and
spend a fair amount of time learning just how to do that. The purpos of
this project is to write a demonsatration dissertation that explains in
detail how it done and how the result can be given to the Bookshop
on an MSDOS floppy disk for printing and binding.

\section*{Work that has to be done}

The project breaks down into the following main sections:-

\begin{enumerate}

\item 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.

\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*{Difficulties to Overcome}

The following main learning tasks will have to be undertaken before
the project can be started:

\begin{itemize}

\item To learn \LaTeX\ and its use on Thor.
```

```
\item To discover how to incorporate encapsulated postscript into
a \LaTeX\ document, and to find a suitable drawing package on Thor
to recommend.

\item To discover what format the Bookshop would like for the finished
dissertation, and how to deal with postscript files that are too
large to fit on a single floppy disk.

\end{itemize}



\section*{Starting Point}

I have a reasonable working knowledge of \LaTeX\ and have convenient
access to Thor using an IBM PC in my office. Writing MSDOS disks is no
problem.

\section*{Resources}

This project requires little file space so 25Mbytes of disk space on Thor
should be sufficient. I plan to use my own IBM PC to write floppy disks,
but could use the PWF PCs if my own machine breaks down.

Backup will be on floppy disks.

\section*{Work Plan}

Planned starting date is 01/12/2000.

\subsection*{Michaelmas Term}

By the end of this term I intend to have completed the learning tasks
outlined in the relevant section.


\subsection*{Lent Term}

By the division of term the overall structure of the dissertation
will have been written and tested.

By the end of term, example figures using encapsulated postscript
will have been included.


\subsection*{Easter Term}

On completion of the exams I will incorporate final details into
the dissertation including a bibliography using bibtex and a table of contents.
The estimated completion date being 25/07/2001 to allow
plenty of time should any unforeseen problems arise.
```

Appendix B

Makefile

B.1 Makefile

```
# This is the Makefile for the demonstration dissertation
# written by Martin Richards
#
# Note that continuation lines require '\'
# and that TAB is used after ':' and before unix commands.

DISS = diss.tex refs.bib propbody.tex figs/diagram.eps makefile.txt

PROP = proposal.tex propbody.tex

help:
        @echo
        @echo "USAGE:"
        @echo
        @echo "make          display help information"
        @echo "make prop     make the proposal and view it using xdvi"
        @echo "make diss.ps  make a postscript version of the dissertation"
        @echo "make diss.pdf make a .pdf version of the dissertation"
        @echo "make gv       view the dissertation with ghostview"
        @echo "make gs       view the dissertation with ghostscript"
        @echo "make all      construct proposal.dvi and diss.ps"
        @echo "make count    display an estimated word count"
        @echo "make pub      put demodiss.tar on my homepage"
        @echo "make clean    remove all remakeable files"
        @echo "make pr       print the dissertation"
        @echo

prop:   proposal.dvi
        xdvi proposal.dvi

diss.ps:        $(DISS)
        xelatex diss
        bibtex diss
        xelatex diss
        bibtex diss
        xelatex diss
        bibtex diss
        dvips -Ppdf -G0 -t a4 -pp 0-200 -o diss.ps diss.dvi
```

```
diss.pdf:      diss.ps
        ps2pdf diss.ps

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

proposal.dvi: $(PROP)
        xelatex proposal

all:    proposal.dvi diss.ps

pub:    diss.pdf
        cp diss.pdf /homes/mr/public_html/demodiss.pdf
        make clean
        (cd ..; tar cfv /homes/mr/public_html/demodiss.tar demodiss)

clean:
        rm -f diss.ps *.dvi *.aux *.log *.err
        rm -f core *~ *.lof *.toc *.blg *.bbl
        rm -f makefile.txt

gv:     diss.ps
        ghostview diss.ps

gs:     diss.ps
        gs diss.ps

pr:     diss.ps
        lpr diss.ps
```

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

Diploma in Computer Science Project Proposal

How to write a dissertation in LaTeX

M. Richards, St John's College

Originator: Dr M. Richards

21 November 2000

Special Resources Required

File space on Thor – 25Mbytes
Account on the DEC Workstations – 15Mbytes
An account on Ouse
The use of my own IBM PC (1000GHz Pentium, 200Mb RAM and 40Gb Disk).

Project Supervisor: Dr M. Richards

Director of Studies: Dr M. Richards

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

Introduction

Many students write their CST and Diploma dissertations in LaTeX and spend a fair amount of time learning just how to do that. The purpos of this project is to write a demonsatration dissertation that explains in detail how it done and how the result can be given to the Bookshop on an MSDOS floppy disk for printing and binding.

Work that has to be done

The project breaks down into the following main sections:-

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.

2. Filling in the details required in the cover page and proforma.

3. Writing the contents of chapters 1 to 5, including examples of common LaTeX constructs.

4. Adding a example of how to use floating figures and encapsulated postscript diagrams.

Difficulties to Overcome

The following main learning tasks will have to be undertaken before the project can be started:

- To learn LaTeX and its use on Thor.

- To discover how to incorporate encapsulated postscript into a LaTeX document, and to find a suitable drawing package on Thor to recommend.

- To discover what format the Bookshop would like for the finished dissertation, and how to deal with postscript files that are too large to fit on a single floppy disk.

Starting Point

I have a reasonable working knowledge of LaTeX and have convenient access to Thor using an IBM PC in my office. Writing MSDOS disks is no problem.

Resources

This project requires little file space so 25Mbytes of disk space on Thor should be sufficient. I plan to use my own IBM PC to write floppy disks, but could use the PWF PCs if my own machine breaks down.

Backup will be on floppy disks.

Work Plan

Planned starting date is 01/12/2000.

Michaelmas Term

By the end of this term I intend to have completed the learning tasks outlined in the relevant section.

Lent Term

By the division of term the overall structure of the dissertation will have been written and tested.

By the end of term, example figures using encapsulated postscript will have been included.

Easter Term

On completion of the exams I will incorporate final details into the dissertation including a bibliography using bibtex and a table of contents. The estimated completion date being 25/07/2001 to allow plenty of time should any unforeseen problems arise.