

University of Southern Queensland
Faculty of Engineering & Surveying

A Really Good Method of Designing Widgets

A dissertation submitted by

A. Person

in fulfilment of the requirements of

ENG4112 Research Project

towards the degree of

Bachelor of (your major, in full)

Submitted: October, 2009

Abstract

This is where the abstract is placed. It should normally be one page only (two pages at the most), comprising several paragraphs. This is a particularly important part of the dissertation.

This is the second paragraph of the abstract. It is really only filling in time and space in order to make up a second paragraph. Note that \LaTeX ignores extra inter-word spaces, and that a paragraph is delimited by one or more blank lines. Take care with the use of quotes – opening quotes like this “ are a different pair of characters to closing quotes like this ”. Note also the use of single dashes - double dashes – and triple —. Each is comprised of one, two or three “minus” or “dash” signs, with each giving a slightly longer line.

The style file `bengdis.sty` was adapted by John Leis (email john.leis@usq.edu.au), Faculty of Engineering & Surveying, University of Southern Queensland, from `utthesis.sty`. The latter was written by Dinesh Das, Dept. of Computer Sciences, The University of Texas at Austin.

University of Southern Queensland
Faculty of Engineering and Surveying

ENG4111/2 <i>Research Project</i>
--

Limitations of Use

The Council of the University of Southern Queensland, its Faculty of Engineering and Surveying, and the staff of the University of Southern Queensland, do not accept any responsibility for the truth, accuracy or completeness of material contained within or associated with this dissertation.

Persons using all or any part of this material do so at their own risk, and not at the risk of the Council of the University of Southern Queensland, its Faculty of Engineering and Surveying or the staff of the University of Southern Queensland.

This dissertation reports an educational exercise and has no purpose or validity beyond this exercise. The sole purpose of the course pair entitled “Research Project” is to contribute to the overall education within the student’s chosen degree program. This document, the associated hardware, software, drawings, and other material set out in the associated appendices should not be used for any other purpose: if they are so used, it is entirely at the risk of the user.

Prof F Bullen

Dean

Faculty of Engineering and Surveying

Acknowledgments

This thesis was typeset using L^AT_EX 2_ε . Your acknowledgements would be placed here. Try not to be excessively dramatic, but do think hard about the help you have received and do not forget non-technical support from your spouse, friends, etc.

Write your own acknowledgement — do not use any of the above text!

A. PERSON

University of Southern Queensland

October 2009

Contents

Abstract	i
Acknowledgments	iii
List of Figures	vi
List of Tables	vii
Chapter 1 Introduction	1
1.1 Using this Template	2
1.2 A Word on Citing	3
1.2.1 A Subsection	4
1.3 Overview of the Dissertation	4
Chapter 2 Design of the Widget	5
2.1 Chapter Overview	5
2.2 Figure and Table Placement	6
2.3 Chapter Summary	8

CONTENTS	v
Chapter 3 Conclusions and Further Work	9
3.1 Achievement of Project Objectives	9
3.2 Further Work	9
References	10
Appendix A Project Specification	12
Appendix B Some Supporting Information	14
B.1 Introduction to this Appendix	15
B.2 Another Section in this Appendix	15
Appendix C How to Include Source Code	16
C.1 The lowertri.m MATLAB Function	18
C.2 The BasicWindow.c Windows C Code	19
Appendix D How to Include Data Sheets	23

List of Figures

2.1	A figure which shows something. Note that captions for figures are <i>below</i> the figure itself, in a smaller font and have a slightly smaller width than the normal text. The text in the figure should be no smaller than shown here. If the figure comes from elsewhere, you should cite it correctly, for example (adapted from (Knuth 1973 <i>b</i>)).	7
B.1	This is a figure.	15

List of Tables

2.1	Summary of some information. Note that captions for tables are <i>above</i> the table itself, in a smaller font and have a slightly smaller width than the normal text.	6
-----	---	---

Chapter 1

Introduction

You can use `pdflatex` to process this document, to generate a PDF file directly. If you do this, all graphics included via `includegraphics` must be either JPEG or PDF format.

You must run \LaTeX to perform the initial compilation, BiBTeX to incorporate the references (in the .bib file), and run \LaTeX *twice* more to resolve all the cross-references.

If you don't do this, \LaTeX will not be able to resolve all the references, and will leave references and citations as a question mark “?”. That is, it needs to format the document once, and then do another pass to work out that, say, the section labelled “Design” is on page 3 (or whatever). For more information on the formatting of references, see one of the recommended tutorials.

Don't be concerned about the “overfull hbox” warnings \TeX issues.

The files you need to edit are:

- `bengdis.tex` This file. Rename it too whatever you wish.
- `bengdis.bib` The bibliography file. See the “bibliography” command at the end.
- `xxxx.tex` The files for each Chapter.

Note that your dissertation uses:

1. An 11 point font;

2. One-and-a-half line spacing, and
3. Margins as prescribed in the Project Book.

In addition, the graphics files from whatever mathematical or drawing software packages you use should be in this directory. Use either Encapsulated PostScript (file.eps) if using `latex-dvips`, or PDF/JPEG if using `pdflatex`.

The Project Specification is shown in Appendix A.

Do not confuse figure and table references using `\ref{}` and bibliography citations using `\cite{}`.

When the final PDF document is produced, be sure to check the page size in Acrobat. It should be A4 size – 210mm × 297mm.

1.1 Using this Template

This template aims to produce a dissertation consistent with USQ Faculty of Engineering & Surveying undergraduate and coursework master’s requirements. However, final responsibility for the finished document rests with the candidate. If in doubt, consult your supervisor.

Students should use this style file and template in conjunction with:

- either Section 11 of the ENG4111/2 Project Reference Book “Preparation of Your Project Dissertation – Guidelines and Requirements”, or
- the “FoES Dissertation Handbook” (ENG8002),

together with advice from your supervisor(s).

Notes on the preparation of undergraduate dissertations may also be useful; these are available at <http://www.usq.edu.au/users/leis/notes/latex/bengdis.html>

For further advice on L^AT_EX in general and other links, see <http://www.usq.edu.au/users/leis/notes/latex/>

1.2 A Word on Citing

Some examples of how you can correctly use citations (referencing a work in the bibliography or list of references) are given in the following paragraph.

Much research has been carried out into computationally efficient basket weaving algorithms (Aamport 1986*a*, Knuth 1973*a*). It has been proven that the sky is blue (Aamport 1986*a*). Aamport (1986*a*) described an experiment to measure the temperature of the sun¹.

Entering URLs and email addresses is a bit tricky, as L^AT_EX may misinterpret the special characters used (Nonymous 2005). For this reason, you have to use the `\url` environment as shown in the bibliography, e.g. `\url{http://www.usq.edu.au/users/leis/}`, which when run through L^AT_EX comes out like this: <http://www.usq.edu.au/users/leis/>. Note that the latter is hyperlinked in the PDF version, and you can click on it to follow the link.

Do not confuse figure and table references using `\ref{}` and bibliography citations using `\cite{}`.

If you want to cite a particular page in a reference, use a construct something like `~\cite[page]{bibkey}`, where “page” is the page you want to reference, and “bibkey” is the key used in the “.bib” file for that particular reference. When formatted, it will come out something like this (Aamport 1986*a*, 34).

If you need to cite a source as part of a figure or table caption, use the `protect` command as shown in Section 2.1 on page 7. This is typeset in the source as (for example), “(adapted from~\protect\cite{aref})”.

Finally, make sure you use an unbreakable space `~` before citations and references,

¹He got sunburnt doing this.

for example `blah blah~\cite{thing}` or `blah blah~\ref{whatever}`. This stops a line-wrap at the end of the line, after the word “Figure” but before the actual figure number, and enhances the readability of the text.

1.2.1 A Subsection

This is a sub-section. Try not to use too many small sub-sections, as they can become rather tedious to the reader. Note that \LaTeX has automatically reduced the font size for the subsection headings as compared to the section headings.

This is a reference to Figure B.1 in Appendix B.

1.3 Overview of the Dissertation

This dissertation is organized as follows:

Chapter 2 describes the basic problem etc etc

Chapter 3 discusses the development of the widget and numerical simulations. Note that the “description” environment used here automatically wraps and formats the paragraph as you see here.

Chapter x something about all the other chapters.

Chapter 8 concludes the dissertation and suggests further work in the area of ‘z’.

Chapter 2

Design of the Widget

2.1 Chapter Overview

Insert a section which describes what this chapter is about.

Don't worry about excessive whitespace – as more text is added, it will fill out the document and L^AT_EX will “float” the figures and tables accordingly to fill the available page space.

And here is some mathematics:

$$x(t) = A \sin \omega t \tag{2.1}$$

The label is Equation 2.1. If you want aligned equations, do this:

$$\begin{aligned} x(t) &= A \sin \omega t \\ \frac{dx(t)}{dt} &= A \omega \cos \omega t \end{aligned} \tag{2.2}$$

The rotation matrix is defined as

$$\begin{pmatrix} x' \\ y' \end{pmatrix} = \begin{pmatrix} \cos \theta & -\sin \theta \\ \sin \theta & \cos \theta \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} \tag{2.3}$$

Table 2.1: Summary of some information. Note that captions for tables are *above* the table itself, in a smaller font and have a slightly smaller width than the normal text.

Something	8000
size	160 samples
rate	50 frames
more things	1,2,3
Total	\$2500
Total Rate	$1 \times 2 \neq 4$

where θ is the angle of rotation. Equation 2.3 may be used to determine the new co-ordinates (x', y') .

A table of useful results is shown in Table 2.1. Figure 2.1 shows an interesting plot. It is actually on Page 7. The utility `epstopdf` may be used to convert EPS into PDF format graphics.

2.2 Figure and Table Placement

Tables and figures are called “floats” in \LaTeX . They are termed floats because \LaTeX uses an algorithm to move or “float” them around to find the optimal placement. This is confusing at first. The rules guarantee that if a float is referenced in the text, then the float itself appears on or after the page on which the reference occurs. The objective of the placement algorithm is to minimize the amount of whitespace appearing on all pages. This can be adjusted using judicious placement of the `\clearpage` command and/or using the “here” placement specifier in the figure environment. Just use `\begin{figure}[h]` – ‘h’ meaning “here if possible please”. Note that this should be done only *after* the text has been completed, as it is likely the default placement method will be appropriate in most cases.

If *exact* placement is required, the `float` package may be used by adding the line `\usepackage{float}` to the document preamble, and specifying the [H] option to the figure placement environment. This is interpreted as “absolutely here”.

Peaks

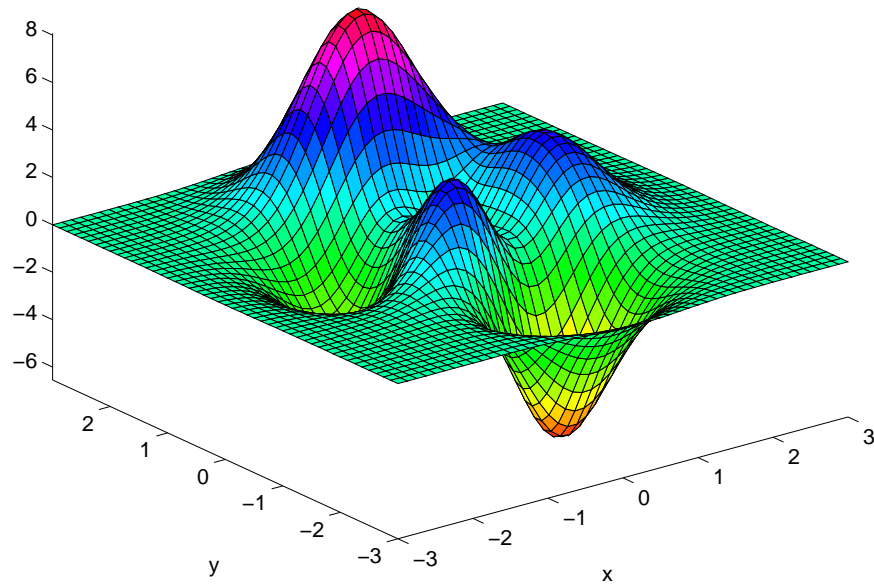


Figure 2.1: A figure which shows something. Note that captions for figures are *below* the figure itself, in a smaller font and have a slightly smaller width than the normal text. The text in the figure should be no smaller than shown here. If the figure comes from elsewhere, you should cite it correctly, for example (adapted from (Knuth 1973*b*)).

Note also that the `\label` must come *after* the `\caption` (or section or equation, or whatever the label is to refer to).

2.3 Chapter Summary

A summary at the end of each chapter is useful to the reader. The `\clearpage` command above makes it start on a new page by itself, if desired.

Chapter 3

Conclusions and Further Work

This will always be the last chapter. The \LaTeX automatic numbering system will number all chapters and appendices for you.

3.1 Achievement of Project Objectives

The following objectives have been addressed:

Overview of Widget Design Methods Chapter 2 presented a summary of recent approaches to widget design.

Comparison of Computational Efficiency This aspect was addressed by doing some simulations.

3.2 Further Work

There is far too much to be done.

References

- Aamport, L. A. (1986a), ‘The gnats and gnu document preparation system’, *G-Animal’s Journal* .
- Aamport, L. A. (1986b), ‘The gnats and gnu document preparation system’, *G-Animal’s Journal* **41**(7), 73+. This is a full ARTICLE entry.
- Knuth, D. E. (1973a), *Fundamental Algorithms*, Addison-Wesley, chapter 1.2.
- Knuth, D. E. (1973b), *Fundamental Algorithms*, Vol. 1 of *The Art of Computer Programming*, second edn, Addison-Wesley, Reading, Massachusetts, chapter 1.2, pp. 10–119. This is a full INBOOK entry.
- Knuth, D. E. (1981a), *Seminumerical Algorithms*, Addison-Wesley.
- Knuth, D. E. (1981b), *Seminumerical Algorithms*, Vol. 2 of *The Art of Computer Programming*, second edn, Addison-Wesley, Reading, Massachusetts. This is a full BOOK entry.
- Knuth, J. C. (1988), ‘The programming of computer art’, Vernier Art Center, Stanford, California. This is a full BOOKLET entry.
- Lincoll, D. D. (1977a), Semigroups of recurrences, in ‘High Speed Computer and Algorithm Organization’, Academic Press.
- Lincoll, D. D. (1977b), Semigroups of recurrences, in D. J. Lipcoll, D. H. Lawrie & A. H. Sameh, eds, ‘High Speed Computer and Algorithm Organization’, third edn, number 23 in ‘Fast Computers’, Academic Press, New York, part 3, pp. 179–183. This is a full INCOLLECTION entry.

Nonymous, A. (2005), *Some Kind of Web Reference*, University of Nowhere.

`http://www.somewhere.com/~some_file.html`

current August 2005.

Appendix A

Project Specification

The project specification is *always* Appendix A. It will be inserted on the following page when you collate the final document.

Place your project specification here.

Appendix B

Some Supporting Information

This is a second appendix. It may contain, for example, some raw data, circuit schematics, mechanical drawings or software listings. Note how the `\clearpage` command was used to start on a new page.

B.1 Introduction to this Appendix

This is often helpful, especially when the information following is not text.

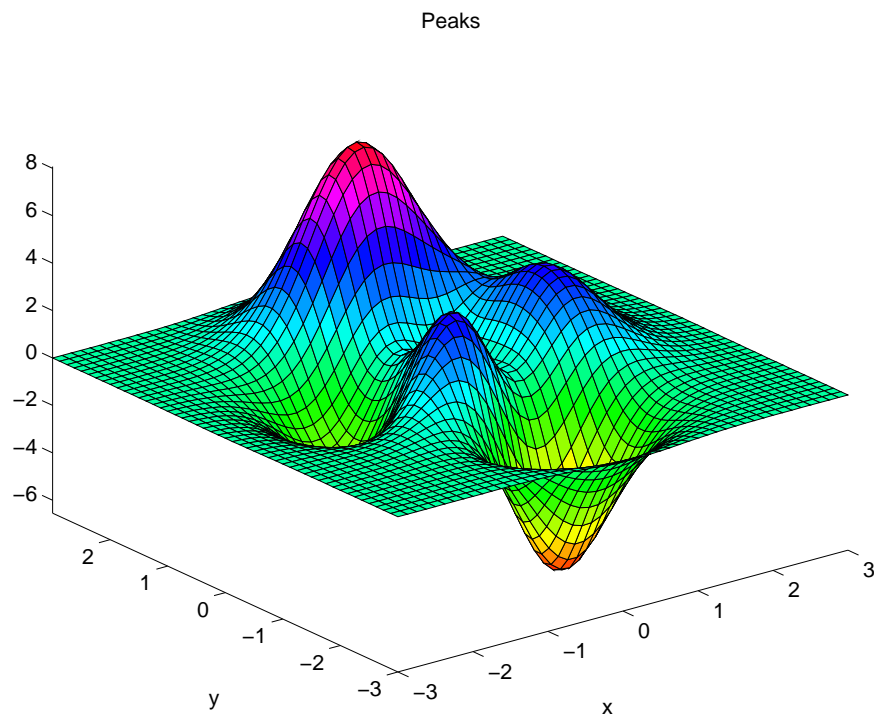


Figure B.1: This is a figure.

B.2 Another Section in this Appendix

Another appendix sub-section might be used when there are several software listings in the same appendix.

Appendix C

How to Include Source Code

You can use the `listings` package for formatting source code. It will format according to the syntax rules of the language used (for example, a certain font for comments, strings, and so forth), as well as correctly wrap multi-page listings.

You'll need to have `\usepackage{listings}` in the `bengdis.tex` file.

Use a format code similar to the following for importing the source code itself. The example shown is for MATLAB, but many other languages are supported.

C.1 The `lowertri.m` MATLAB Function

The function `lowertri.m` does clever things, and if need be you could put a brief explanation of *what* it does and *how* it does it here.

Listing C.1: A clever MATLAB function.

```
% function [alphanat, yt, thetat] = lowertri(xt, d)
% this is a matlab function called lowertri()
%
% inputs: ...
% outputs: ...
% usage:
%       [alphanat, yt, thetat] = lowertri(xt, d)
%       where ...

function [alphanat, yt, thetat] = lowertri(xt, d)
alphanat = acos(xt/(2*d));
yt = d*sin(alphanat);
thetat = pi - 2*alphanat;
```

C.2 The BasicWindow.c Windows C Code

The function `BasicWindow.c` is included to show how to include C source code. Again, you might need an explanation of *what* it does and *how* it does it here.

Listing C.2: A basic Windows program.

```

/* BasicWindow.c
 *
 * A basic Windows program
 *
 * To compile with lcc
 *   lcc -c -Ic:\lcc\include -A %1.c
 *   lcclnk -subsystem windows %1.obj -o %1.exe
 *
 * lcc compiler:
 *   General: http://www.cs.princeton.edu/software/lcc/
 *   Windows: http://www.cs.virginia.edu/~lcc-win32/
 *
 * John Leis
 */
//-----
#include <windows.h>
//-----
//-----
#include <string.h>
#include <stdio.h>
#include <stdlib.h>
//-----
//-----
// buttons
#define IDB_TESTBUTTON      200
#define IDB_EXIT            210
//-----
//-----
char szAppName[] = "BasicWindow";
//-----
//-----
HWND CreateMainWindow(HINSTANCE hInstance,
                     HINSTANCE hPrevInstance,
                     LPSTR lpszCmdLine, int nWinMode);
//-----
//-----
HWND      hMainWnd;
HINSTANCE hInstSave;
//-----

```

```

//-----
int WINAPI WinMain(HINSTANCE hInstance ,
                  HINSTANCE hPrevInstance ,
                  LPSTR lpszCmdLine , int nWinMode)
{
    MSG          msg;

    //-----
    hMainWnd = CreateMainWindow(hInstance , hPrevInstance ,
                               lpszCmdLine , nWinMode);
    if( ! hMainWnd )
        return 0;
    //-----

    //-----
    while( GetMessage(&msg, NULL, 0, 0) )
    {
        TranslateMessage(&msg);
        DispatchMessage(&msg);
    }
    //-----

    return msg.wParam;
}
//-----

//-----
LRESULT CALLBACK WndProc(HWND hwnd, UINT message ,
                        WPARAM wParam, LPARAM lParam)
{
    PAINTSTRUCT    ps;
    HDC            hdc;

    switch( message )
    {
        case WMCOMMAND: // menu & commands
            switch( LOWORD(wParam) )
            {
                //-----
                case IDB_TESTBUTTON:
                    MessageBox(NULL, "this is a test",
                               "BasicWindow", MB_OK);
                    break;
                //-----
                //-----
                case IDB_EXIT:
                    PostMessage(hwnd, WMDESTROY,
                                (WPARAM)0, (LPARAM)0);
                    break;
                //-----
            }
            return 0; // WMCOMMAND handled

        case WMCREATE:
            return 0;
    }
}

```

```

        case WMPAINT:
            hdc = BeginPaint(hwnd, &ps);

            // paint window here

            EndPaint(hwnd, &ps);
            return 0;

        case WMLCLOSE:
            PostMessage(hwnd, WMDESTROY, (WPARAM)0, (LPARAM)0);
            return 0;

        case WMDESTROY:
            PostQuitMessage(0);
            return 0;

        default:
            return DefWindowProc(hwnd, message, wParam, lParam);
    }
}
//-----

//-----
HWND CreateMainWindow(HINSTANCE hInstance,
                     HINSTANCE hPrevInstance,
                     LPSTR lpszCmdLine, int nWinMode)
{
    WNDCLASSEX wndclass;
    HWND hwnd;

    //-----
    // main window
    wndclass.cbSize = sizeof(WNDCLASSEX);
    wndclass.style = 0; //CS_HREDRAW | CS_VREDRAW;
    wndclass.lpfnWndProc = WndProc;
    wndclass.cbClsExtra = 0;
    wndclass.cbWndExtra = 0;
    wndclass.hInstance = hInstance;

    // no icons
    wndclass.hIcon = NULL; // desktop icon 32x32
    wndclass.hIconSm = NULL; // minimize/menu icon 16x16

    wndclass.hCursor = LoadCursor(NULL, (LPTSTR)IDC_ARROW);

    // window background
    //wndclass.hbrBackground =
    // (HBRUSH) GetStockObject(LTGRAY_BRUSH);
    //wndclass.hbrBackground = (HBRUSH)(COLOR_BACKGROUND + 1);
    wndclass.hbrBackground = GetSysColorBrush(COLOR_BTNFACE);

    wndclass.lpszMenuName = NULL; // register menu name
    wndclass.lpszClassName = szAppName;
    //-----

    //-----
    if( ! RegisterClassEx(&wndclass) )
        return 0;
    //-----
}

```

```
//-----  
hwnd = CreateWindowEx(WS_EX_CLIENTEDGE,  
                    szAppName, "BasicWindow",  
                    WS_OVERLAPPEDWINDOW, // normal  
                    CW_USEDEFAULT, CW_USEDEFAULT, // x, y  
                    360, 200,  
                    HWND_DESKTOP, // no parent window  
                    NULL,  
                    hInstance, NULL);  
  
//-----  
//-----  
// save main window handle  
hMainWnd = hwnd;  
hInstSave = hInstance;  
  
ShowWindow(hwnd, nWinMode);  
UpdateWindow(hwnd);  
//-----  
//-----  
// exit button  
CreateWindowEx(BS_PUSHBUTTON,  
              "button", // window class name  
              "exit",  
              WS_CHILD | WS_VISIBLE | BS_PUSHBUTTON,  
              220, 130, 100, 20,  
              hwnd, (HMENU)IDB_EXIT,  
              hInstSave, (LPVOID)NULL);  
  
//-----  
//-----  
CreateWindowEx(BS_PUSHBUTTON,  
              "button", // window class name  
              "Test_Button",  
              WS_CHILD | WS_VISIBLE | BS_PUSHBUTTON,  
              20, 20, 100, 20,  
              hwnd, (HMENU)IDB_TESTBUTTON,  
              hInstSave, (LPVOID)NULL);  
  
//-----  
return hwnd;  
}  
//-----
```

Appendix D

How to Include Data Sheets

You can use the `pdfpages` package for including PDF data sheets, specification documents, drawings and the like.

You must use `pdflatex` if using this package.

You will need to have `\usepackage{pdfpages}` in the `bengdis.tex` file. Note that `pdfpages` requires some other support packages as well: see the documentation on the package itself for information about this.

Some Datasheet

<i>some other document page 1</i>
<i>some other document page 1</i>
<i>some other document page 1</i>
<i>some other document page 1</i>

<i>some other document page 2</i>
<i>some other document page 2</i>
<i>some other document page 2</i>
<i>some other document page 2</i>