UNIVERSITY OF BIRMINGHAM

School of Computer Science

Writing Mini-project and Project Reports

MSc in Advanced Computer Science (MScACS)
MSc in Human-Computer Interaction (MScHCI)
MSc in Robotics (MScRob)
MRes in Natural Computation (MResNC)

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Introduction

The projects that you are doing as part of this course are possibly very different from what you have done before. In particular, they are meant to be *research* projects rather than the often more constrained and directed projects that you may have done as part of your undergraduate degree.

The aims of the project are threefold:
- that you undertake a piece of challenging research work
- that you learn how to undertake research (under the guidance of an expert researcher)
- that you learn how to present the results of your research in an appropriate way (again, under the guidance of someone who is expert at doing this).

Your project is likely to evolve through the course of undertaking it. You will build an understanding of the area within which you are working and will usually move from a broadly defined project towards a focus on open and interesting questions. It is where you end up that is important, rather than your journey, so it is *this* that you should report.

Projects can be very varied (they might concentrate on an analysis of existing work or they may have much more applied emphasis). However, the reports that you write should all:
- include a clear and explicit statement of the research questions that are being addressed
- demonstrate a deep and thorough understanding of existing work undertaken in this area
- present a clear and critical analysis of the achievements of the work that you have undertaken.

Most projects will also involve:
- Developing a general and abstract model that addresses the research question
- Building a constrained implementation of a system that acts as a *proof of concept*
- Undertaking an evaluation of this system (perhaps, including some form of experiment but often just a subjective assessment)

So, you should ensure that you include discussion of these areas within your report.

It is also almost inevitable that your work will raise as many questions as it answers. These are important and should be reported as part of your discussion of further work that could follow on what you achieved.

It is very important that you consider the contents of your final report as you go along – if not, then you risk neglecting a crucial part of your work.

Ultimately, your supervisor is expert at this and will guide you. It is important that you work closely with them and learn from their advice at all stages of your project.

Writing your first mini-project report can be a daunting prospect. This document gives some information and some simple ideas to help you produce a good report.

General formats for mini-project and summer project reports

In the course of your degree programme you will complete one or more mini-projects (in Semester 1 and/or semester 2), and one main pr oject (through the summer). At the completion of each of these projects you will have to write a report. The formats for mini - projects and the main (summer) project are different.

Mini-projects

The mini-project report is to be written in the style of a technical report. There is no specific word or page limit, however, you are expected to be mindful of your readers and to produce a report that is of an appropriate and reasonable length. Appendix I gives detailed guidance on the form of the mini-project report.

The main (summer) project

The summer project report is to be written in the style of a journal paper.   You will be provided with more detailed guidance about the style and length of this report at the start of the summer period.

Planning in advance

You should start to plan your report from the day you begin your mini -project or a project. The report is one of the products of your work, in the same way as a computer program is a product.

You should discuss with your supervisor the way in which your work will be reported. You can produce an outline plan of your report after your first meeting with your supervisor. This plan will not be detailed, but you can gradually increase the amount of detail in the plan until it is a complete basis for writing the report. The process of planning can help you sort out your ideas, to make woolly ideas firmer and to get things in a good sequence.

One common mistake students make is to believe that a plan cannot be changed or that it is a sign of weakness to change a plan. A plan is another tool to be used to get work completed to a satisfactory standard. It needs to be treated with no more respect than any other tool.

At first, the plan for a mini-project report might be a list of chapter headings. Next , one or more of these can be broken down into sections, then the sections into subsections, and so on until a whole chapter is ready to be written. You may decide to split a chapter into two or more chapters or to merge two or more chapters into one. Even more importantly, your plan can help you see where the strengths and weaknesses of your work lie. This means that you can use your plan to decide when to strengthen your report by some extra work, or when to pass on to new work. In a similar way you can develop the main sections, subsections etc. for the main project report.

A less common mistake that students make is to think that their report has to be written in order from the first page to the last. It is wise not to start to write until you have some level of plan for the whole report, but you can write parts as you go along. For instance, when you have the material for your review of previous work, you can write that chapter. It is quite

usual to write the inner chapters before the last chapter and then to write the introductory chapter as the last part you complete.

Audience

You should consider for whom you are writing the report. Obviously, you are writing for the two people who will assess your work as part of your course. Your supervisor should be knowledgeable in the topic and may even know as much about your topic as you do. The second reader (Moderator) will know less than you, but will be experienced in reading and writing technical papers.

Probably the best audience to whom you should address your report is personified by the second reader: an intelligent and knowledgeable person, but not necessarily knowledgeable in your precise area. You should be able to make your work comprehensible to just such a person and, if possible, your fellow students.

Structuring your report

We know that a report must have a beginning, a middle and an end. The first reaction of most students is to label the beginning "Introduction" and the end "Conclusions". The middle may consist of "Method" an d "Results". In a way, this division is true of many technical reports in computing, but you need to develop a more sophisticated way of thinking about structure.

Structure is the most important issue in writing your report.

A good structure is one that allows you to fit the important points into your report in a good sequence and to leave out the unimportant points. You should consider the following:

Introductory material
Introduce your aim or aims (e.g., as given on your mini-project or project declaration) and your objectives. This gives your motivation for the work you are writing-up.

Include your review of previous work - previous literature and previous software. This review should not be a list of previous papers with some text written aroun d it, but an account of previous work written from the viewpoint of your aims and objectives. So, if your work is about planning in robotics and you have read some relevant papers about planning freight movement, it would not *usually* be sensible to spend too much time discussing the detail of moving freight. *Make your review suit your work.*

An essential component of a review is a *critical analysis* of research relevant to your work. "Critical" does not mean "negative" or "disparaging" (e.g. about work of the others). It means unbiased and insightful review of relevant literature to[1]:
"

> *1. Determine the research and methods previously conducted in the field.*
> *2. Discover what remains to be learned in the field.*
> *3. Highlight mistakes, difficulties, or ethical issues encountered by others [...].*
> *4. Clearly define parameters for your own scientific study.*

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[1] http://www.csd509j.net/CVHS/science/scientific literature review.doc

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Any comments that you make – positive or negative – should be justified. Similarly, if you identify any gaps or open issues, you must comment on their significance to t he field.

The middle
This analysis of previous work should allow you to justify your aims and objectives in a broader context of the field of research, to state precisely what work you planned to do and to explain why it was worth doing. You should then say what you did and present the results. When describing experimental studies you must provide sufficient detail to enable a reader to reproduce your experiments and your results.

Ending material
The results you have produced may be interesting but even more interesting is your interpretation of those results. You have to tell your reader what you think is the *interpretation* (or *meaning*) of your results.

You should then evaluate your results to show their *significance*. The significance of your work can be judged by looking at how your work adds to the previous work on the topic. So, you should build on your review and analysis of previous work. Your review should have identified areas where the previous work had gaps: you should explain to your reader how your work has filled some of those gaps.

There are two common errors made at this point. First, students assume that their work must be represented as a complete success. This is not true. It is far more important to evaluate your work with the same rigour as other people's work. The second error is to be unduly negative about your own work. Your work must be evaluated with no more harshness than other people's work.

It is usual to have a chapter or section called "Conclusion". This should br ing together the strands of your work, commenting on what has been discovered and what future work has been identified, including possible ways of overcoming limitations you have identified.

It is difficult to set a good level of detail for both the introduction and the conclusion. Some people feel that it should only be necessary to read the introduction and conclusion of a technical report to get an understanding of the work. Then it is only necessary to read the middle chapters should you need to know a lot of detail about the work.

Producing the report

Reports must be in a word processed or printed form. There is no requirement to use a particular word processing or document preparation system. In choosing a system, you should discuss with your supervisor the suitability of the system you propose to use and the need to develop skills in using unfamiliar document preparation software. Hand -written reports are unacceptable.

Style

There are a number of recognised manuals of style that guide the author in consistent ways of writing. Two widely used manuals for writing are:

- *The Chicago manual of style* (15th ed) (University of Chicago Press, 2003);
- *The Oxford dictionary for writers and editors* (2nd rev ed)   (Oxford English Dictionary Department, 2000).

There are a number of citation style manuals, for instance:

- *Publication manual of the American Psychological Association* (5th ed) (American Psychological Association, 2001);
- *MLA handbook for writers of research papers* (6th ed) (Gibaldi, 2003).

Style manuals are useful in that they allow you to draw on the experience and expertise of the publishing industry.   Citation manuals in particular ensure that you present sufficient information in a consistent format.

Feedback and comments

You should always run a spelling checker over your written work and read through it, checking for typographical errors. It is more difficult for you to see where you may have expressed an idea poorly: you understand what you mean to say, but your reader is not as familiar as you with your topic. So, it is a good idea to get someone else to read through your report.

Your supervisor may be willing to read through some of your report. You should discuss this issue with your supervisor in advance. You should establish how much he or she will read and what kinds of comments they are prepared to offer (content; style; typographical errors). Most supervisors will read some of your report because it is a way in which they can help to train you in technical writing. It is usually a bad idea for a supervisor to read an entire report before submission. The reason is obvious. An aim of the course is to make you more independent and confident in your research work. While studying on the programme, you should become progressively more confident about producing your own work without the need for it to be checked by a figure of authority. Hopefully, by the end of the programme you will be looking to raise general issues of presentation with your supervisor, content in the feeling that you know how to present and take responsibility for your own work.

You may be able to get a colleague from the programme to read your report in return for you reading theirs. This has two positive aspects. First, you get your report read by a person who is likely to be about as knowledgeable as your second reader. They should be able to easily see where your presentation is obscure. Second, you get the opportunity to see how another person puts a report together and should be able to learn from the close observation of another person going through the same process. You should also learn something about ways of making comments that are simultaneously sympathetic and effective.

Avoiding plagiarism

Plagiarism is the use of other people's work so that is appears to be your own. 'Other people' include other students as well as authors of books, papers, documents or programs on the internet, etc. Deliberate plagiarism is a very serious offence that is treated in the same way as cheating in an examination; this could result in expulsion from the University, and as a minimum it results in disqualification from the project module. The University and the School are very strict about plagiarism, and you have signed a contract with the University on that topic.

Be careful to ensure that plagiarism does not occur accidentally. You can quote other people's work, but you must clearly indicate that this is what you are doing, and include the source. Direct quotation of narrative material should always be enclosed in quotation marks and the source of the material referenced either immediately before or immediately after the quotation. The full description of the source can be given in the References at the end of the dissertation. A guide to one style of referencing can be found at:

http://www.cs.bham.ac.uk/~pxc/refs/

If the material is paraphrased, it should not be enclosed in quotation marks, but the source should still be stated clearly. Tables, diagrams, etc. copied from elsewhere must also be clearly labelled as such, with reference to the source. You may have used other people's programs or source code in producing your software. This is perfectly acceptable provided you make it clear, by acknowledging t he source. If you do not, it will be considered plagiarism.

Appendix I: The form of a mini-project report

The report will comprise:

Title page
This should state the following information
- Type of project (e.g. Second semester mini-project)
- Project title
- Author
- Supervisor
- Affiliation (School of Computer Science, University of Birmingham)
- Date

Abstract and keywords
An informative abstract of no more than 250 words. This should state the aim or aims of the project. Being an informative abstract, it should contain sufficient information about the outcome and conclusions of the work as to allow the knowledgeable reader to judge the significance of the work.

There should be up to 10 keywords or key phrases suitable as indexing points in an information retrieval system.

Contents
The contents page(s) will list the contents of the report, including:
- Abstract
- Contents
- Figures
- Tables
- Chapters (including sections, subsection, etc, where appropriate)
- List of references or bibliography
- Appendices

Figures
A list of figures included in the report (if any). Each figure should be numbered and have a brief caption.

Tables
A list of tables included in the report (if any). Each table should be numbered and have a brief caption.

Chapters
Each chapter, section and subsection is to have a number and title. Each chapter starts on a new page.

List of References or Bibliography
There will be either a list of references or a bibliography. The ordering of entries and the form of entries must follow some authority. Students may choose to follow well-known citation standards (e.g. APA manual), the form prescribed by a journal or publishing house, or some other format.

At the end of the List of References or Bibliography, there must be a statement of the form of the citation used.

Required appendices

There are some appendices which are required for each mini-project and project.

A *Mini-project declaration*
   A copy of the agreed mini-project declaration form. (This form can be scanned in using the School Library scanner.)

B *Statement of information search strategy*
   This is a statement of your method of identifying significant literature and related work (in paper and/or electronic form). This should include, amongst other things:

   •   forms of literature to be retrieved
      -   significant parameters for the search, e.g.:
      -   cut-off date
      -   need for current/recent information
      -   restrictions as to language

   •   search tools to be used to retrieve information

   •   search statement used in retrieval

There should be a *brief* evaluation of the search.

Optional appendices

Material that supports the report should be placed here.

Supervisors have differing opinions about the inclusion of program code in reports. A minority wish to have all programs included in printed form. More commonly any significant code should be included on a CD attached to the report.

If a significant amount of your work has taken the form of a program, you should, additionally, provide instructions on how to run it. You should then include brief details of what you have made available and where it is located in an appendix.

The University of Birmingham
School of Computer Science
MSc in Advanced Computer Science / Natural Computation

First semester mini-project

Intelligent optimisation of meta-interpreted parsers

A. Student

Supervisor: P J Hancox

January 2010

Abstract

Unification grammars describe the syntactic structure primarily by their use of feature structures which allows the linguist to encode many syntactic features in addition to the syntactic class. Complex labels mean that matching needs to be more than direct equality, usually unification.

Linguists are able to express several finer distinctions for a word with one syntactic category by using feature structures. This means that grammars and, in particular, lexicons, are very much larger and there is much more ambiguity during parsing. Research has focused on ways of encoding unification grammars so that they more readily lend themselves to practical implementation in Prolog.

This work focused on two techniques to optimise grammars in a top-down parser. Analysis of the search tree of the grammar: paths through the search tree were merged or pruned where determinism could be introduced and cycles in the grammar removed. Classification of features by the role played in determining the choice of syntactic category: the presence or absence of some features determines the choice of syntactic category, whereas other features merely sub-divided a syntactic category. The former class of features was computed during parsing, while the latter was computed after parsing.
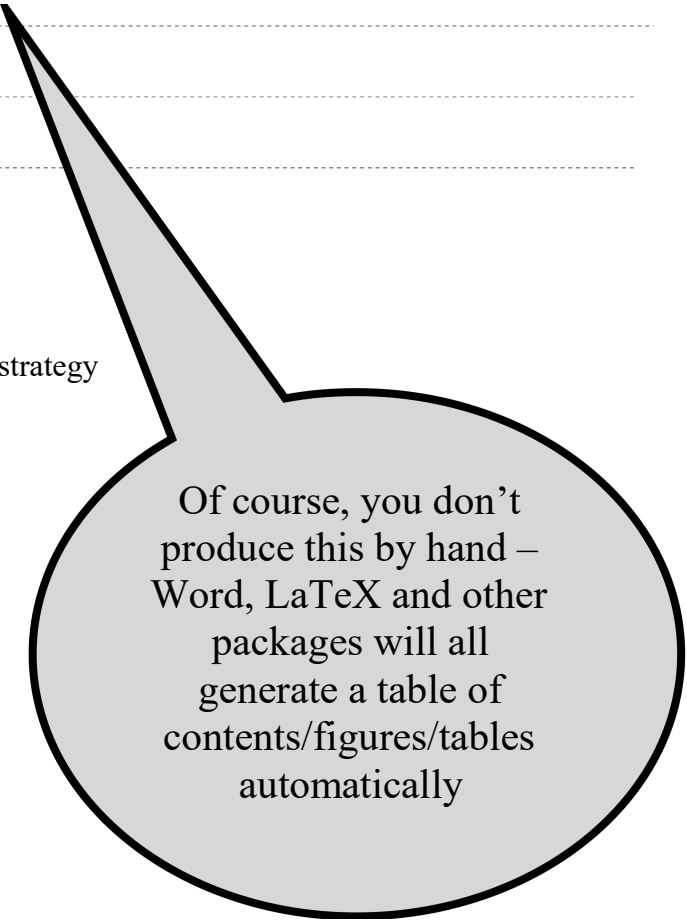
These techniques were compiled into a recursive transition network and tested individually and in combination against recognised test samples. Results suggest that analysis of the phrase structure improves speed significantly for all sentences, whereas classification of features does not add significant improvement, either when used alone or with the analysis of phrase structure.

Contents

Of course, you don't produce this by hand – Word, LaTeX and other packages will all generate a table of contents/figures/tables automatically

Figures

Tables

Chapter 1
Introduction

There are many ways of laying out a chapter. The key points are that each chapte r should start on a new page and should have a number and a title.

1.1 Page numbering

Purists like the page number of the first page of a chapter to be at the bottom of the page, in the centre. On the second and following pages of the chapter, the page number is placed at the top of the page. On even numbered pages it is on the left -hand side of the page; on odd numbered pages, it is on the right-hand side of the page.

1.2 Sections, subsections, sub-subsections and so on

It is usual to split chapters into sections, subsections, etc, and to number the sections, etc. Some word processors and document preparation tools do this automatically for you. They should also automatically create your contents, figures and tables pages. This is a good feature, because it allows you to change your document without having to manually change your contents, figures and tables pages.

1.3 Etc.

References

American Psychological Association (2001) *Publication manual of the American Psychological Association* (5th ed). Washington, DC: American Psychological Association.

Gibaldi, J. (2003) *MLA handbook for writers of research papers* (6th ed). Modern Language Association of America.

Hirsch, H (2003) *Essential Communication Strategies: For Scientists, Engineers and Technology Professionals*. Wiley.

Lamport, L (1994). *LaTeX: A Document Preparation System*. Addison-Wesley.

Ritter, R (2000) *The Oxford dictionary for writers and editors* (2nd rev ed). Oxford University Press.

University of Chicago Press. (1993) *The Chicago manual of style* (14th ed). Chicago; London: University of Chicago Press.

The references have been prepared using:

American Psychological Association (1994) *Publication manual of the American Psychological Association* (4th ed). Washington, DC: American Psychological Association.

MSc in Advanced Computer Science / Natural Computation

First semester mini-project

This form is to be used to declare your choice of mini -project in the first semester of the course. Please complete this form, obtain the signature of your supervisor and post it in the appropriate assessed work pigeon hole.

Deadline: 16.00 hrs, 20th October 2010

Name: A. Student

Student number: 01214141234

Mini-project title: Intelligent optimisation of meta-interpreted parsers

Mini-project supervisor: P J Hancox

The following questions should be answered in conjunction with a reading of the course handbook.

Aim of mini-project	To investigate ways of compiling unification grammars so that they can be parsed more quickly and using less memory.

Objectives to be achieved	To investigate methods of merging search trees to reduce non -deterministic choice;
	To investigate methods of pruning search trees by removing deterministic sequences;
	To investigate methods of partitioning features into those that influence the choice of syntactic label (eg NP, noun) and those that subdivide a syntactic label (eg noun singular; noun plural).
	To implement the above in a parser for Lexical Functional Grammar based on recursive transition networks.
	To test the effect of the methods described above on parse time and memory usage for test sentences.

Project management skills *Briefly explain how you will devise a management plan to allow your supervisor to evaluate your progress*	*There is an agreed plan showing the milestones to be reached during the course of the mini-project.* *Progress will be reviewed in the regular meetings between supervisor and student.*

Systematic literature skills *Briefly explain how you will find previous relevant work*	The important categories are (in order): conference papers; technical reports; journal articles and theses. Conference papers, journal articles and some theses will be identified using *Engineering Index, Science Citation Index* and *Social Science Citation Index.* Reports will be retrieved using WWW report repositories. *Dissertations Abstracts International* and *Index to Theses* will be used in more theses need to be found. The search will look for items dating from 1993 to the present.

Communication skills *What communication skills will you practise during this mini-project?*	Written skills will be practised in the writing of the report. Oral skills will be presented in • verbal reports to the supervisor; • 20 minute presentation in SEM580; • presentation to the AI seminar group.

Signed (student)   *A Student*

Date: *9th October 2010*

Signed (supervisor):   *Peter Hancox*

Date: 10th October 2010

Appendix B
Statement of information search strategy

Parameters of your literature search

Forms of literature
The important categories are (in order):
- conference papers;
- technical reports;
- journal articles
- theses.

Books are not likely to be significant, except for basic programming techniques.

Geographical/language coverage
Important work is likely to be from the North America and Western Europe. Preferred language is English. Papers in French and German could be read. For papers in other languages, it would be necessary to reply on abstracts in English.

Retrospective coverage and currency
It is probably sufficient to search retrospectively for five years. This is a current research topic, so it is necessary to use indexing and abstracting services that are very up-to-date: ie machine-based services, rather than paper indexes.

Appropriate search tools

Engineering Index
To be used to retrieve conference papers, journal articles and some theses. This is strong on North American and UK publications (ie English), but less strong on Western European. It has the retrospective coverage and currency required. Abstracts are available for many publications. It has the retrospective coverage and currency required. Abstracts are available for publications in the source journals.

Science Citation Index and Social Science Citation Index.
Primarily for journal articles. These will be used as ordinary keyword-based indexes (as for Engineering Index) and/or for citation searching, perhaps using an early paper or papers retrieved from Engineering Index.

Dissertations Abstracts International and Index to Theses
DAI will be used if the retrieval of North American theses from Engineering Index seems poor. *Index to Theses* will be used if the retrieval of UK theses from En gineering Index seems poor.

Search statements

The search statements used will be based on:
      pars* AND unification AND grammar*

This may need to be refined in the number of recalled items is too large. Keywords from items that have been found will be reviewed in order to refine the set of keywords used.

Brief evaluation of the search.

[The following is a fictional evaluation.]

The search in *Engineering Index* retrieved 12 items judged to be relevant of which:
- 7 conference items
- 4 journal articles
- 1 thesis (North American)

The search in *Science and Social Science Citation Indexes* retrieved 7 journal articles judged to be relevant of which:
- 5 were retrieved from *Engineering Index*
- 2 were not retrieved from *Engineering Index*

2 older and most relevant conference papers retrieved from *Engineering Index* were used as the basis of a citation search in *Science and Social Science Citation Indexes*. This retrieved a further 11 journal papers which were judged relevant in whole or in part.

Reports were retrieved using the University of Waikato report repository and index, and by a search using *Google Scholar*. 2 reports were retrieved that were not the basis of other forms of publication.

A search in *Index to Theses* confirmed that there were no relevant UK theses. It was concluded that there was no need to search *Dissertations Abstracts International* for North American theses.