Writing Scholarly Papers

COMS W4995-02

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Why Are We Bothering?

I want the literature survey and final report to look like a workshop paper.

Useful to know the style for doing future research.

This is how academics communicate

You should know the technique

Proven over time

References

I took many points from a webpage of Henning Schulzrinne:

`www.cs.columbia.edu/~hgs/etc/writing-style.html`

In addition to advice, this includes many references

Here, I'm following a cardinal rule of scholarly writing: clearly state your sources.

Research Papers

- Clear statement of the problem being addressed
- What has been done before and what is new
- Proposed solution
- Results achieved

Literature survey should include the first two

Final report should include all four

Typical Outline

Abstract

Introduction

Related Work

Description of problem solution

Experimental results

Conclusions and future work

Bibliography

The Abstract

Short: 2–3 paragraphs/100–150 words

Introduce problem in first paragraph

Describe your approach in second

Brief conclusions and impact in third

Abstract often separated from paper; must stand alone and be pure English

Do not include biblographic citations or mathematics

A Sample Abstract

Embedded hard real-time software systems often need fine-grained parallelism and precise control of timing, things typical real-time operating systems do not provide. The Esterel language has both, but compiling large Esterel programs has been challenging, producing either needlessly slow or large code.

This paper presents the first Esterel compiler able to compile large Esterel programs into fast, small code. By choosing a concurrent control-flow graph as its intermediate representation, it preserves many of the control constructs to produce code that can be a hundred times faster and half the size than that from other compilers with similar capacity.

The primary contribution is an algorithm that generates efficient sequential code from a concurrent control-flow graph. While developed specifically for compiling Esterel, the algorithm could be used to compile other synchronous languages with fine-grained parallelism.

The Introduction

Describe both the area you're working on and what you've found

Cut to the chase early

"My field is interesting and here's what I've done"

Don't repeat the abstract

Orient the reader about what they should expect

Some references are appropriate here, but they need not be exhaustive

Related Work

Describe relevant work of others, contrasting it with yours

Be respectful to authors:

> Smith [1] describes a system for real-time scheduling...

Don't use citations as nouns:

In [1], a system for real-time scheduling is described

Goals of the Related Work Section

Orient the reader

Part of your job is to figure out the state of the field and communicate that clearly

Your audience needs to know how your work is a huge step forward from what was done before

Convince the reader you are knowledgeable

Academics work by consensus

There's an accepted body of knowledge

Yours won't be added to it unless you understand and acknowledge it, too

Bibliography

Many different styles that differ only slightly

All have the same goal of providing enough information so that a reader can find what you read

Information in most citations:

- Author(s) of the work
- Title of the work
- Where it appeared (if a conference or journal publication)
- Date (at least year) at which it appeared

Biliographic Entry: A Conference Paper

[1] L. Lavagno and E. Sentovich. ECL: A specification environment for system-level design. In *Proceedings of the 36th Design Automation Conference*, pages 511–516, New Orleans, Louisiana, June 1999.

Authors' names. Title. In *conference title*, pages xx–yy, Conference Location, Month 19xx.

Biliographic Entry: A Book

[2] S. Edwards. *Languages for Digital Embedded Systems*. Kluwer, 2000.

Author. *Title.* Publisher, 19xx.

Biliographic Entry: A Journal Paper

[3] S. Edwards, L. Lavagno, E. Lee, and A. Sangiovanni-Vincentelli. Design of embedded Systems: Formal models, validation, and synthesis. *Proceedings of the IEEE* 85(3):366–390, March, 1997.

Author(s). Title. *Journal* volume(number):page–page, month, 19xx.

Bibliography Entry: A Technical Manual

[1] M. D. Smith. *An Introduction to Machine SUIF.* Harvard University, 2000.

Author(s). *Title.* Organization, 19xx.

Citing Web Pages

URLs are not generally considered reasonable scholarly citations

- Not peer-reviewed
- Very fragile
- Can easily be changed

Best used for pointing people to projects or companies

Personally, I put them in footnotes.

Those in most of my papers are incorrect now.

More Information on Bibliographies

I learned much of what I know from

Mary-Claire van Leunen. *A Handbook for Scholars*. Oxford University Press, 1992.

This appears to be out-of-print, but it's well worth finding.

Creating Bibliographies

BibTeX automatically formats and includes citations written using LaTeX

Database consists of entries like

```
@Book{edwards2000languages,
  author     = {Stephen A. Edwards},
  title      = {Languages for Digital
                Embedded Systems},
  publisher  = {Kluwer},
  month      = sep,
  year       = 2000
}
```

Creating Bibliographies

I enter everything I ever read into a BibTeX database

It's now very easy to assemble a bibliography for a paper: I just look in the file

BibTeX can create bibliographies in just about any style a publisher demands

```
Edwards~\cite{edwards2000languages} describes many different languages.
```

becomes

Edwards [1] describes many different languages.

[1] S. Edwards. *Languages for Digital Embedded Systems*. Kluwer, 2000.

The Body

Describe what you've done with reasonable detail

Make sure to describe any unexpected or particularly difficult problems

Goal is to simplify life for those in the future

Describe what you did and how it turned out

No requirement to include everything

"Thanks, but that's a little more information than I needed to know."

Clear Writing

Main goal: **Be succinct**

I think of it as an engineering problem:

How can I communicate using the fewest words?

Be emphatic

Avoid passive constructions

Instead of "The silicate globules were assembled into a sloping conical arrangement by the group," write "We piled the stones."

Clear Writing

Avoid Wordy Idioms

Instead of	**Prefer**
make assumption	assume
is a function of	depends on
is an illustration of	illustrates

Avoid inactive verbs

Avoid "to be" (is, was, will be)

Instead of "In Smith [1], a clear-cut distinction was made..." prefer "Smith [1] drew a distinction..."

Clear Writing

Start each paragraph with a topic sentence:

You will be amazed by how much this helps. People will sing your praises. Professors will grade you higher. Your peers will call you "The Exalted One." Little children will bow in your presence.

Technical writing is not a murder mystery: tell whodunit immediately. Suspense has no place.

That vs. Which

Restrictive clauses use *that*

Added to constraint the number of different things being considered

Don't need commas

"Buildings that have white walls are common here."

Nonrestrictive clauses use *which*

Added to give additional information without changing collection being considered

Need commas

"Stucco buildings, which have white walls, are common here."

Clear Writing

Everybody should have a copy of Strunk & White, *The Elements of Style.*

It's exactly what it should be: an amazingly short, succinct book on how to write well.

Experimental Results

For those of you that will have some,

Include important results that actually show something

Avoid including endless tables or graphs if they don't further your point

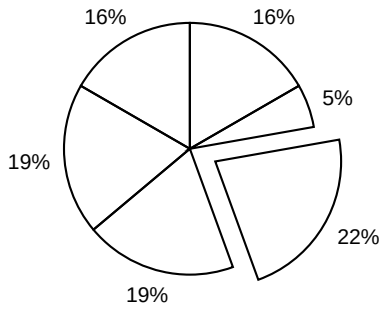
Clearly label and explain how to interpret your graph

What are you measuring?

What are you controlling?

What is your experimental setup?

Don't Do This



Experimental Results

Graphs often illustrate trends and behaviors much more clearly than tables

Consider using graphics where you can

Often much more succinct

Less preferable when data is more varied, highly-dimensional, or spotty.

Drawing Graphs

Basic rule of Edward Tufte:

Don't waste ink.

Only include graphical elements that convey information

Shun "chartjunk": extraneous lines, dots, and grids

Tufte's three beautiful books on this:

The Visual Display of Quantitative Information (2001)

Envisioning Information (1990)

Visual Explanations (1997)

Conclusion Section

Here, summarize the results, say what worked and what didn't, and explain what remains to be done

Be careful not to save the best for last

I've read many papers where the contents of the conclusions section should have been written in the introduction

This is not a murder mystery

Paper Format

Most conferences and workshops require this format:

Two columns

10 point type

Usually Times Roman

Single-spaced

Paper is precious: don't waste it

(Hint: indent paragraphs, don't space them)

Paper Length

Six pages maximum

I will deduct points if the paper, including bibliography, is over six pages

Yes, you may have to work to shrink it

Yes, you will have to leave out some details

No communication has unlimited bandwidth

This is a common restriction for technical papers

A key skill of a writer is efficient communication in limited bandwidth