

Writing Scholarly Papers

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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

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Typical Outline

- Abstract
- Introduction
- Related Work
- Description of problem solution
- Experimental results
- Conclusions and future work
- Bibliography

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Why Are We Bothering?

- I want the 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

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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 have included the first two
- Final report should include all four

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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 must stand alone as pure English
 - No bibliographic citations
 - No mathematics

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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.

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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

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Related Work

- Describe the relevant work of others
- You won't be exactly duplicating their work, so contrast your results with theirs

- 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~~

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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
 - They need to know how your work is a huge step forward from what you've done
- 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

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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

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Example Bibliographic Entries

- A paper in a conference

[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.

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Example Bibliographic Entries

- A book

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

Author. *Title*. Publisher, 19xx.

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Example Bibliographic Entries

- A journal paper

[1] 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.

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Example Bibliographic Entries

- A technical manual

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

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

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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

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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.

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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,  
}
```

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Creating Bibliographies

- I've entered everything I ever read into a big 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

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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."

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Clear Writing

- Be succinct
 - This is the main goal
 - I think of it as an engineering problem:
 - How can I communicate using the fewest words?
- Be emphatic
 - Avoid passive constructions
 - Not "The silicate globules were assembled into a sloping conical arrangement by the group"
 - Write "We piled the stones."

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Clear Writing

- Avoid wordy idioms

<i>Instead of</i>	<i>Prefer</i>
make assumption	assume
is a function of	depends on
is an illustration of	illustrates
- Avoid inactive verbs
 - Avoid writing "to be"
 - Not "In Smith, a clear-cut distinction was made ..."
 - Instead "Smith made a clear-cut distinction..."

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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:
 - Explain whodunit immediately
 - Suspense is not the point

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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."

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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.

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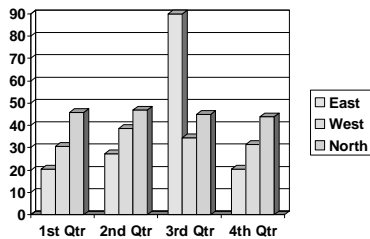
Experimental Results

- 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?

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Experimental Results

- Don't do this:



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Experimental Results

- Graphs often illustrate trends and behaviors much more clearly than tables
- Consider using graphics where you can
- Often much more succinct

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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)

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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

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Paper Format

- **Most conferences and workshops require a common format**

- **Two columns**
- **10 point**
 - Usually Times Roman
- **Single-spaced**

- **Paper is precious: don't waste it**

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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**

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