



Technical English

Jason J. Gu

Electrical and Computer Engineering

Biomedical Engineering

Dalhousie University

&

School of Control Science and Engineering

Shandong University

11/14/2006

Department of Electrical and Computer Engineering
Dalhousie University
Halifax, Nova Scotia



1

Lecture
November 2006
Shandong University

Time Table

- Instructor Jason GU

- Time

- Tuesday 1:30pm-4:00pm
 - Tuesday 6:30pm-9:00pm (note the schedule change)
 - Office hour 1:30pm-4:00pm (4-315A)

- Acknowledgement

- Professor Peter Liu
 - Systems and Computer Engineering
 - Carleton University
 - Canada



Course Outline

- Part I: How to write a technical paper
- Part II: How to prepare a presentation I
- Part III: How to develop Thesis
- Part IV: How to write thesis
- Part V: How to develop a poster
- Part VI: How to use Latex
- Part VII: How to do presentation



Part 1: How to write a technical paper

- I. Research paper and its structure
- II. Principles of writing
- III. Hints of technical writing
- IV. Implementation issues
- V. Good and bad examples





How to Write a Technical Paper

Research paper and its structure

Principles of writing

Hints of technical writing

Implementation issues

Good and bad examples



Why your paper is accepted/rejected

Professionalism [determined by *you*, can be improved]

- **Writing**
 - Acceptable: writing
 - Clear: rules
 - Beautiful: skills and fluency
- **Format**
 - Template
 - Figures, diagram, tables
 - Equations
 - Fonts, headings, spacing, indent, alignment, etc.
 - References
- **Organization and presentation**
 - Logic
 - Complete
- Contribution [determined by the *nature of work*. Can do nothing once it is there]: Not at all or trivial / Minor / Significant
 - **Originality**
 - **Significance**
 - **Solidness**





I. Research paper and its structure



Intro: Why to write a research paper

- To communicate an idea (or a set of ideas) to people who have the ability to
 - either carry the idea even further
 - or make other good use of it.

It is believed that the communication of good ideas is the medium through which science progresses.

- Thus, the first thing to do before starting to write a paper is to ask
 - what is the idea (or ideas) that the paper is intended to communicate.
- An idea can be
 - a new way of looking at objects (e.g., a “model”),
 - a new way of manipulating objects (i.e., a “technique” or “algorithm” or “design”),
 - or new facts concerning objects (i.e., “results”).
- If no such idea can be identified one should reconsider whether to write the paper at all. If an expert in the field reads this paper, she/he MUST learn something new --- which is the test if the paper is publishable or not. Otherwise, do not continue writing it – this means it should not be published nor known previously. This is referred to as being novel work.



Intro: Paper publication

- The following is based on my understanding
 - IEEE allows that the same idea be published on
 - A workshop
 - A conference proceedings
 - A Journal (with extended work)

Note that new work is expected.

- The same work published in different languages are in general not allowed.
- Republication is only permitted if the publisher who owns the copyright consents and it is clearly stated in the republished work.



Intro: What is a research paper

- A formal written report that includes research findings and a researcher's own ideas.
- It contains novel research results or reviews existing results.
- The essential of a research paper is an original contribution to knowledge.
- Your paper should prove that you have made such a contribution and publicize it.



Intro: What is contribution

- Two points
 - you have identified a worthwhile problem or question which has not been previously answered or well answered.
 - you have solved the problem or answered the question; or you have done considerable improvement over to existing methods; or you have find an alternative new method which possesses merits.



Intro: What a paper should focus on

- Describing the results in sufficient details to establish their validity
- Identifying the novel aspects of the results
 - what new knowledge is reported
 - what makes it non-obvious
- Identifying the significance of the results
 - what improvements
 - impact



Intro: Paper Category

- An algorithm
 - Itself and implementation
- A system construct: such as hardware design, software system, protocol, etc.
 - One goal of the paper is to ensure that the next person who designs a system like yours doesn't make the same mistakes and takes advantage of some of your best solutions.
 - So make sure that the hard problems (and their solutions) are discussed and the non-obvious mistakes (and how to avoid them) are discussed.
- A performance evaluation or comparison: obtained through analyses, simulation and/or measurements
- A theory: consisting of a collection of theorems
- A survey



Paper structure

- A. Title
- B. Authorship
- C. Abstract
- D. Introduction (including problem statement)
- E. Related work
- F. Proposed approach
 - Theoretical model, analysis, and solution
 - Simulated results
 - Experimental results
- G. Comparison with previous works and discussion
- H. Limitations
- I. Conclusion
- J. Acknowledgements
- K. References
- L. Appendix



A. Title

- Fit into a sequence of past and future work:
 - sufficiently different from the titles of previous work
 - should allow room for subsequent work.
- Do not use
 - A study of ...
 - A Research on/of....
 - A preliminary...
- Avoid all but the most readily understood abbreviations and no citations
- Be concise and to the point.
 - In general, no more than ten words



B. Authorship

- The IEEE policies (Section 6.4.1) state: “The IEEE affirms that authorship credit must be reserved for individuals who have met each of the following conditions:”
 - 1) made a significant intellectual contribution to the theoretical development, system or experimental design, prototype development, and/or the analysis and interpretation of data associated with the work contained in the manuscript,
 - 2) contributed to drafting the article or reviewing and/or revising it for intellectual content,
 - 3) approved the final version of the manuscript, including references.



C. Abstract

- Very important
 - What a reviewer always reads first.
 - Some people will only read the abstract. (Some conferences only accept abstract)
 - The reader will decide whether the paper is worthy enough to merit further study.
- Should contain:
 - a clear and concise statement of your problem;
 - a brief explanation of your solution and its key ideas;
 - a brief description of the results obtained;
 - a brief description of the impacts and importance of the results obtained.
- Should avoid
 - all but the most readily understood abbreviations.
 - use of "in this paper"
 - equations and math. Exceptions: Your paper proposes $E = m c^2$.



C. Abstract

■ Need NOT

- include the motivation of the work (as this will be typically done in the introduction).
- list and/or recall the contents of prior work (but rather, if necessary, it may describe the nature of the improvement over possibly unspecified “prior work”).
- provide an accurate description of the paper’s results (but may rather describe them in imprecise but clear terms using warning phrases as “loosely speaking”). In cases where even an imprecise (but clear) description is infeasible, the abstract may merely convey the flavor or nature of the new results.
- provide a description of all the paper’s results (but may rather confine itself to the most important ones, while clarifying that these are merely the main results).



C. Abstract

An example

- Many mobile robot path planning algorithms, produce changing intermediate goal coordinates for a mobile robot to pursue, and provide motoring speed/torque signals based upon local sensor information and the position of the global target. This is often done with little or no regard for the low level vehicle dynamics, which, in practice, must be taken into account for efficient path planning. Therefore, in this article mobile robot path planning parameters are related to the application of a correct, general control law. It will be shown that nonlinear control analysis provides a useful tool for quantifying various path planning parameters in order that stable asymptotic convergence of a mobile robot to its target is guaranteed. Contrary to previous work, this analysis allows a deceleration zone to be quantified which surrounds any mobile robot's goal. Results show that near time optimal goal seeking is possible with real vehicles having simple proportional or integral controllers only.



C. Abstract

- Must NOT
 - cite references.
 - Be sure that
 - terms that identify your work are found there
- Since the abstract will be used by search engines.
- In general, not more than 200 words.
 - Slightly different from the one required for thesis, report, etc.



D. Introduction

- Provide a clear background on and motivation to the questions studied in the paper,
 - establishing its importance (theoretical, technical, or industry)
 - leading to the problem to be solved.
 - Exceptional cases refers to well-known questions having well-known motivation
 - Assuming that the readers know the motivation is a calculated risk, but sometimes such risks are worthwhile taking.

The motivation need not be argued from scratch. If there are dozens of works dealing with a particular type of questions then this type requires no motivation, but the specific question within this type may require motivation.

- Provide a clear statement of the problem to be addressed
- Provide a clear description of the main results and a high-level description of the techniques.
 - In most cases it should be possible to provide sketchy versions of the main theorems and to describe the main ideas underlying the techniques and the results .



D. Introduction

- Place the current paper in context of prior related work. Assuming such related work exists, the (main) differences with respect to it should be pointed out and fairly evaluated: The aspects in which the new paper improves over prior work as well as aspects in which it is worse should be clearly stated and discussed.
- Gives a summary and outline of your paper, telling readers what they should expect to find in it.
- The introduction should highlight important new ideas and novel conceptual observations (no exaggeration).
- A few paragraphs are sufficient.



D: Introduction-- Paragraphs

- Paragraph 1: Motivation.
- Paragraph 2: What is the specific problem considered in this paper?
- Paragraph 3: "In this paper, we show that ...".
- Paragraph 4: At a high level what are the differences in what you are doing, and what others have done?
- Paragraph 5: "The remainder of this paper is structured as follows..."



Introduction

An example

Many new domains for genetic programming require evolved programs to be executed for larger amounts of time. For example, it is beneficial to give evolved programs direct access to low-level data arrays, as in some approaches to signal processing, and protein segment classification. This type of systems automatically performs more problem-specific engineering than a system that accesses highly preprocessed data. However, evolved programs may require more time to execute, since they are solving a harder task.

One way to control the execution time of evolved programs is to impose an absolute time limit. However, this is too constraining if some test cases require more processing time than others. To use computation time efficiently, evolved programs must take extra time when it is necessary to perform well.



An example of Introduction

We introduce a method that gives evolved programs the incentive to strategically allocate computation time among fitness cases. Specifically, with an aggregate computation time ceiling imposed over a series of fitness cases, evolved programs dynamically choose when to stop processing each fitness case. We present experiments that show that programs evolved using this form of fitness take less time per test case on average, with minimal damage to domain performance. We also discuss the implications of such a time constraint, as well as its differences from other approaches to. The dynamic use of resources other than computation time, e.g., memory or fuel, may also result from placing an aggregate limit over a series of fitness cases. [A clear statement of results should be added]

The following section surveys related work in both optimizing the execution time of evolved programs and evolution over Turing-complete representations. Next we introduce the game Tetris as a test problem. This is followed by a description of the aggregate computation time ceiling, and its application to Tetris in particular. We then present experimental results, discuss other current efforts with Tetris, and end with conclusions and future work.



Introduction

Another example

Sam's paper



DONT'S of Introduction

- Avoid stock and cliché phrases such as
 - "recent advances in XYZ" or
 - description of PID control
- Repeating the abstract in the introduction is a waste of space.



E. Related work

- Review of recent work (normally within 6 years) on solving this problem.
- It is usually compared to the rest of the paper and only addresses a much narrower slice of the field.
- For each work, briefly describe
 - how do these previous techniques work
 - what are their technical strengths
 - What are their technical weaknesses.

Note:

- Do not disparage other people's work just to make your work look good: your work is good only when it solves the problem.
- Be fair in criticism and support your views with technical reasons, not personal opinions.



E. Related work

- Example:

Much work has gone into supporting mobile clients [21] and into creating programming models that incorporate adaptation into the design of the application [17]. The work that most closely relates to Pup is Ody [28], which splits the responsibility for adaptation between the application and the system. Pup takes a similar approach, pushing common adaptation tasks into the system infrastructure and leaving the application-specific aspect of adaptation to application drivers. The main difference between the two systems lays in Pup's use of existing run-time interfaces to adapt existing applications, whereas Ody requires applications to be modified to work with it.

Visual Proxies [34], an offspring of Ody, implements application-specific adaptation policies without modifying the application by using interposition between the X-server and the application. While this technique enables many adaptations that are possible with Pup, it requires much more complicated application drivers.



F. Proposed approach

- Theoretical model, analysis, and solution (This is the most important part of the paper).
 - Present an in-depth discussion of the theoretical aspects of your proposed approach.
 - Use fundamental theory (EE, Math, Physics, etc.), circuit design, circuit analysis, algorithms, etc.
 - Analyze the efficiency of your approach after the presentation, again using theoretical analysis.
 - Theoretical results may be plotted or illustrated by figures and / or tables for later comparison with simulated and / or experimental results.
 - Analyze the complexity, overhead, cost, etc. of your approach.
 - All approaches must be theoretically solid and justifiable. Trial-and-error and lucky good guesses are not acceptable.



F. Proposed approach --Simulation

- Simulate your approach using whatever tools
- Describe the environment of your simulations, including
 - the parameters and conditions of the environment
 - The model used
- Generate figures and / or tables of results and compare with the theoretical results in the previous section to support the theoretical analysis.
 - Each figure (or graph) should be well explained.
 - Discuss agreements and discrepancies.
- Choose realistic case studies, not just those that your approach happens to work well with.
 - Do not choose "toy" problems as case studies. For example, an 8-bit ADC is a valid case study, a 3-bit ADC is "toy."
 - Some conferences and journals accept papers with simulation results but others demand more.



F. Proposed approach—experiment

- Simulation alone is not sufficient to support your theory since simulation is not accurate and does not include many real-life effects.
- Many high-quality conferences and journals demand experimental results before publications.
- Present experimental results from real circuits or systems
- Plan the experiment well in advance since it takes time.
- Compare experimental results in figures / tables with simulated results and theoretical predictions. Discuss agreements and discrepancies.



G. Comparison with previous work

- Compare honestly your work with previous works reviewed
 - Using the list of goals / criteria established in the previous section.
 - Discuss where your solution is better, where it is weaker, etc.
 - Use a table with criteria as column headings and solution methods (others and yours) as row headings to show tradeoffs.
 - Use figures to illustrate differences in solutions.
 - Check to make sure that your approach actually solves the problem.



H. Limitations

- No work is perfect.
- Discuss honestly the limitations of your proposed approach.
- Limitations may be theoretical or experimental or practical (e.g. manufacturing cost increasing too fast with circuit complexity, etc.).
- Is it possible to overcome some limitations while others are totally unavoidable?
- Can be put on the section of either comparison or conclusion



I. Conclusions

- Not a repetition or copy of the abstract
 - Summarize the contribution: problem and your proposed approach
 - Elaborate on the impacts or importance of using your approach.
 - State both strong and weak points.
 - Provide directions for future research in the field.



I. Conclusions that don't...

- DON'T do this:
- Write a paper in which the conclusions were an almost exact copy of the introduction, changing only the tense of the verbs. That's unforgivable.
- Conclusions should synthesize the results of your paper and separate what is significant from what is not. Ideally, they should add *new* information and observations that put your results in perspective. Here's a simple test: if somebody reads your conclusions before reading the rest of your paper, will they fully understand them? If the answer is "yes," there's probably something wrong. A good conclusion says things that become significant after the paper has been read. A good conclusion gives perspective to sights that haven't yet been seen at the introduction. A conclusion is about the implications of what the reader has learned. Of course, a conclusion is also an excellent place for conjectures, wish lists, and open problems.
- If you don't have any conclusions, be honest with yourself and don't write a "Conclusions" section. You've probably been indoctrinated with the notion that it's bad to end a paper without conclusions. I absolutely disagree. But whether it's bad or not, it's surely worse to end a paper without conclusions and yet include a section entitled "Conclusions" anyway.



J. Acknowledgments

- Truth: as our primary concern is providing information, truth is of utmost importance. We should never mislead the reader by unjustified or inaccurate credits attributed to other work/people.
- Kindness: within the domain of truth one should be kind. For example, the reader will not be harmed if the writer acknowledges each person with whom he had a relevant discussion.
- Funding agencies. Most of the research work will be supported by some foundations.
- Some times, lab mates or volunteers will be involved in experimental study, they should be thanked for.



K. References

- List appropriate work referred to in the paper.
- Use recent work (in the last 5-8 years) as much as possible.
- At least there are papers from targeted journals or conferences.
- We should never mislead the reader by unjustified or inaccurate credits attributed to other work.
- be consistence.
- Journal editors tend to pick reviewers from the authors of the references cited in the submission.
- Never include any references you have not read about. Don't put reference just for because you need to put reference there.



I. Appendix

- Those materials which are deemed inessential to the understanding of the paper, but included for the sake of completeness.
- Usually, detailed mathematical proofs are put in the appendix to make the paper more readable.





II. Principles of English Writing

-- Strunk and White's Rules



Rule 1

Rule 1: Form the possessive singular of nouns with 's

- *Tom's friend*
- *Jessie's poems*
- When a word already ends in S, as with most plurals, the apostrophe is added without the S to avoid a rather clumsy double-s sound. So you get s' rather than 's. For example,
 - *The message of the prophets = The prophets' message*
 - *The papers of the students = The students' papers*
- There are, of course, exceptions.
 - *The life of Jesus is most often written "Jesus' life."*
 - *On the other hand, as we have just seen, the book of James can be written "James's book." With singular words ending in s there is no set unbreakable rule.*



Rule 2

Rule 2: In a series of three or more terms with a single conjunction, use a comma after each term except the last term.

- *red, white, and blue*
- *honest, energetic, but headstrong*
- *He opened the letter, read it, and made a note of its contents.*
- In the names of business firms the last comma is omitted, as
 - *Bell, Dell and Motel*
- The abbreviation *etc.*, even if only a single term comes before it, is always preceded by a comma.
 - *Tom, etc.*



Rule 3

Rule 3: Enclose parenthetical expressions between commas.

- *The best way to see a country, unless you are pressed for time, is to travel on foot.*
- *The audience, which had at first been indifferent, became more and more interested.*
- If the interruption to the flow of the sentence is but slight, the writer may safely omit the commas.
 - *My sister Jennifer will come here.*
- But whether the interruption be slight or considerable, one must never omit one comma and leave the other. The following is unacceptable:
 - *Mary's husband, John Nelson paid us a visit yesterday,*
 - *My brother you will be pleased to hear, is now in perfect health.*



Rule 3...

- Non-restrictive relative clauses (they do not limit the application of the words on which they depend)
 - *In 1769, when Napoleon was born, Corsica had but recently been acquired by France.*
 - *Nether Stowey, where Coleridge wrote *The Rime of the Ancient Mariner*, is a few miles from Bridgewater.*
- However, restrictive relative clauses are not set off by commas.
 - *The candidate who best meets these requirements will obtain the place.*

In this sentence the relative clause restricts the application of the word *candidate* to a single person. Unlike those above, the sentence cannot be split into two independent statements.



Rule 3...

- If a parenthetical expression is preceded by a conjunction, place the first comma before the conjunction, not after it.
 - *He saw us coming, and unaware that we had learned of his story, greeted us with a smile.*



Rule 4

Rule 4: Place a comma before *and*, introducing an independent clause.

- *The early records of the city have disappeared, and the story of its first years can no longer be reconstructed.*
- Note that *and* is the least specific of connectives. Used between independent clauses, it indicates only that a relation exists between them without defining that relation. In the example above, the relation is that *of cause and result*. The sentence might be rewritten:
 - *As the early records of the city have disappeared, the story of its first years can no longer be reconstructed.*



Rule 5

Rule 5: Do not join independent clauses by a comma.

- If two or more clauses, grammatically complete and not joined by a conjunction, are to form a single compound sentence, the proper mark of punctuation is a semicolon.
 - *Steven's romances are entertaining; they are full of exciting adventures.*
 - *It is nearly half past five; we cannot reach town before dark.*
- It is of course equally correct to write the above as two sentences each, replacing the semicolons by periods.
 - *Steven's romances are entertaining. They are full of exciting adventures.*
 - *It is nearly half past five. We cannot reach town before dark.*
- If a conjunction is inserted, the proper mark is a comma (Rule [4](#)).
 - *Stevenson's romances are entertaining, for they are full of exciting adventures.*
 - *It is nearly half past five, and we cannot reach town before dark.*



Rule 5

- Note that if the second clause is preceded by an adverb, such as *accordingly, besides, so, then, therefore, or thus*, and not by a conjunction, the semicolon is still required.
 - *I had never been in the place before; so I had difficulty in finding my way out.*
- In general, however, it is best, in writing, to avoid using *so* in this manner; there is danger that the writer who uses it at all may use it too often. A simple correction, usually serviceable, is to omit the word *so*, and begin the first clause with *as*:
 - *As I had never been in the place before, I had difficulty in finding my way out.*



Rule 6

Rule 6: Do not break sentences in two.

- In other words, do not use periods for commas.
 - *I met them in a party several years ago. Coming home from Liverpool to New York.*
 - *He was an interesting talker. A man who had traveled all over the world, and lived in half a dozen countries.*

In both these examples, the first period should be replaced by a comma, and the following word begun with a small letter.



Rule 7

Rule 7: A participial phrase at the beginning of a sentence must refer to the grammatical subject.

- *Walking slowly down the road, he saw a woman accompanied by two children.*

The word *walking* refers to the subject of the sentence, not to the woman. If the writer wishes to make it refer to the woman, he must recast the sentence:

- *He saw a woman, accompanied by two children, walking slowly down the road.*
- *Assuming $a \ll 1$ and substituting in Eq. 12, the relation becomes Eq. 14.*

The relation or Equations neither assume nor substitute. It should read:

- *When $a \ll 1$, Eq. 12 can be simplified to become Eq. 14.*



Rule 7

- Some others

- Incorrect: *On arriving in Chicago, his friends met him at the station.*
Correct: *When he arrived (or, On his arrival) in Chicago, his friends met him at the station.*
- Incorrect: *A soldier of proved valor, they entrusted him with the defense of the city.*
Correct: *A soldier of proved valor, he was entrusted with the defense of the city.*
- Incorrect: *Young and inexperienced, the task seemed easy to me.*
Correct: *Young and inexperienced, I thought the task easy.*
- Incorrect: *Without a friend to counsel him, the temptation proved irresistible.*
Correct: *Without a friend to counsel him, he found the temptation irresistible.*



Rule 8

Rule 8: Divide words at line-ends, in accordance with their formation and pronunciation.

- Divide the word according to its formation:
 - *know-ledge (not knowl-edge); Shake-speare (not Shakes-peare); de-scribe (not des-cribe); atmo-sphere (not atmos-phere);*
- Divide "on the vowel:"
 - *edi-ble (not ed-ible); propo-sition; ordi-nary; espe-cial; reli-gious; oppo-nents; regu-lar; classi-fi-ca-tion (three divisions possible); deco-rative; presi-dent;*
- Divide between double letters, unless they come at the end of the simple form of the word:
 - *Apen-nines; Cincin-nati; refer-ring; but tell-ing.*



Rule 9

Rule 9: Make the paragraph the unit of composition: one paragraph to each topic.

- If the subject on which you are writing is of slight extent, or if you intend to treat it very briefly, there may be no need of subdividing it into topics.
- The beginning of each paragraph is a signal to him that a new step in the development of the subject has been reached.
- As a rule, single sentences should not be written or printed as paragraphs. An exception may be made of sentences of transition, indicating the relation between the parts of an exposition or argument.



Rule 10

Rule 10: Begin each paragraph with a topic sentence; end it in conformity with the beginning.

Enables the reader to discover the purpose of each paragraph as he begins to read it, and to retain the purpose in mind as he ends it.

- the topic sentence comes at or near the beginning;
 - the succeeding sentences explain or establish or develop the statement made in the topic sentence; and
 - the final sentence either emphasizes the thought of the topic sentence or states some important consequence.
- Ending with a digression, or with an unimportant detail, is particularly to be avoided.



Rule 11

Rule 11: Use the active voice

- The active voice is usually more direct and vigorous than the passive. Avoid use of passive tense if at all possible:
 - *I shall always remember my first visit to Boston.* is better than *My first visit to Boston will always be remembered by me.*
 - *In each reservation request message, a refresh interval used by the sender is included.* reads better and shorter as *Each reservation request message includes a refresh interval.*
- Some exceptions where *there is*, or *can be heard*, is needed.
 - Better: *There were a great number of dead leaves lying on the ground.*
OK: *Dead leaves covered the ground.*
 - Better: *The sound of the falls can still be heard.*
OK: *The sound of the falls still reaches our ears.*



Rule 11

- As a rule, avoid making one passive depend directly upon another.
 - Incorrect: *Gold was not allowed to be exported.*
Correct: *It was forbidden to export gold (The export of gold was forbidden).*
 - Incorrect: *He has been proved to have been seen entering the building.*
Correct: *It has been proved that he was seen to enter the building.*
- In addition, the following is incorrect
 - *The program thinks that ...*
 - *The system does not want....*
 - *We compute a graph* (makes it sound like the authors did it by hand)
 - *We generate a current.*
 -



Rule 11

- In the following, the verb have no function beyond that of completing the sentence.
 - Incorrect: *A survey of this region was made in 1900.*
Correct: *This region was surveyed in 1900.*
 - Incorrect: *Confirmation of these reports cannot be obtained.*
Correct: *These reports cannot be confirmed.*

Compare the sentence, "The export of gold was forbidden," in which "was forbidden" expresses something not implied in "export."



Rule 12

- Rule 12: Put statements in positive form.

Make definite assertions. Avoid tame, colorless, hesitating, indefinite, non-committal language. The reader is dissatisfied with being told only what is not; he wishes to be told what is. Hence, as a rule, it is better to express a negative in positive form. Use the word *not* as a means of denial, never as a means of evasion.

- Indirect: *He was not very often on time.*
Better: *He usually came late.*
- Indirect: *He did not think that studying Latin was much use.*
Better: *He thought the study of Latin useless.*
- Indirect: *He is not very attractive.*
Better: *He is unattractive.*
- Indirect: *None of these integers were non-negative."*
Better: *All of these integers were negative."*



Rule 12

- Try avoiding negative words like “un,” “non,” etc., as well as double negatives such as “not invalid,” “not uninteresting” as much as possible. For example,
 - use “invalid” instead of “not valid,”
 - use “violating” instead of “not satisfying.”
- Note: Negative words other than *not* are usually strong. Be care in daily life.
 - *I am angry.*
 - *I am not so happy*

 - *I am disappointed*
 - *I am not so satisfactory or not completely satisfactory.*



Rule 13

- Rule 13: Omit needless words.
- Many expressions in common use violate this principle:
 - *the question as to whether/whether (the question whether)*
 - *used for fuel purposes/used for fuel*
 - *he is a man who/he*
 - *in a hasty manner/hastily*
 - *this is a subject which/ this subject*
 - *His story is a strange one/ His story is strange.*
- In especial the expression *the fact that* should be revised out of every sentence in which it occurs.
 - *owing to the fact that /since (because)*
 - *in spite of the fact that / though (although)*
 - *call your attention to the fact that / remind you (notify you)*
 - *I was unaware of the fact that / I was unaware that (did not know)*
 - *the fact that he had not succeeded/ his failure*
 - *the fact that I had arrived / my arrival*



Rule 13

Who is, which was, and the like are often redundant.

- *His brother, who is a member of the same firm / His brother, a member of the same firm*
- *Waterloo, which was Nelson's last battle / Waterloo, Nelson's last battle*
- A common violation of conciseness is the presentation of a single complex idea, step by step, in a series of sentences which might to advantage be combined into one.
 - *Macbeth was very ambitious. This led him to wish to become king of Scotland. The witches told him that this wish of his would come true. The king of Scotland at this time was Duncan. Encouraged by his wife, Macbeth murdered Duncan. He was thus enabled to succeed Duncan as king. (55 words.)*
 - *Encouraged by his wife, Macbeth achieved his ambition and realized the prediction of the witches by murdering Duncan and becoming king of Scotland in his place. (26 words.)*
 - Trade-off



Rule 14

Rule 14: present and/or past tense only.

- Many engineers believe that *all* formal technical writing should use the past tense.
- However, it is appropriate to use present tense for things that are true when the author writes about them and will still be true in the future when the text is read.
- As a rule, use *past tense* to describe events that have happened. Such events include procedures that you have conducted and results that you observed. Use *present tense* to describe generally accepted facts or state your finds.



Rule 14

- An example:

We sought to determine if mating behavior in the fish is related to male tail length by placing combinations of two male fish with different length tails in the same tank with a female fish.

We found that protein synthesis in treated embryos was considerably less than in untreated embryos. This finding agrees with the model stating that protein synthesis is dependent on synthesis of new messenger RNA.



Rule 15

Rule 15: about voice, not *I* or *you*, but *we*, *the author (s)* or *one*

- Somebody prefers to use first person, active voice in writing, because such writing is both easier to write and to read.
- This is, however, contrary to the advice found in some other sources, that would have one write "the voltage was measured by the author" rather than "I measured the voltage."



Rule 15

- In informal English, the pronoun "you" is often used to indicate an indefinite person, not necessarily the reader or listener. This can be mildly offensive, for example:

- *When you make a mistake....*

It is preferable to use third person:

- *When one makes a mistake...*

- *When an engineer makes a mistake....*

Other synonyms for this usage of "you" include "a person", "people", etc.

The usage of "you" often results in childish constructions that indicate personal involvement of the reader when it is unnecessary or inappropriate:

- *When you apply a greater electric field....*

should be

- *When the electric field is more intense....*



III. Hints and Errors of Technical Writing



Who do you write to?

- The reviewer, which can be assumed to
 - be intelligent
 - have basic background in the field, but not more.
 - a good student at the beginning stages of graduate studies.
- As these people are drowning in a flood of mostly irrelevant information, it is extremely important to single out clearly the new ideas presented in the paper.
- Having understood the abstract requirements, it is left to carry out this understanding to each level of the writing process: from the overall structure of the paper, through the structure of single paragraphs and sentences, to the choice of phrases, terms and notation.



Focusing on the readers' needs rather than on the writer's desires

The writer is often overwhelmed by his own desires to say certain things and neglects to ask himself what are the real needs of the reader.

- The "Checklist" phenomenon:

- The writer puts in the paper everything he knows about the subject matter.
- The writer inserts his insights in the first possible location rather than in the most suitable one.
- In extreme cases, the writer has a list of things he wants to say and his only concern is that they are all said somewhere in the paper.

Clearly, such a writer has forgotten the reader.

- Obscure generality:

- The writer chooses to present his ideas in the most general form instead of in the most natural (or easy to understand) one.
- Utmost generality is indeed a virtue in some cases, but even in these cases one should consider whether it is not preferable to present a meaningful special case first.
- It is often preferable to postpone the more general statement, and prove it by a modification of the basic ideas (which may be presented in the context of such a special case).



Focusing on the readers' needs rather than on the writer's desires

- **Idiosyncrasies:**
 - Some writers tend to use terms, phrases and notations that only have a personal appeal (e.g., some people use notations which are shorthand for Chinese terms...).
- **Lack of hierarchy/structure:**
 - It is very rare to find a person who will not benefit from having new ideas presented to him in a structured/hierarchical manner.
 - Specifically, the write-up should make clear distinctions between the more important ideas/statements and the less important ones.
- **"Talmud-ism":**
 - The writer explores all the subtleties and refinements of his ideas when first introducing them and before clarifying the basic ideas.
 - Furthermore, the writer discusses all possible criticisms (and answers them), before providing a clear presentation of the basic ideas.



Awareness to the knowledge level of the reader

- Be aware of complexity
 - Whenever presenting a complex concept/definition, beware that the reader cannot be assumed to fully grasp the new concept and all its implications immediately.
- Conceptual steps first
 - Whenever presenting proofs be sure to elaborate on the conceptual steps rather than on the standard technical analysis. Having done the conceptual steps yourself, they seem rather evident to you, but they may not be evident to the reader. Furthermore, these conceptual steps are typically the most important ideas in the paper and the ones with which the readers have most difficulties.
- Specialty to Generality
 - As said above, one should try to avoid treating the general case with all its complications in one shot. Thus, one may first present a special case that captures the main ideas and later derive more general statements by introducing additional (secondary) ideas.
- Minimize the number of new concepts
 - Try to minimize the number of new concepts and definitions you present. The reader's capacity of absorbing concepts and definitions is bounded.



Making reading a non-painful experience

- **Implicit pointers:**

- The words “it” and “this” are commonly used as implicit pointers to entities mentioned in previous sentences, but the reader can find it difficult to figure out to which entities the writer was referring. Consider, for example,

A is interested in doing X. It has property Y but not Z. This property allows it to do this.

The writer should consider making these pointers explicit (by explicitly referring to objects by their names).

- **Sentences with complex logical structure:**

- i.e., conditional sentences, having multiple and sometimes nested conditions and consequences, for example,

If X and Y or Z then P or Q

- **Mixture of mathematical symbols and text:**

- **For example**

on input x, y , A runs B on $f(x)$ ”.

A more clear alternative is

on input x and y , algorithm A runs the oracle machine B on input $f(x)$ placing y on B’s oracle tape.

It never hurts reminding the reader of the categorical status of the objects.



Making reading a non-painful experience

- Avoid cumbersome notations and terms: for example,
 - Notation: $M_{i,j,k_t}^{O_b^c}$
 - multiple parameters term: an $(a, b, c, d, e, f, g, h, i, j)$ system
 - multiple qualifications term: like a *kuku-muku popo-toto* system.



Benefiting from readers' comments

- Occasionally, writers ask their friends and close colleagues for comments on their write-up. Typically, these comments are not useful because
 - friends and close colleagues feel reluctant to point out major expositional problems.
 - these friends and close colleagues may know the work before reading it or at least may have a better a priori knowledge about the work than an average reader may have.

In any case, it is very dangerous to conclude from the fact that the writer's friend (or close colleague) liked the write-up that the write-up is indeed good. (Needless to say, it is dangerous to conclude from the fact that the writer likes the write-up that the write-up is indeed good.)

- Thus, if you ask a friend (or close colleague) to give you comments, make sure this friend understand that you are interested in a critical reading and not in compliments.



Benefiting from readers' comments

- Readers that may be assumed to be critical are reviewers. They typically point out problems and make suggestions.
 - One should not necessarily follow the reviewer's suggestions, but one must always bear in mind that these suggestions indicate problems in the current write-up. It may be that the reviewer is not suggesting a good solution to these problems (or that the authors has a better a solution), but for sure there is a problem.
 - Reviewers are typically not idiots, and one can learn even from idiots!
 - If the author decides not to adopt a reviewer's suggestion in a the course of a review process for a journal publication, then the author should justify this decision in a letter to the handling editor.





IV. Implementation Issues

--How to Organizing a Research Paper



LaTeX vs. MS Word

LaTeX usually turns out more efficient in long run for dissertation (when many figures, equations, and tables can cause headaches).

Word will be used ONLY if you take the time to make all the formatting as professional looking as LaTeX would for every:

- table,
- equation symbols,
- equation numbering,
- theorem/definition formatting & numbering,
- Figure numbering,
- Reference numbering,
- Section numbering,
- list, and
- font use.



LaTeX vs. MS Word

- If using Word then must do 100% professional formatting yourself (without Advisor having to keep fixing the formatting and floating figure problems).
- All Figure numbers, Reference IDs, Section numbers, etc must NOT be hardcoded (so that they are re-numbered automatically --- please figure out if you choose to use Word).
- Latex to be continued



File Naming Convention

- To help with version control, please maintain yourself and exchange via email (to advisor and others) filenames only using the following naming convention:
- <StudentFirstName>-
<Conference/JournalAcronym/purpose>-
<2digitYear><TodaysDayDigit><TodaysMonthName><TodayYear>-<24hourtime>"hrs"
- like:
 - wang-ICRA05-08Feb2005-2100hrs.doc



Format

- Most journals and conferences have their own style files on their website.
 - No short path, use the template and follow the requirements strictly.
- Your work will be rejected, especially for conferences, if you don't comply.
- The notations and format should be consistent throughout the paper.



Diagrams, Tables, Graphs

- At least 90% of the substance of any technical paper is in its diagrams, tables, and graphs.
- Have one diagram/table/graph every one or two pages – do NOT proceed more than 2 pages without a one.
- Writing should be concise and follow along from the figures and tables naturally.
- Most of the words explain or “walk the reader through” the diagrams, tables, graphs ... so if there isn't a table or figure to explain at anytime then you probably need to stop writing text and make one.
- "Talk to" the figures or tables in the text.



Diagrams, Tables, Graphs

- Table name/heading is always located on top of Table.
- Figure name or heading is always located below the Figure.
- For graphs/charts:
 - a) Title
 - b) Axes
 - c) Legends
 - d) Plots, graphs
 - e) self explanatory



Diagrams, Tables, Graphs

- Do spend time right then to make the diagram pretty ... besides improving image quality, **THIS IS THE TIME** when you will find that you will capture the most useful scholarly information as you:
 - -adjust font sizes for headings of whats really important (Why?)
 - -make lines different thickness for whats the primary dataflow / control flow (Why?)
 - -provide precise vertical spacing / placement that corresponds to the relative grouping of ideas (Why?)
 - -use of shapes/arrows that capture the relative same and different meanings (Why?)



Diagrams, Tables, Graphs

- The figures may be placed immediately after they are referred to in the text, or placed at the end of the paper.
- Each figure should be readable without relying on the accompanying description in the text. Thus, all symbols used in the figure should be explained in the figure legend.
- In addition, do not make the figures and legends too small. Some figures may be reduced by the publisher before they are printed, and one should ensure that the figures are still legible after reduction.



Sentence Construction

- Simple Structure
 - Write simply using subject/verb/object construction much of the time.
 - Avoid extra words: if a word or sentence doesn't need to be there (the reader learns the same thing without it) then it must be removed.
 - Avoid subjunctive clauses
 - Eliminate deadwood sentences
 - Example: "*Y can be one way that is used in a method to show how X is achieved.*" which becomes just "*Y makes X achieved.*" and stop at that.
 - Eliminate sentences that exhaust the reader's mental energy
 - Example: "CGT methods will be useful in increasing the efficiency of the process of hardware repair using evolutionary methods in general." becomes just "CGT methods increase the efficiency of repair."



Sentence Construction

- Reserved Words and Formatting
 - Figures/Tables
 - Table 1 “lists” ...
 - Figure 1 “shows” or “illustrates” or “depicts” ...
 - But don’t write that Table 1 “shows.”



Microsoft Word Items

- Retype the quotation marks so that they properly “curl in” towards text (properly typeset quotes), not straight up and down quote marks (this is due to cut and paste into MS Word. If using MS Word then you MUST check every time manually yourself.)
- References numbers should not be hardcoded
- Figure and table numbers should not be hardcoded
- Use two spaces after every period at the end of a sentence, like "It is an FPGA. It is fast ..." not "It is an FPGA. It is fast ..."

Notice 2 spaces looks better and is the way to typeset a document. LaTeX does this automatically with no effort, but in word, you must remember to type 2 spaces manually after every sentence.



References

- Order references alphabetically by surname (last name) of first author or the appear in the text.
- Use proper modern citation format for all references, i.e. A. Smith, B. Jones, ... not Smith, A. and Jones, B.
- Some examples:

Book:

- [1] R. F. DeMara, editor, *Advances in Evolvable Hardware*, forthcoming, Springer-Verlag, 2005.

Journal Article:

- [2] B. S. Motlagh and R. F. DeMara, "Performance of Scalable Shared-Memory Architectures," *Journal of Systems, Circuits, and Computers*, Vol. 10, No. 1, February, 2000, pp. 1 – 20.
- [3] S. C. Smith, R. F. DeMara, J. S. Yuan, M. Hagedorn, and D. Ferguson, "Delay-Insensitive Gate-level Pipelining," *Integration, The VLSI Journal*, Vol. 30, No. 2, November, 2001, pp. 103 – 131.



References

- [4] A. J. Rocke and R. F. DeMara, "Trusted Detection of Unauthorized Filesystem Modifications to Combat Insider Tampering," submitted to *IEEE Transactions on Dependable and Secure Computing* on December 17, 2004
- [5] J. Castro, M. Georgiopoulos, and R. F. DeMara, "Data Partitioning with Fuzzy ARTMAP using the Hilbert Space Filling Curves: Emphasis on Large Database Problems," accepted to *Neural Networks* on January 28, 2005.

Conference Article:

- [6] M. Georgiopoulos, J. Castro, A. Wu, R. F. DeMara, E. Gelenbe, A. J. Gonzalez, M. Kysilka, and M. Mollaghasemi, "CRCD in Machine Learning at the University of Central Florida: Preliminary Experiences," in *Proceedings of the Eight Annual Conference on Innovation and Technology in Computer Science Education (ITiCSE-2003)*, Thessaloniki, Greece, June 30 – July 2, 2003, pp. 249.



References

- [7] A. Ejnoui and R. F. DeMara, "FPGA Defragmentation for Sustainable Performance in Reconfigurable Computers," accepted to *The International Symposium on VLSI (ISVLSI'05)*, Tampa, Florida, U.S.A., May 11 – 12, 2005.
- [8] J. Di, J. S. Yuan, and R. F. DeMara, "High Throughput Power-aware FIR Filter Design based on Fine-grain Pipeline Multipliers and Adders," in *Proceedings of the 2003 IEEE Annual Symposium on VLSI (ISVLSI'03)*, Tampa, Florida, U.S.A., February 20– 21, 2003, pp. 260 – 266.

Book chapter:

- [8] S. H. Chung, D. I. Moldovan, and R. F. DeMara, "Massively Parallel Speech Understanding," in *Massively Parallel Artificial Intelligence*, MIT Press, 1993, J. A. Hendler and H. Kitano, Ed., ISBN: 0-262-61102-3, pp. 138 – 170.

Web link:

- [9] R. F. DeMara, Ph.D. Thesis, available at <http://cal.ucf.edu/demara/advising>, February 01 2005



Final Check: the paper

- has a provocative yet well-formed title,
- is sufficiently justified/motivated in terms of previous work yet doesn't slam others,
- conveys new information to an expert in the field
- doesn't use "you" or "I,"
- extensive use of tables, figures and/or diagrams
- use of at least 1 figure/table per page,
- professional-grade figures (cleanly drawn, good use of fonts, line size),
- content-dense-yet-not-incomprehensible text,
- polished proper word use and impeccable formatting,
- acceptable scholarly level of equations and terminology,
- every sentence is phrased in the authoritative ("I am the expert") tone,
- distribution of space devoted to each topic is balanced and symmetric,
- re-floating of any moved figures nicely on the page,
- final spellchecking done, and
- final proofreading done.
- requirements on format, template, page limit, etc. are strictly followed.



Paper Submission

- Check the conference or journal website for instructions
- Make sure your supervisor has approved your submission
- Make sure all coauthors have received one copy and agreed to submit
- Compose a cover letter like:



Cover Letter – A Sample

October 23, 2006

Professor Alessandro De Luca
Dipartimento di Informatica e Sistemistica
Universita' di Roma "La Sapienza"
Via Eudossiana 18
00184 Roma, Italy

Dear Professor Alessandro De Luca,

We would like to submit the following manuscript to *IEEE Transactions on Robotics* for possible publication.

The information on this paper is as follows:

Title: Static analysis of cable-driven manipulators with non-negligible cable mass

Authors: Tao Wang, Jie Wu and Bing Zhang

Keywords: Cable-driven robotic manipulators, kinematics, modeling, statics, stiffness.

Corresponding author:

Tao Wang,

Department of Control Engineering

Shandong University, Jinan, 250061

P. R. China

Email: tao.wang@ce.sdu.edu.cn



Cover Letter-- A Sample

We would like to have it considered as a regular paper first, or secondarily as a short paper otherwise.

Please let me know if any questions arise. Thank you!

Sincerely,
Tao Wang

Tao Wang
Department of Control Engineering
Shandong University, Jinan, 250061
P.R.China
Tel: (86)-531-88364787
Fax: (86)-531-88565167
Email: tao.wang@ce.sdu.edu.cn (not hotmail, 163 mail, etc)





V. Good and Bad Examples



Part II. How to Prepare a Research Presentation



Hints on Presentation

- A good rule of thumb is one to two minutes per slide of presentation, although that depends on the individual speaker and the contents of the slide.



Hints on Presentation

- Visit the venue of the presentation before the talk to get familiar with the layout of the room, and with the presentation equipment.



Hints on Presentation

- Do not dive into the viewgraphs immediately. Establish rapport with the audience by speaking to them for a couple of minutes before turning on the projector.
 - What does one talk about?
 - One can summarize the results; explain how this talk relates to other talks in the session; or how it relates to the keynote speech of the conference;
 - or even tell a story of how one got interested in this particular research topic, etc.

Of course, this cuts into valuable presentation time, and should not be overdone. This will get the audience to focus on the speaker, rather than on the screen.



Hints on Presentation

- Maintain eye contact with the audience throughout the talk.
 - Talk to the audience, not to the viewgraphs.
 - Address different parts of the room as the talk progresses. This means that the room should remain lit.
- Do not put too many ideas on the same transparency. The audience should be focusing on what the speaker has to say, rather than desperately trying to read the transparency.
- Everything on the slide should be explained.



Hints on Presentation

- The presentation does not have to follow the paper exactly.
- In a conference, 20 min will normally be allocated to each speaker, with 15 min for presentation and five minutes for questions and answers, and there is no way to include all the details of the paper. The goal should be
 - to explain the importance of the work,
 - the key ideas of the solution, and
 - how it is different, and hopefully, better than existing solutions.

If the audience is interested, the paper is available in the conference proceedings.

Note: It is absolutely unacceptable for the speaker to read the transparencies of the paper or read the slides without any explanation.



Hints on Presentation

- On the other hand, the presentation should not deviate too much from the paper either.
- While this may be acceptable for informal workshops, it is not appropriate for conferences in which all of the submissions have been formally reviewed.
- Do not put too much mathematics on the slides. It is usually difficult to follow detailed mathematical derivations during a 15-min presentation. Just enough mathematics should be presented to bring the key points across. The focus of the talk, in general, should be on the results. Use figures (plots) to bring the points across.



Hints on Presentation

- There will usually be questions at the end of the presentation. In fact, a good session chair will usually prepare a couple of questions in advance just in case there are no questions from the audience.
 - Some of these questions will hopefully have already been asked during the rehearsal, and should be handled very well.
 - If there is difficulty with a particular question, do not be overly defensive.
 - While there may be showoffs who deliberately make very critical remarks just to show how good they are, in general most people are just trying to be helpful, and perhaps have not really understood some key points of the presentation.



Hints on Presentation

- If forced into a corner, and the session chair does not come to the rescue, one can escape by suggesting that, due to the lack of time, the discussion will be continued during the coffee break.
- Alternatively, a particularly difficult question posed by the audience can be turned into an idea for future work.
- By the way, it is always a good idea to repeat the question so the audience knows what is being asked. This will also ensure the question is understood.



Hints on Presentation

- When an audience asks a question, it is a good idea to repeat the question, asking the questioner whether you have understood it, before answering the question. This has three benefits.
 - You ensure that you have understood the question. When thinking under pressure, it can be far too easy to jump to conclusions, and it is bad to answer a question different than the one that was asked. A related benefit is that you get to frame the question in your own words or from your own viewpoint.
 - You give yourself a few moments to think about your answer.
 - If the audience member does not have a microphone, the rest of the audience may not have been able to hear the question clearly.
- Be willing to answer a question with "no" or "I don't know". You will get into more trouble if you try to blather on.



Hints on Presentation

- It is a good idea to have a slide entitled “Contributions,” especially in an interview presentation.
- Never leave an interview committee in doubt about the nature of the contributions.



Hints on Presentation

■ Pronunciation

<http://www.webster.com>



Part III: Approaches to Thesis Developing

- A. Seven Steps Toward a Thesis.
- B. Relationship with your Supervisor
- C. Reading, Reading and Reading
- D. Progressing...



General Thesis question

- How long does it take to generate the first draft of the thesis?
 - This depends on how good your bookkeeping has been during the course of the research. The following hints will speed up the process:
 - Write up algorithms and experimental results as soon as they are completed. This way when thesis writing time comes, you already have important fragments of text for the thesis, instead of having to write all the text from scratch.
 - Do a presentation of the completed research before starting to write the thesis.



General Thesis question

- How long does it take to turn the first draft into a completed thesis?
 - Experience has shown the average time required to fine tune the first *complete* draft of a thesis into a defensible version is *two months*. During this time, several iterations on the text of the thesis will take place, plus additional experiments will be conducted to strengthen the arguments in the thesis. A thesis defense will only be scheduled after the supervisor has reviewed and approved a complete draft of the thesis. The defensible draft results from a good first draft after 2-3 revisions.
 - Please take this into account when you plan your graduation or accept a full-time job, and do yourself a favor by allowing for the time required to get a decent thesis done.



A. Seven Steps Toward a Thesis

- The idea
- Motivation, use, or application
- Details of the idea
- Data
- Discovery methodology
- History
- Proof

by Eduard Hovy, USC Information Sciences Institute



The Idea

- Is there a claim?
- Is the claim clear?
- Is the idea large or small?
- Is the idea as large as it can be?
- Is it feasible?
- Is it implemental?



The Idea — How to pick

- Pick something you find interesting - if you work on something solely because your advisor wants you to, it will be difficult to stay motivated.
- Pick something your advisor finds interesting - if your advisor doesn't find it interesting he/she is unlikely to devote much time to your research. He/she will be even more motivated to help you if your project is on their critical path (although this has down sides too!).
- Pick something the research community will find interesting -if you want to make yourself marketable.



The Idea — How to pick

- Make sure it addresses a real problem
- Remember that your topic will evolve as work on it
- Pick something that is narrow enough that it can be done in a reasonable time frame
- Have realistic expectations (i.e. Don't expect the Nobel Prize)
- Don't worry that you will be stuck in this area for the rest of your career. It is very likely that you will be doing very different research after you graduate.



Motivation, Use, or Application

- Why should we care?
- Is there any impact?
- How can the claim be used?
- Is it applicable? Other potential application?



Details of the Idea

- What are the basic items/elements /representation units of the idea?
- What are the rules or types of interrelationships between them?
- How elaborated are these items and rules/relationships?
- How much of the phenomena do they cover?
- Any tools needed, any knowledge needed, cost? Time? Manpower?



Details of the Idea...proposal

- - A clear formulation of the research question.
- - An identification of the significant problems in the field of research.
- - An outline of the current knowledge of the problem domain, as well as the state of existing solutions.
- - A presentation of any preliminary ideas, the proposed approach and the results achieved so far.
- - A sketch of the applied research methodology.
- - A description of the project's contribution to the problem solution.
- - A discussion of how the suggested solution is different, new, or better as compared to existing approaches to the problem.



Data

- Do you need data?
- How to collect data?
- How to verify data?
- Any ethics issues?
- Is there enough data in the study?
- Is it representative? trustworthy? applicable?



Discovery Methodology

- Is there any existing methodology?
- Is the proposed methodology viable?
- Is the method of investigation clear?
- Is it appropriate? Does it ignore phenomena that look relevant?
- Is there any assumptions?
- Is it well-reasoned? no biases or mistakes?



History

- Is prior work recognized? used?
- Any strength or weakness of prior work?
- Any presumptions of prior work?
- Any applications of prior work?
- Any unsolved problem from prior work?



Proof

- Is there an evaluation?
- If so, is it adequate? Complete enough?
 - Does it speak to the claim?
 - Does it actually prove the claim?
- If not, why not?
 - Is there a discussion of how one might try to test or prove the claim?
 - Can one make predictions and (easily) test them?



B: Relationship with your Supervisor



Relationship with your Supervisor

- Meet regularly - you should insist on meeting once a week or at least every other week because it gives you motivation to make regular progress and it keeps your advisor aware of your work.
- Prepare for your meetings - come to each meeting with:
 - List of topics to discuss
 - Plan for what you hope to get out of the meeting
 - Summary of you have done since your last meeting
 - List of any upcoming deadlines
 - Notes from your previous meeting



Relationship with your Supervisor

- Email him/her a brief summary of EVERY meeting - this helps avoid misunderstandings and provides a great record of your research progress. Include (where applicable):
 - Time and plan for next meeting
 - New summary of what you think you are doing
 - To do list for yourself
 - To do list for your advisor
 - List of related work to read
 - List of major topics discussed
 - List of what you agreed on
 - List of advice that you may not follow



Relationship with your Supervisor

- Show your advisor the results of your work as soon as possible - this will help your advisor understand your research and identify potential points of conflict early in the process.
 - Summaries of related work
 - Anything you write about your research
 - Experimental results
- Communicate clearly - if you disagree with your advisor, state your objections or concerns clearly and calmly. If you feel something about your relationship is not working well, discuss it with him or her. Whenever possible, suggest steps they could take to address your concerns.
- Take the initiative - you do not need to clear every activity with your advisor. He/she has a lot of work to do too. You must be responsible for your own research ideas and progress.





C: Reading, Reading and Reading



Reading, Reading and Reading

- Be organized
 - Keep an electronic bibliography with notes & pointers to the paper files
 - Keep and file all the papers you have read or skimmed
- Be efficient - only read what you need to
 - Start by reading only the conclusion, scanning figures & tables, and looking at their references
 - Read the other sections only if the paper seems relevant or you think it may help you get a different perspective
 - Skip the sections that you already understand (often the background and motivation sections)



Reading, Reading and Reading

- Take notes on every paper you find worth reading
 - What problem are they trying to solve?
 - What is their approach?
 - How is it different from other approaches?
- Summarize what you have read on each topic - after you have read several papers covering some topic, note the:
 - key problems
 - various formulations of the problem they are addressing
 - relationship among the various approaches
 - alternative approaches



Reading, Reading and Reading

- Read PhD theses - even though they are long they can be very helpful in quickly learning about what has been done in some field. Especially focus on:
 - Background sections
 - Method sections
 - Your advisor's thesis - this will give you an idea for what he/she expects from you.





D: Progressing



Progressing

- Keep a journal of your ideas - write down everything you are thinking about even if you think it is stupid. It will help you keep track of your progress and keep you from going in circles. Do not plan to share it with anyone, so you can write freely.
- Set some reasonable goals with deadlines
 - Identify key tasks that need to be completed
 - Set a reasonable date for completing them (on the order of weeks or months).
 - Share this with your advisor or enlist your advisors help in creating the goals and deadlines.
 - Set some deadlines that you must keep (e.g., volunteer to give a student seminar on your research, work toward a conference paper submission deadline, etc.)



Progressing

- Keep a to do list - Checking off things on a to do list can feel very rewarding when you are working on a long-term project.
 - List the small tasks that can be done in about an hour
 - Pick at least one that has to be completed each day
- Continually update your:
 - Problem statement
 - Goals
 - Approach (or a list of possible approaches)
 - One-minute version of your research
 - Five-minute version of your research



Progressing

- Discuss your research with anyone who will listen - use your fellow students, friends, family, etc. to practice discussing your research on various levels. They may have useful insights or you may find that verbalizing your ideas clarifies them for yourself.
- Write about your work
 - Early stage: Write short idea papers and share them with your advisor and colleagues.
 - Intermediate stage: Find workshops and conferences for submitting preliminary results. This can also help you set deadlines.
 - Advanced stage: Target relevant journals.



Progressing

- Avoid distractions - it is easy to ignore your research in favor of more structured tasks such as taking classes, teaching classes, organizing student activities, creating web pages like this, etc. Minimize these kinds of activities or commitments.
- Confront your fears and weaknesses
 - If you are afraid of public speaking, volunteer to give lots of talks.
 - If you are afraid your ideas are stupid, discuss them with someone.
 - If you are afraid of writing, write something about your research every day.
- Balance reading, thinking, writing and hacking - often research needs to be an iterative process across all of those tasks.





Part IV: Approaches to Thesis Writing

- ❖ Thesis Structure
 - ❖ Writing Hints
 - ❖ Plagiarism
 - ❖ Useful links



Thesis Structure

- i. Abstract
- ii. Chapter 1: Introduction
- iii. Chapter 2: Background / Related Work
- iv. Chapter 3: Theory / Solution / Program / Problem
- v. Chapter 4: Implementation / Formalism
- vi. Chapter 5: Results and Evaluation
- vii. Chapter 6: Conclusions and Future Work
- viii. Bibliography / References
- ix. Appendix



Before Abstract

- **Acknowledgement optional** (Write up a short acknowledgment section, including your sources of financial support and everyone who helped you to get this work done. No one was ever accused of being too generous here.)



I: Abstract

- ≤ 2 page
- Give a short background
- Stating what the thesis is about
- Highlight the contributions of the thesis



II: Chapter 1 -- Introduction

- 5-10 pages
- Thesis Statement (one or two sentences)
 - What is your hypothesis?
 - How will you test (prove/disprove) your hypothesis?
- Motivation
- Goals / Objectives
- Contributions
- What have you contributed to the field of research?
 - Why is the world a better place because of what you've done?
 - What is now known/possible/better because of your thesis?
- Outline of the thesis



III: Chapter 2 -- Background

- 8-20 pages
- More than a literature review
- Organize related work - impose structure
- Critique the existing work - Where is it strong where is it weak? What are the unreasonable/undesirable assumptions?
- Identify opportunities for more research (i.e. your thesis)
Are there unaddressed, or more important related topics?
- After reading this chapter, one should understand the motivation for and importance of your thesis



IV: Chapter 3 -- Theory / Solution / Program / Problem

- 15-30 pages
- continuing from Chapter 2 explain the issues
- outline your solution / extension / refutation
- Derive equations
- Develop algorithms
- Write programs



V: Chapter 4 -- Implementation

- ◆ 15-30 pages
- ◆ not every thesis has or needs an implementation
- ◆ Simulation using proper tools
- ◆ Design system or component using proper designing tools



VI: Chapter 5 -- Results and Evaluation

- 15-30 pages
- Adequacy, efficiency, productiveness, effectiveness (choose your criteria, state them clearly and justify them)
- Be careful that you are using a fair measure, and that you are actually measuring what you claim to be measuring
- If comparing with previous techniques those techniques must be described in Chapter 2
- Be honest in evaluation
- Admit weaknesses



VII: Chapter 6 -- Conclusions and Future Work

- 5-10 pages
- State what you've done and what you've found
- Summarize contributions (achievements and impact)
- Outline open issues/directions for future work



VIII: Bibliography / References

- No page limit
- Include references to:
 - credit others for their work
 - help to distinguish your work from others
 - provide pointers to further detailed readings
 - support your claims (if evidence can be found in others work)



VIII: Bibliography

- Ensure that ALL bibliographic entries are complete including: authors, title, journal or conference, volume and number of journals, date of publication and page numbers. Be careful to at least be consistent in punctuation.
- Learn how to use a good typesetting program that can track and format bibliographic references (e.g., groff, latex, frame).
- Within the text of the thesis, a reference with a number of people can be referred to as Lastname et al. (where et al appears in italics and the al is followed by a period).
- My personal view is that URL's are not valid bibliographic references. They and their contents change and they often contain material that has not been refereed.



IX: Appendix

- No page limit
- Include technical material that would disrupt the flow of the thesis.
- Included for curious or disbelieving readers





❖ Writing Hints



Writing Hints

Before handing in a copy of what you've written you should proof read it and make corrections yourself. Be critical of your own work when you do this. You should think not only about syntax and grammar but about the structure of the document and whether or not your are making good arguments and whether or not someone else will be able to follow and believe what you are saying. You should repeat this process a large number of times before you hand in a copy. Far too many people type something in, print it out and hand it in. If this is the case you as a student are not doing your job. It is not your supervisor's job to write your thesis.



Writing Hints...

- Try to aim for around 100 pages or less.
- Including a glossary or list of acronyms may be helpful.
- Start thinking about what your contributions are early on.
- How is what you are doing interesting and important?
- How will it make the world a better place?
- What are you doing or discovering that hasn't already been done or isn't already known?
- For many people it is best to start by writing the "guts" of the thesis, Chapters 3, 4 and 5. In some cases the results and conclusions may not be known (or may change) while doing these chapters.



Writing Hints...

- Chapters 3,4 and 5 can take on different forms depending on the thesis and approaches being used.
- Sometimes design, implementation and performance are subsections within chapters and the chapters are broken down by other criteria.
- Remember (especially those doing experiments) that you must include enough detail in your thesis so that someone else could read your thesis and reproduce your results - without ever talking to you.



Writing Hints...

- The word performance is by itself quite meaningless. Stating that you've improved performance significantly does not tell the reader anything. There are problems with the word performance and the word improved. Remember that there are often a number of different performance metrics that can be applied to a system. Instead of using the word performance state precisely what performance metric is improved. Also improved may also be potentially ambiguous. State precisely what you mean. For example: The mean response time has been decreased by 20%. Peak bandwidth has been increased by 40%.



Writing Hints...

- Try to get an outline and style guidelines from someone else for the system you use for formatting your thesis.
- All figures included should add to the work. As such, there should be text included that refers to the figures (preferably before the figure is encountered). The text should explain what the reader should get from the figure - what are they supposed to notice and what is the figure explaining. Often people just include a figure with no reference to the figure and no explanation of what the figure is for - if the figure was not included no one would notice (this is not a good approach).



Writing Hints...

- Using and misusing abbreviations.
- The word "it's" is an abbreviation of "it is" it is NOT a possessive form of "it".
- The abbreviation of the phrase "for example" is written "e.g.". It contains a period after the "e" and one after the "g". A comma is also usually required with its use. This is an sentence that uses "for example" (e.g., this is how to use for example). Quite often it is enclosed in parentheses and you should avoid using it too often.



Writing Hints...

- The abbreviation of the phrase "that is" is written "i.e.". It contains a period after the "i" and one after the "e". A comma is also usually required with its use. This is a sentence containing an example of how to use "that is" (i.e., this sentence is the example). Quite often it is enclosed in parentheses and you should avoid using it too often.
- Don't use the abbreviation "etc.". The use of etc. is usually an admission of ignorance. It is like admitting that the list you've given is not complete but you don't know what is missing. If you did know what was missing the list would be complete".



Writing Hints...

- ⑩ You should purchase and use a book like "The Elements of Style" by Strunk and White.





❖ Plagiarism



Plagiarism

- You must not make minor modifications to someone else's work and include it in your own work.
- If you want to explain someone else's work the best approach is to read it over, put it aside, and then write in your own words what that work is about (do this without referring to the original source).



Plagiarism

- Examples
- Graduate student proposal
- Paper manuscript





❖ Useful links


- ⑩ <http://www.columbia.edu/acis/bartleby/strunk/>
- ⑩ (the element of Style)
- ⑩ Your Faculty web-site
- ⑩ Graduate studies web-site
- ⑩ Conference web-site
- ⑩ Journal paper submission site
- ⑩ Online paper database





Part V: How to Develop a Poster



- 
- A: close book exam
 - B: open book exam
 - C: take home exam
 - D: course project



What is a Poster

10

A poster is very different from a paper or a talk, and so different techniques need to be used in its preparation. In particular, a poster is not a conference paper, and simply pinning a paper to a poster board usually makes a very poor poster. A poster board is typically 4 feet high and 6 feet wide, but the reverse orientation (tall and thin) is also seen. It is advisable to check beforehand on the size of the boards that will be available to you. A poster itself is a visual presentation comprising whatever the contributor wishes to display on the poster board. Usually, a poster is made up entirely of sheets of paper pinned or attached with velcro strips to the board, but there is no reason why other visual aids should not be used. The pins or velcro are usually provided with the board by the conference sponsors.



Why a Poster

- More conferences offering poster sessions,
- Excellent way of Presentation
- Easy to create one than before



Tools for Poster Design

- PowerPoint
- Latex
- Adobe Illustrator
- Photoshop
- PageMaker
- Freelance
- Corel Presentations
- FreeHand
- Publisher



PowerPoint for Poster Design

- Most people have used PowerPoint to create presentations.
- PowerPoint is a very user friendly program.
- Most people have access to PowerPoint.
- PowerPoint is readily compatible with other Microsoft programs such as Word, Excel, and Access.
- PowerPoint presentations (already created) can be quickly adapted to a poster.



Material for PowerPoint

- **Text:** Can be typed in a word processing program such as Word or WordPerfect. Text might include the following: Title, Authors, Abstract, Introduction, Methods, Data Collection, Results, Conclusions, References, Acknowledgements, Further Study
- **Graphics:** Charts, graphs, logos, pictures, drawings. Graphics can be created in many different programs and imported into PowerPoint. Photos and slides can be scanned and saved as files.
- **Poster Guidelines from the Conference:** Size limitations, Format. Title placement and Font size, Poster # placement etc.



Preparing Hint

- 10 In preparing a poster, simplicity is the key. A typical reader may spend only a few minutes looking at the poster, so there should be a minimum of clutter and a maximum of pithy, informative statements and attractive, enlightening graphics. A poster should tell a story. As always in a scientific presentation, the broad outline includes a statement of the problem, a description of the method of attack, a presentation of results, and then a summary of the work. But within that format, there is much scope for ingenuity. A question-and-answer format, for example, may be appropriate for part of the poster.



Designing Hint

- ⑩ A poster is usually formed from separate sheets of letter paper: 8 × 11 inches (U.S.) or A4 (Europe). The number of pages should be minimized—for these sizes a suggested maximum is 15. But larger sheets, or even sheets of differing sizes within one poster, can also be very effective.



Designing Hint

10

Whatever the size of the sheets, the typeface chosen should be considerably larger than standard. Because not all readers will have perfect eyesight, and because the crowd of readers around a popular poster may be several people deep, the type should be easily readable by a person standing a few feet away. In particular, the title of the poster and the author's name should be large and prominent. If it is not convenient to print directly at the desired typesize, pages can be magnified on a photocopier. Good use can be made of color, both to provide a more interesting image and for color coding of the text. A colored backing card for each sheet can be effective. For added interest, try including an appropriate cartoon, photograph, or quotation. There is plenty of scope for creativity.



Designing Hint

- ⑩ If the sheets are arranged as a matrix, two layouts are possible: horizontal (reading across the rows) and vertical (reading down the columns). While the horizontal ordering is perhaps more natural, it has the major disadvantage of requiring the reader to move to and from along the poster; if there are many readers, congestion can result. A vertical ordering is therefore preferable, although other possibilities should be considered as well.



Poster Samples

- ⑩ Horizontal (reading across the rows)
- ⑩ Vertical (reading down the columns)
- ⑩ Other Hybrid ones



DO's and DON'Ts of Poster Presentation

10 Poster Layout and Format

- 10 DON'T write an overlong title,
- 10 DON'T make the title type size too large or too small,
- 10 DON'T leave people wondering about who did this work,
- DON'T use too small a typesize for your poster. *This is the single most common error.* Never, ever, use 10- or 12-point type,
- DON'T pick a font that's a pain to read.



DO's and DON'Ts of a Poster Presentation

10 Poster Layout and Format

- 10 DO lay out the poster segments in a logical order,
- 10 DO, by all means, use colors in your poster,
- 10 DO design your poster as if you were designing the layout for a magazine or newspaper,
- 10 DO use a high-quality laser or inkjet printer to print your poster.



DO's and DON'Ts of Poster Presentation

10 Poster Content

- 10 DO break your poster up into sections,
- 10 DO get right to the heart of the matter,
- 10 DO recall that a poster should be more telegraphic in style, and also far more accessible,
- 10 DON'T leave prospective readers hanging, or assume they're all experts,
- 10 DON'T leave out the acknowledgments,
- 10 DON'T leave out the references.



DO's and DON'Ts of Poster Presentation

10 Poster Presentation

- 10 DON'T leave everything until the last minute,
- 10 DON'T stand directly in front of your poster at the session,
- 10 DON'T pull a disappearing act.
- 10 DO be a good scout, (Reprints, business cards, slips of paper),
- 10 DO consider using some kind of attention-getting gimmick.





Part VI: Latex Introduction



Outline

- What is LaTeX?
- Document Writing
- Common Tasks
- Software



What is LaTeX?

- LaTeX (Lamport TeX) is a document preparation system based on the TeX language
- TeX developed by Donald Knuth developed in 1978 for good typesetting
- More of a Unix/Linux user base, but Windows is well supported



LaTeX Sample

- HTML like syntax
- Classes determine how formatting is applied to elements, but may be overridden inline.
- Any text editor can be used, but specialized LaTeX editors make life easier

```
\documentclass {IEEEtran}

\begin{document}

    \title{Some Title}

    \maketitle

    Article text goes here.

\end{document}
```



Figures

- Encapsulated Post Script (EPS) files used for figure content

```
\begin{figure}[h]  
\centering  
\includegraphics[width=2.5in]{TeleoperationSystem}  
\caption{Teleoperation Block Diagram} \label{TeleopSys}  
\end{figure}
```

- EPS drawings can be created using e.g. Corel Draw, Open Office Draw or EPS printer driver
- Matlab can print EPS as well



Formulas

- Less intuitive than Word's Equation Editor

```
\begin{equation}
\label{eq:stochasticdelay}
\tau(t) = \tau_{avg} + \epsilon(t)
\end{equation}
```

$$\tau(t) = \tau_{avg} + \epsilon(t) \quad (4)$$

```
\begin{eqnarray}
\label{eq:mastercontroller}
u_m(t) = -\alpha F_h(t) - B_mv_m(t) - K_mx_m(t) + \beta\hat{F}_e(t) \\\
\text{\nonumber} + \beta[F_e(t-T(t)) - \hat{F}_e(t-\hat{T}(t))]
\end{eqnarray}
```

$$u_m(t) = -\alpha F_h(t) - B_m v_m(t) - K_m x_m(t) + \beta \hat{F}_e(t) \quad (3) \\ + \beta [F_e(t - T(t)) - \hat{F}_e(t - \hat{T}(t))]$$



Bibliography

- Bibliography is stored in a .bib file and referenced in a paper or thesis using a codename associated with each bibliographic entry. Program bibtex extracts only the data for the entries cited in the paper/thesis and automatically constructs a .bbl file with the Latex source for the reference section according to the specified document and bibliography style. Latex can handle multiple .bib files. Bib files are a resource that can be reused for multiple documents or by multiple users.



Bibliography

- In document

```
\cite{Lawrence93}  
\bibliographystyle{IEEEtran}  
\bibliography{sources}
```

- .bib File

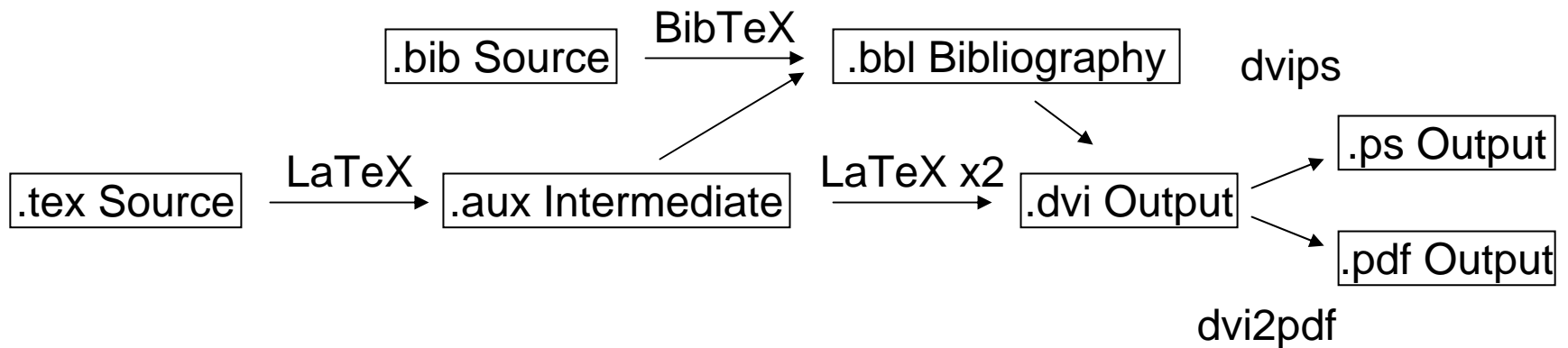
original transparency definition

```
@article{Lawrence93,  
  author = {Dale A. Lawrence},  
  title = {Stability and Transparency in Bilateral Teleoperation},  
  journal = {IEEE Transactions on Robotics and Automation},  
  volume = {9},  
  number = {5},  
  month = {October},  
  year = {1993},  
}
```



Workflow

- The editors trigger this form of process in the background



Editors

- Few WYSIWYG editors exist
 - Lyx, BaKoMa (30-day shareware)
- Most are text-based editors with Visual Studio style interface
 - WinEdt
 - LaTeX Editor (LEd)
 - WinShell



MikTeX

- Not all editors packaged with a Tex distribution
- MikTeX popular Windows LaTeX implementation



LaTeX Vs. Word

LaTeX:

- Easy to reuse content (includes supported)
- Easy to manage references
- Class files let you format your paper automatically based on the conference's / journal's standards

Word:

- WYSIWYG (extends to drawings and figures)
- Good for collaboration
- Very easy for basic formatting (near impossible for exact formatting)

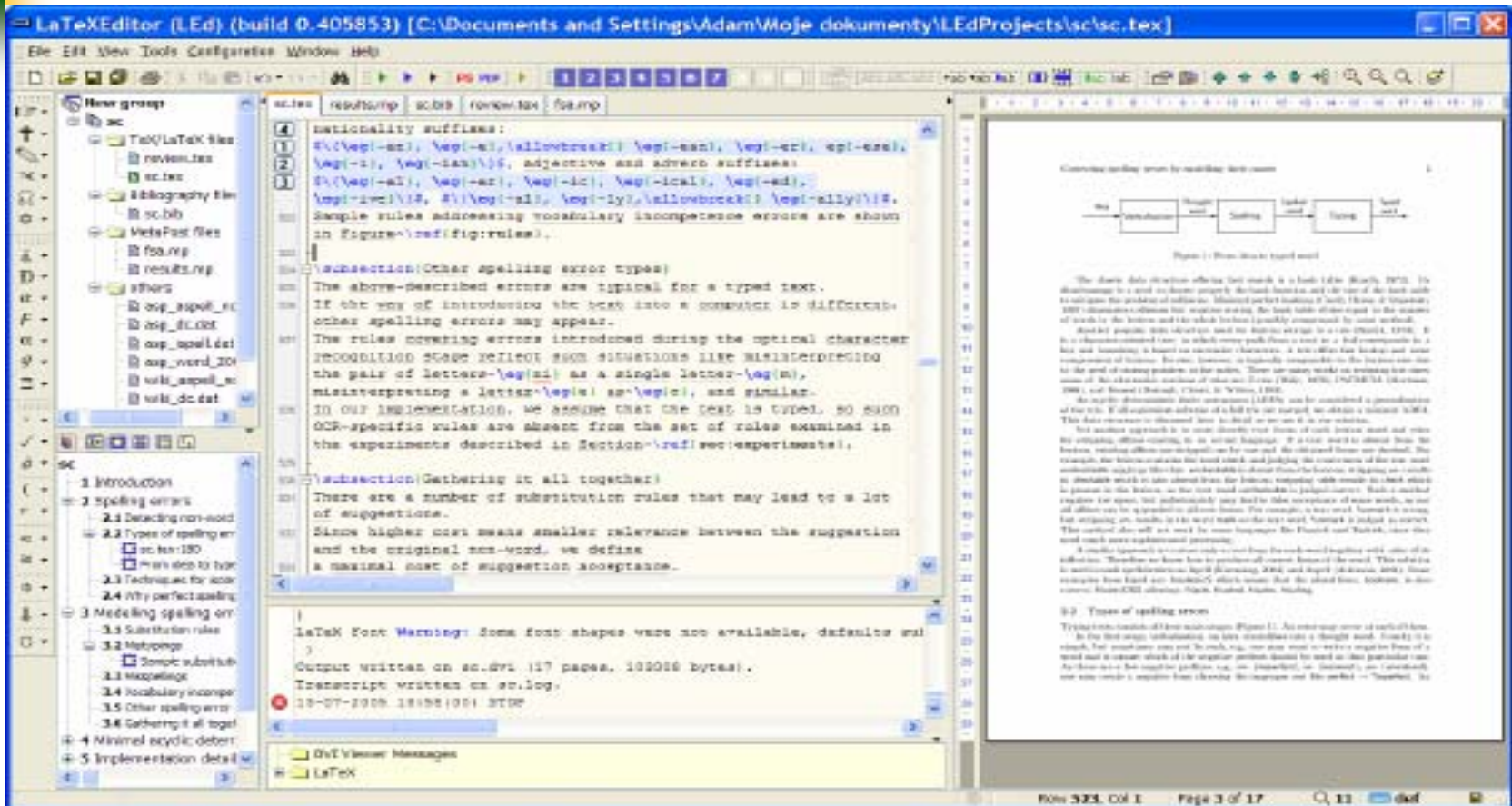


Suggested Software

- MikTeX: <http://www.miktex.org/>
- WinEdt: <http://www.winedt.com/>
- LaTeXEditor (LEd) <http://latexeditor.org/>
- Open Office: <http://www.openoffice.org/>
- Emerson University help guide
http://www.emerson.emory.edu/services/latex/latex_toc.html



Editor Example



Demo & Questions?

11/14/2006

**Department of Electrical and Computer Engineering
Dalhousie University
Halifax, Nova Scotia**



190

**Lecture
November 2006
Shandong University**



Part VII: Presentation of Group (II)



Some Rules of Thumb

USUALLY BETTER

- Talk
- Stand
- Move
- Vary the pitch of your voice
- Speak loudly and clearly, toward the audience
- Make eye contact with the audience

USUALLY WORSE

- Read
- Sit
- Stand still
- Speak in a monotone
- Mumble, facing downward
- Stare at the podium



Some Rules of Thumb

USUALLY BETTER

- Focus on main arguments
- Use visual aids: outlines, pictures, graphs
- Finish your talk within your time limit. Corollary: rehearse your talk
- Summarize your arguments at the beginning and end
- Notice your audience and respond to its needs
- Emulate excellent speakers

USUALLY WORSE

- Get lost in details
- Have no visual aids
- Run overtime. Don't practice.
- Fail to provide a conclusion
- Ignore audience behavior
- Emulate excellent speakers



Conference Talk Guideline

- Title/author/affiliation (1 slide)
- Forecast (1 slide)
Give gist of problem attacked and insight found (What is the one idea you want people to leave with? This is the "abstract" of an oral presentation.)
- Outline (1 slide)
Give talk structure. Some speakers prefer to put this at the bottom of their title slide. (Audiences like predictability.)
- Background



Conference Talk Guideline

- Motivation and Problem Statement (1-2 slides)
(Why should anyone care? Most researchers overestimate how much the audience knows about the problem they are attacking.)
- Related Work (0-1 slides)
Cover superficially or omit; refer people to your paper.
- Methods (1 slide)
Cover quickly in short talks; refer people to your paper.



Conference Talk Guideline

- Results (4-6 slides)

Present key results and key insights. This is main body of the talk. Its internal structure varies greatly as a function of the researcher's contribution. (Do not superficially cover all results; cover key result well. Do not just present numbers; interpret them to give insights. Do not put up large tables of numbers.)



Conference Talk Guideline

- Summary (1 slide)
- Future Work (0-1 slides)
Optionally give problems this research opens up.
- Backup Slides (0-3 slides)
Optionally have a few slides ready (not counted in your talk total) to answer expected questions. (Likely question areas: ideas glossed over, shortcomings of methods or results, and future work.) Example for graduate thesis defense



Course Review and Final Exam

- Part 1: How to write a technical paper
- Part 2: How to make a presentation I
- Part 3: How to develop thesis
- Part 4: How to write thesis
- Part 5: How to develop a Poster
- Part 6: How to use Latex
- Part 7: More on Presentation

