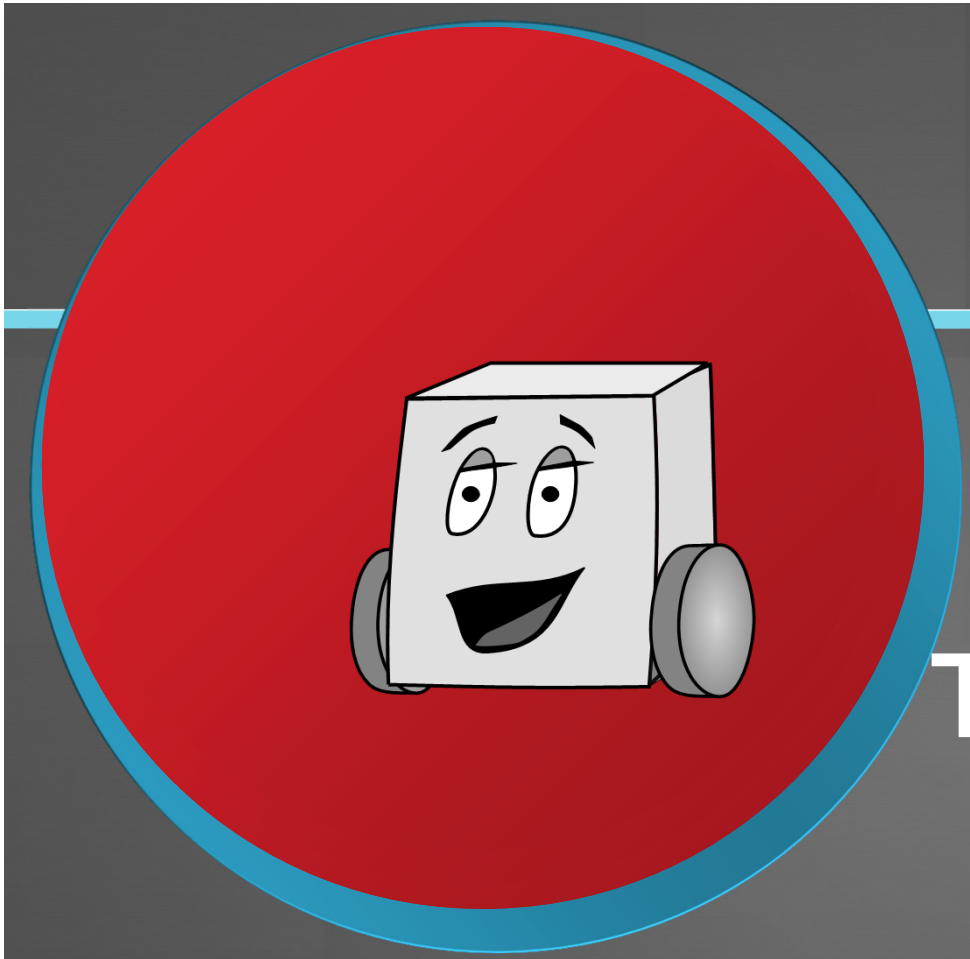

E11 Lecture 18: Technical Writing

Profs. David Money Harris & Sarah Harris

Fall 2011

with some examples and text from http://www.writing.engr.psu.edu

Outline

- Logistics
- Final Report Guidelines
- Technical Writing Guidelines
- Examples
- Group Writing Guidelines

Logistics

- Team Final Report:
  - Due at end of your lab section week of Dec 5th (email to your section instructor as a word document)
  - 4 pages
  - Template posted on web
- Team Presentation:
  - In lab week of Dec 5th (email slides to section instructor by 8am the day of your lab section)
  - 10 minutes
  - Template posted on web

E11 Remaining Schedule

- This week:
  - Lectures: Technical Writing, Presentation Skills
  - In Lab: Team writing of final reports
- Next week:
  - Lectures: Peer Editing, Engineering Outlook
  - In Lab:
    - 10 minute presentations
    - peer editing (each team brings 2 copies of final report)
  - Final report submission! Due at the end of your lab section)

E11 Final Report Guidelines

- 4 pages (excluding cover page, appendices and source code)
- Classmates should be able to understand and replicate your robot based on your report
- Must contain:
  - Overview of your robot
  - Explanation of your game playing algorithm
  - Description of modification
  - Summary of robot performance, including tests, scrimmage, and final competition
  - Summary of main lessons learned from the project
  - Appendix with your Arduino Code

E11 Final Report Guidelines

- 4 pages (excluding appendices and source code)
- Classmates should be able to understand and replicate your robot based on your report
- Must contain:
  - Overview of your robot
  - Explanation of your game playing algorithm
  - Description of modification
  - Summary of robot performance, including tests, scrimmage, and final competition
  - Summary of main lessons learned from the project
  - Appendix with your Arduino Code

Description of Modification

- Dimensioned drawing of your chassis if you designed a new one
- Description and bill of materials for any hardware you added
- Schematics of any electronics beyond any stock hardware

Summary of Robot Performance

- Includes tests, scrimmage, and final competition performance
- Also discuss:
  - Discrepancies with the intended algorithm
  - Limitations you have observed
  - Concrete recommendations for improvement

Writing

- *"There is no great writing, only great rewriting"* – Justice Brandeis
- This gives you the freedom to write something imperfect the first time – but then revise!

What is technical writing?

- What is the purpose of creative writing?
- What is the purpose of technical writing?
- What are the major goals of technical writing?

Consider Audience, Purpose, and Occasion

- Audience:
  - Who they are
  - What they know
  - Why they will read
  - How will they read
- Purpose:
  - To inform
  - To persuade
- Occasion:
  - Format
  - Formality
  - Politics and Ethics
  - Process and Deadline

Your Audience, Purpose, and Occasion

- Audience:
  - Your instructors/classmates
- Purpose:
  - To inform
- Occasion:
  - Format (see template)
  - Process and Deadline (writing this week, peer editing/submission next week)

Your Audience Will Assess

1. Content
   - The information contained in the report.

2. Style
   - The way information is presented, including structure, language, and illustration (figures and tables).

3. Form
   - The appearance of the information, including grammar, punctuation, spelling, and format.

Some Guidelines

- Use topic sentences!
- Use active verbs
- Keep it simple
- Avoid ambiguity
- Avoid storytelling

Topic Sentences!

- A topic sentence states the main point of the paragraph.
- Every other sentence in the paragraph supports the topic sentence.
- Use them!
- Common error is to dive into the details before setting the framework with the topic sentence.

Topic Sentence: Example

- *Before:* Piranhas rarely feed on large animals; they eat smaller fish and aquatic plants. When confronted with humans, piranhas' first instinct is to flee, not attack. Their fear of humans makes sense. Far more piranhas are eaten by people than people are eaten by piranhas. If the fish are well-fed, they won't bite humans.
- *After:* Although most people consider piranhas to be quite dangerous, they are, for the most part, entirely harmless. Piranhas rarely feed on large animals; they eat smaller fish and aquatic plants. When confronted with …

http://writingcenter.unc.edu/resources/

Be Specific

EXAMPLE: *From a progress report to the Department of Energy:*

- Before: After recognizing some problems with the solar mirrors, we took subsequent corrective measures.
- After: After finding that high winds (and not hail) had cracked the ten solar mirrors, we began stowing all mirrors in a horizontal position during thunderstorms.

Use Active Voice (vs Passive)

- *Before:* A new process for eliminating nitrogen oxides from diesel exhaust engines is presented. Flow tube experiments to test this process are discussed. The percentage in nitrogen oxide emissions is revealed.
- *After:* This paper presents a new process for eliminating nitrogen oxides from diesel engine exhaust. To test this process, we performed experiments in flow tubes. These experiments revealed a 99 percent decrease in nitrogen oxide emissions.

Use active voice where possible, but do not overuse "we" or "the team".

Keep it simple! (sentence level)

- ***Before:*** **Vibration measurements made in the course of the Titan flight test program were complicated by the presence of intense high-frequency excitation of the vehicle shell structure during the re-entry phase of the flight.**
- ***After:*** **Vibration measurements made in the Titan flight were complicated by intense high-frequency excitation of the vehicle shell during re-entry.**

Think about word "economy": how many words would you keep if you had to pay per word?

Keep it simple! (word level)

- *Before:* The goal of this study is to develop a commercialization strategy for solar energy systems by analyzing factors impeding early commercial projects (i.e., SOLAR ONE) and by identifying the potential actions that can facilitate the viability of the projects.
- *After:* This study will consider why current solar energy systems, such as Solar One, have not reached the commercial stage and will find out what steps we can take to make these systems commercial.

Do not use needlessly complex words.

Avoid Ambiguity

- *Before:* **We examined neat methanol and ethanol and methanol and ethanol with 10% water.**

- *After:* **We examined four fuels: neat methanol, neat ethanol, methanol with 10% water, and ethanol with 10% water.**

Ambiguity is frustrating for the reader, and in industry could even end in a lawsuit!

Avoid storytelling (chronology)

- ***Before:*** **First, we used a co-current heat exchanger design due to simplicity. However, heat transfer was not sufficient and the design would need to be large, so we then switched to a counter-current heat exchanger design. Next, we calculated the heat transfer coefficients for the flow conditions described above using the equation below.**

- ***After:*** **A counter-current shell-and-tube heat exchanger design was chosen to maximize heat transfer and minimize heat exchanger size. The heat exchanger coefficients were calculated for turbulent conditions using the following correlation:**

$$Nu_D = 0.027\,\mathrm{Re}_D^{4.5}\,\mathrm{Pr}^{1/3}\left(\frac{\mu}{\mu_s}\right)^{0.14} \qquad (3)$$

Focus on final outcomes and justifications; the order in which you made attempts and most failed attempts are not relevant!

What's wrong with this paragraph?

- Mount St. Helens erupted on May 18, 1980. Its slope collapsing, the mountain emitted a cloud of hot rock and gas. In minutes, the cloud devastated more than 500 square kilometers of forests and lakes. Although the effects of the eruptions were well documented, the origin is not well understood. Volcanic explosions are driven by a rapid expansion of steam. Recently, debate has arisen over the source for the steam. Is it groundwater heated by magma or water originally dissolved in the magma itself? To understand the source of steam in volcanic eruptions, we need to determine how much water the magma contains.

Revised Paragraph

- Mount St. Helens erupted on May 18, 1980. A cloud of hot rock and gas surged northward from its collapsing slope. The cloud devastated more than 500 square kilometers of forests and lakes. The effects of Mount St. Helens were well-documented with geophysical instruments. The origin of the eruption is not well understood. Volcanic explosions are driven by a rapid expansion of steam. Some scientists believe the steam comes from groundwater heated by the magma. Other scientists believe the steam comes from water originally dissolved in the magma. We need to understand the source of steam in volcanic eruptions. We need to determine how much water the magma contains.

Other things to consider

- Hints on word choices:
  - "in order to" can almost always be replaced with "to"
  - "utilize" -> "use"
  - "implement" -> "build"
  - "very" is very unnecessary and can almost always be deleted
- A picture (figure, table, diagram) is worth a thousand words.
  - If possible, draw figures yourselves. If not, you must cite the source of your figure.
  - Make sure to label tables and figures (number and title) and refer to them in the text.
- Use transition sentences.
  - When beginning a new paragraph or section, use a transition sentence to tie in with the previous paragraph/section.
- Number and name all figures/tables/appendices
  - Also mention figure/table/appendix in text and discuss briefly if needed.

Group Writing Strategies?

Group Writing Method	Pros	Cons
1. One person from the group writes the entire report with little help from anyone else. *(Bad Method)*	• You won't have to worry about agreeing on a single voice. • If this person is a good writer with a good understanding of the project, the report will be pretty decent.	• This person will hate everyone else on the team. • This person will not get a lot of sleep before the report is due (especially if it's a long report). • Nobody else has a say in what goes in the report. • Everybody's specialized technical knowledge will get lost forever
2. The group leader splits the report into sections and divies it out to the group members. Each person writes their own section, then the sections are cut-and-pasted together. *(Bad Method)*	• Each person contributes more or less equally. • Nobody ever has to read the entire report.	• The person receiving the report will hate all of you. • Whoever has to edit the report before it's completed (your advisor, liaison, professor, etc.) will get little sleep. • Your report will likely lack quality, integrity, and coherence.
3. Same as 2, except then also have the best writer in the group read and edit the entire report before turning it in. *(Slightly better Method)*	• The report will have a single voice • Everyone's specialized technical knowledge and/or unique perspectives will be included.	• A tremendous amount of time will be needed to edit everything. • Your chosen editor may be a poor editor.
4. The group writes an extensive outline together and decides up front: audience, tone, information to include, organization. Everyone writes his/her section. Finally, everyone takes a turn reading/ commenting on the entire report and a final editor cements suggested changes. *(Good Method)*	• Relatively little time is necessary in the editing stage. • The workload is pretty equal and nobody gets stuck doing the lion's share. • Everybody has a say in what information goes in the final report and how it's presented. • Having everyone edit virtually guarantees a correctly spelled title.	• This method takes a lot of time on the front end. Granted, it's well worth it, but if you're late getting started this may be a difficult method to implement at the last minute. • You will spend lots of time in a room together with your team. Order pizza.
5. The group writes the intro, conclusion, and all transitions together. The rest is the same as 4. *(Better Method)*	• See Method 4.	• See Method 4. But order Chinese food instead.
6. The group locks themselves in a room and writes the entire report together. *(Ok method, slightly insane)*	• The report has a single voice. • Everyone has a say in what the final report looks and sounds like. • Everyone suffers equally.	• Order pizza and Chinese food. This is a huge time commitment. • It's difficult to remain sensitive to others' feelings when stuck in a small room for long periods of time. You may all hate each other before you are done. • This may not be fun, and the resulting report may show it.