Algorithms and Computation in Signal Processing

special topic course 18-799B
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LU Factorization and Related Problems (cont'd)

Complexity

- **Source:** **Buergisser, Clausen, Shokrollahi "Algebraic Complexity Theory," Springer 1997, pp. 426**

- **Definition:** **P(n), n > 0, a sequence of problems (n = problem size), complexity measure = number of adds + mults, then**

$$w(P) = inf(g \mid complexity(P(n)) = O(n^g))$$

- **Problems:**
  - MMM(n): multiplying two n x n matrices
  - MInv(n): inverting an n x n matrix
  - PLU(n): computing PLU factorization of an n x n matrix
  - Det(n): computing the determinant of an n x n matrix

Complexity Results

- **Example (we had that before): $2 \leq w(MMM(n)) < 2.38$**
- **Theorem:**
  $w(MMM(n)) = w(MInv(n)) = w(PLU(n)) = w(Det(n))$
- **Cost of usual implementations:**
  - $MMM(n) = 2n^3 + O(n^2)$
  - $MInv(n) = 8/3\ n^3 + O(n^2)$
  - $PLU(n) = 2/3\ n^3 + O(n^2)$
  - $Det(n) = 2/3\ n^3 + O(n^2)$

Small Guide to Presentations

Importance of Presentations

- In contrast to a paper or other technical writing, you present your work and yourself
- People remember good presentations
- "Good" means: good content, well presented, on well-designed slides.
  Contents or looks alone does not cut it.
- Many of my colleagues and I put a lot of effort in each presentation, and at the beginning of a career it's even more important

Presentations are very important

Small Guide Overview

- The “Physical” Presentation
- Contents
- Looks

The Physical Presentation

- **Use the right tools:**
  - Laptop (and know how to use it), laser pointer
  - Ideally: remote mouse
  - Bring talk on USB key as backup
- **Be reasonably dressed**
- **Start with introducing yourself and state the presentation title**
- **Acknowledge your co-authors!**
- **Speak clearly, not too fast**
- **Don’t talk to the floor etc., look at audience and slides**
- **Don’t put your hands in your pockets, don’t cross your arms**

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Contents: Organization of the Talk

- **In the beginning you have to get across (without details) what you are actually doing and why and why it is important, e.g.**
  - Motivation
  - Why is it important
  - Problem statement + maybe hint to solution
- **You need an overview slide either right in the beginning or after the above**
  - Short talks (<= 20 min) one time may be enough
  - Longer talks: this slide should appear at the beginning of each section
- **Typical organization:**
  - Motivation and problem statement
  - Background
  - Your contribution
  - Results
  - Conclusions
- **Slide numbers may be useful**

Typical Overview Slide (assuming motivation and problem statement done)

- Background on signal transforms and SPIRAL
- Loop merging in SPIRAL using Sigma-SPL
- Experimental results and benchmarks
- Conclusions

Contents: Text

- Use text only as needed, pictures are often better
- Use bullets
- Don’t write full, long sentences
- If you have a full slide of text, let it appear (not fly in) bullet by bullet
- Define acronyms

Technical Contents

- **Don't try to get every detail across, it's the main idea that you have to get across**
- **The key to sucessfully getting technical contents across: use the power of the medium:**
  - Visualization
  - Visualization
  - Visualization
  - That includes properly used animations
  - Properly used means: animation is used to better visualize not to fancify trivial things

Contents: Miscellaneous

- Don't loose people after a few slides,
  sequence of presented material has to be logical
- Mention related work and cite like [Miller and Smith ITC 03],
  use "et al." only if necessary
- In the conclusions repeat the main messages that you want
  the people to remember after the talk
- You may want to have some backup slides for questions that
  you expect

Small Guide Overview

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- Looks

The Looks (The Design)

- As important as contents
- Design includes master style, colors, fonts, pictures, graphics, viewgraphs
- Don’t put too much stuff into one slide
- Standard style:
  Black text (not blue, green, etc.) on white background or bright text on dark background

The Looks: Fonts

- Use a sans serif font, often bold is the best choice
  - Sans serif font Arial
  - Sans serif font Arial Narrow
  - Serif font Times
  - `For code Courier bold is best`
  - I am not a fan of fonts like this
- Don't use small text (this here is 24pt)
- Use only one font
  (max. two if you have to, but then be consistent in use)
- If you have many formulas or sophisticated ones:
  Get texpoint
- Math in text: make italic

The Looks: Colors

- Colors are good, but
- Don't use more than 2 colors (I usually stick with one) and make sure they fit together.
  Exception: In diagrams, figures etc., where more colors enhance presentations
  For example, in a block diagram, does every block need a different color? Usually not.
- Be consistent in color use (e.g., in this presentation I emphasize text using always red)
- I use pastel color very sparsely only as background

The Looks: Graphics and Tables

- **Make sure they look good**
  - Colors
  - Format, e.g., jpeg only for images
- **Thin lines usually look bad**

Powerpoint

- **Use latest version if possible (~$10 in computer store)**
- **Use properly (i.e., don't hard code)**
  - Slide master
  - Slide layout
  - Style (format -> slide design)
- **In bulleted lists**
  - Format using ruler (no space-space-space…)
  - shift+enter makes a line break without new bullet