

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

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

- **Problems:**

- MMM(n): multiplying two $n \times n$ matrices
- MInv(n): inverting an $n \times n$ matrix
- PLU(n): computing PLU factorization of an $n \times n$ matrix
- Det(n): computing the determinant of an $n \times n$ matrix

Complexity Results

- Example (we had that before): $2 \leq w(\text{MMM}(n)) < 2.38$

- Theorem:

$$w(\text{MMM}(n)) = w(\text{MInv}(n)) = w(\text{PLU}(n)) = w(\text{Det}(n))$$

- Cost of usual implementations:

- $\text{MMM}(n) = 2n^3 + O(n^2)$
- $\text{MInv}(n) = 8/3 n^3 + O(n^2)$
- $\text{PLU}(n) = 2/3 n^3 + O(n^2)$
- $\text{Det}(n) = 2/3 n^3 + O(n^2)$

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**

Small Guide Overview

- The “Physical” Presentation
- Contents
- Looks

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 successfully 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 fancyfy trivial things

Contents: Miscellaneous

- Don't lose 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

- The “Physical” Presentation
- Contents
- 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)**

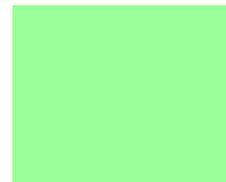
- Use **only one** font
(max. two if you have to, but then be consistent in use)

- 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