EDA Seminar

專題討論

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Graduate of Electronics Engineering
National Taiwan University

Fall 2009

Administrative Matters

- **Time:** normally Mondays 3:30--4:20pm
- **Location:** BL-112
- **Instructor:** Yao-Wen Chang
- **E-mail:** ywchang@cc.ee.ntu.edu.tw
- **URL:** http://cc.ee.ntu.edu.tw/~ywchang
- **Office:** BL-428 (Tel) 3366-3556; (Fax) 2364-1972
- **Office Hours:** Tuesday 5--6pm or by appointment
- **TA:** Kuan-Hsien Ho (khho@eda.ee.ntu.edu.tw)
- **Course contents:**
  - Research presentations *(preferably in English)*
  - Important talks from the web
  - Industry talks
- You are allowed to switch from/to the CS seminars *with my approval and the approval from the other instructor in advance*
Administrative Matters (Cont’d)

- Grading:
  - At most two absences are allowed to pass this course unless with legitimate reasons
  - Base score: 90 pts, +5 pts for each presentation, -10 pts for each absence
- “Legitimate” reasons for absence: attending conferences, emergency with proof
- Non-H1N1 sickness is not considered a “legitimate” reason, so don’t make any request based on similar reasons
- Those funded or will be funded by the department/MOE/NSC to attend conferences abroad will be assigned for presentations
- Every other volunteer presenter claimed by Sept. 30, 2009 can be exempted from one more class

Murphy’s Law

- If anything (something) can go wrong, it will.
- Laws of Applied Terror:
  - Exam: Eighty percent of the exam will be based on the one lecture you missed and about the one chapter you didn’t read.
  - Attendance: My total number of absences is one more than the maximum allowance.
- Langsam’s Ornithological Axiom:
  - On Study Group: It is difficult to soar with eagles when you work with turkeys.
What Your Future Bosses Care About?

Seminar Schedule for the Coming Month

- http://cc.ee.ntu.edu.tw/~ywchang/Courses/Seminar09F/seminar09f.html
  - Sept. 14: Meet with EDA faculty
  - Sept. 21 (3:30-5:10pm; 100 min): “The Last Lecture” given by Prof. Randy Pausch of CMU on Sep. 18, 2007 (see www.TheLastLecture.com for more detail)
  - Sept. 28 (3:30-4:50pm; 80 min): “Time Management” given by Prof. Randy Pausch of CMU at Univ. of Virginia in November 2007 (check YouTube on-line)
  - No class on the midterm week (Nov. 9)
The Last Lecture

“The brick walls are there to stop the people who don't want it badly enough.” ~ Randy Pausch

EDA Group Brief

http://cc.ee.ntu.edu.tw/~eda

- An independent research group since August 2004
- EDA people
  - 12+1+1 professors
  - about 70+ M.S. students, 30+ Ph.D. students + EDA students in the CS group
  - Covers all areas of electronic design automation
  - With an EDA union lab
- Strong ties with EDA & IC design/manufacturing industry
- High international visibility
Industrial & Governmental Sponsorship

- More than 15 industrial & governmental sponsors for students’ fellowships, research projects, and donation.
- Average number of projects: about 5 projects/person-year
- Average research grant: about 160K USD/person-year

Students’ Industrial Scholarship & Internship

(Ref: student’s living expense ~ USD$200 ~ $600/month)

- EDA group entrance scholarship (dedicated to NTU/GIEE)
  - PhD: ~USD$800/month (Cadence, TSMC)?
  - Master: ~USD$450/month (Incentia)?

- EDA research fellowship (offered to EDA students in Taiwan)
  - For 1st and 2nd year PhD students: ~USD$800/month
  - Synopsys: 3 for year 2007

- EDA summer internship programs
  - Avery, Cadence, SpringSoft, Synopsys,
  - Design houses (e.g. MediaTek)
  - ~USD$1000/month

- And many more RAships from schools, government, industries, research institutes, etc.
International Visibility: Conferences

- Many professors are on the technical program committees of top EDA conferences
  - E.g., ACM/IEEE ICCAD (executive committee), DAC, ASP-DAC (steering committee), DATE, ACM ISPD (program chair), GLSVLSI, IEEE ICCD, ISCAS, ISQED (program chair), FTP (program chair), SOCC (TPC chair), VLSI-DAT (chair), APCCAS, etc

International Visibility: Journals

- Editorial boards of international journals
  - IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems
  - IEEE Transactions on Dependable and Secure Computing
  - Journal of Information Science and Engineering
  - Journal of Electrical and Computer Engineering
  - Journal of Computer Science and Technology
Published the most top-rated ICCAD/DAC papers in the world during the past 3 years

<table>
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<tr>
<th>Year</th>
<th>Japan</th>
<th>Taiwan</th>
<th>NTU</th>
</tr>
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<tbody>
<tr>
<td>2002 (DAC+ICCAD)</td>
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<tr>
<td>2003 (DAC+ICCAD)</td>
<td>4</td>
<td>4</td>
<td>3 (+1*)</td>
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<td>7</td>
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<td><strong>Total</strong></td>
<td>39</td>
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Consider 1st authors only (* Co-authored with NTU faculty)

DAC Publication Statistics (2002-2009)

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<tr>
<th>Year</th>
<th>1st</th>
<th>2nd</th>
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<td>Belgium (5)</td>
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<td>Italy (5)</td>
<td>Switzerland (4)</td>
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<td>Spain (4)</td>
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<td>2005</td>
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<td>Canada (10)</td>
<td>China (5)</td>
<td>Korea (4)</td>
<td>Germany (5)</td>
<td>Japan (3)</td>
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<td>Korea (5)</td>
<td>China (7)</td>
<td>Canada (8)</td>
<td>Israel (3)</td>
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<td>2007</td>
<td>USA (98)</td>
<td>Taiwan (12)</td>
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<td>Switzerland (4)</td>
<td>Singapore (4)</td>
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* 2002, 2003: Taiwan (1)
+ NTU was world #1 in 2008 (7) and 2009 (8)

# of papers; Consider 1st authors only
ICCAD Publication Statistics (2002-2008)

| Year | USA | Canada | Japan | Korea | Germany | Taiwan | Switzerland | China | Canada | Korea | France | Italy | Sweden | Belgium | Ireland | China | Germany | France | Italy | Sweden | Switzerland | Japan | Korea | Belgium | Ireland | Switzerland | Japan | Korea | France | Italy | Sweden | Switzerland |
|------|-----|--------|-------|-------|---------|--------|-------------|-------|---------|-------|--------|-------|--------|---------|---------|-------|---------|--------|-------|--------|-------------|-------|-------|---------|-------|--------|-------------|-------|-------|---------|-------|--------|-------------|
| 2002 | 105 | (86)   |       |       |         |        |             |       |         |       |        |       |       | (4)     |     (3)  |       |         | (2)    |       | (3)    |             |       | (11)  |       |       | (2)    |             |
| 2003 | 129 | (97)   |       |       |         |        |             |       |         |       |        |       |       | (7)     |     (3)  |       |         | (2)    |       | (5)    |             |       | (11)  |       |       | (3)    |             |
| 2004 | 127 | (98)   |       |       |         |        |             |       |         |       |        |       |       | (5)     |     (3)  |       |         | (2)    |       | (3)    |             |       | (12)  |       |       | (3)    |             |
| 2005 | 128 | (110)  |       |       |         |        |             |       |         |       |        |       |       | (3)     |     (3)  |       |         | (2)    |       | (3)    |             |       | (17)  |       |       | (4)    |             |
| 2006 | 128 | (97)   |       |       |         |        |             |       |         |       |        |       |       | (5)     |     (4)  |       |         | (2)    |       | (4)    |             |       | (15)  |       |       | (4)    |             |
| 2007 | 139 |       |       |       |         |        |             |       |         |       |        |       |       | (4)     |     (5)  |       |         | (2)    |       | (4)    |             |       | (11)  |       |       | (3)    |             |
| 2008 | 122 |       |       |       |         |        |             |       |         |       |        |       |       | (3)     |     (4)  |       |         | (2)    |       | (4)    |             |       | (17)  |       |       | (3)    |             |
| 2009 | 115 |       |       |       |         |        |             |       |         |       |        |       |       | (2)     |     (3)  |       |         | (2)    |       | (4)    |             |       | (17)  |       |       | (3)    |             |

* 2002: Taiwan (1)
+ NTU was world #1 in 2007 (9) and 2009 (8) & #2 in 2008 (7)

2007 & 2008 ICCAD & DAC Rankings
2009 DAC Rankings

2009 ICCAD Rankings
Recent Paper Awards/Nominations at ICCAD/DAC

- **Best Paper Award Nominations at DAC (since 2005)**
  - 2005 on X-architecture routing: physical design
  - 2007 (two papers) on (1) flash-memory storage system: embedded systems and (2) flip-chip routing: beyond-die design
  - 2008 on optical proximity correction: physical design & manufacturability
- **2007 IEEE/ACM ICCAD Professor Margarida Jacome Memorial Award**: bio-chip routing
- **Best Paper Award Nominations at ICCAD (since 2005)**
  - 2007 (two papers) on (1) logic synthesis and (2) routing for manufacturability
  - 2009 (two papers) on (1) IR-drop aware placement and (2) 3D IC thermal modeling
- **The only university with two best paper nominations: DAC’07, ICCAD’07, ICCAD’09**

Achievements in Major International EDA Contests

- **ACM CADathlon @ ICCAD Contests (in November since 2002)**
  - 2006: 3rd place
  - 2007: 1st & 2nd places
  - 2008: 2nd place
- **ACM ISPD Contests (in April since 2005)**
  - 2006 on placement: 3rd place
  - 2008 on global routing: 2nd place
  - 2009 on clock network synthesis: 1st place
  - NTU is the sole winner of the three ISPD contests on placement, global routing, clock network synthesis (2006, 2008, 2009)
  - EETimes citations: 4/17/2008 & 4/7/2009 ("how the Taiwanese beat both the US and Europeans in the ISPD Global Routing Contest…")
The most important CAD contest in Taiwan
- Hosted by the Ministry of Education
- NTU won 46 awards (46% of the total awards) in recent five years
  - Received 14 1st prizes (64% of the 1st prizes)

<table>
<thead>
<tr>
<th>Year</th>
<th>#Awards</th>
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<tbody>
<tr>
<td>2003</td>
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<td>2009</td>
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<table>
<thead>
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<th>University</th>
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<tr>
<td>NTU awards</td>
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</tr>
<tr>
<td>A University</td>
<td>15</td>
</tr>
<tr>
<td>B University</td>
<td>10</td>
</tr>
</tbody>
</table>

Textbook on EDA by NTU Professors
- Seven (out of 14) chapters, 466 (out of 934) pages are co-authored by five NTU professors involved in this education program
- A bestseller at DAC’09
Conclusions and Future Work

․ A dummy fill algorithm considering both gradient minimization and coupling constraints

․ Achieve more balanced metal density distribution with fewer dummy features and an acceptable timing overhead

Future work: integration of gradient minimization and coupling constraints

⎯ Simultaneously minimize the gradient and the coupling capacitance

Thank You!!

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