Name/Office hours/Email/TA?

Exciting field:
Spetacular failures and a few rousing successes
($250 M investment => 0$)
Exciting of seeing hundreds of people using your machines
(e.g., 1990 100,000 SPARC statitions based on instruction set archtiecture developed at Berkeley)

Times of change
Traditional categories changing
supercomputer (>$1 to $20M)
mainframe ($0.5 to $3M)
minicomputers ($0.05 to $0.5M)
microcomputers $0.002 to $0.020M)

1990s End of traditional supercomputer & minicomputer

Principles that guide comptuer designers

Make the common case fast
Limited HW resources and limited development time
=> concentrate on the common case
(e.g., CPU addition, optimize no overflow)

Amdahl's Law
Over Sierras and through Death Valley
Hike over mountain = 20 hrs

last 200 miles several options

| Method | Vehicle | Hours for desert | Speedup desert | Total | Speedup Total |
|---|---|---|---|---|---|
| Walk | Feet | 50 | 1 (4 pmh) | 70 | 1 |
| Pedal | Bike | 20 | 2.5 (10) | 40 | 1.8 |
| Drive | Excel | 4 | 12.5 (50) | 24 | 2.9 |
| Hold on | Rocket car | 0.33 | 150 (600) | 20.33 | 3.4 |

Its not peak speed, it is time for full task

If speedup portion of task, overall speedup is limited by unimproved portion (or fraction of time faster mode is used)

$$\textit{Speed-up} = \frac{1}{(1 - \text{Fraction}_{\text{enhanced}}) + \frac{\text{Fraction}_{\text{enhanced}}}{\text{Speed-up}_{\text{enhanced}}}}$$

## Class stuff:

Lecture style
Distrubte Survey
No discussion sections; individual times on projects instead
First home work assignment: Exercises First home work assignment: 1.1 through 1.6, and 1.8 and 2.1-2.7/ **in 533 Evans by Noon(too mnay students) Friday**
Tapes available 1 or 2 days after lecture; in 205? McLaughlin

Book not ready: first portion available at Copymats on Bancroft for about $15
Books delivered to class when avilable (about march 1)
Will take checks in class for difference between book and copy
Go over approximate schedule

Mention quizzes, term projects, Grades: about 30%/category, 10% participation

Questions?

**Continue Lecture**

Review: Common Case Fast, Amdahl's Law

Now locality of reference
90% time in 10% of the code (3%- 5% = 80%, 92% to 13% = 90%)
Temporal & spatial locality

Memory hierarchy: faster & more expensive vs. slower & cheaper
registers - caches - main memory - disk

Use Amdahl's Law to show the speedup
Suppose 90% time data is in cache, and cache is 6 X faster
1/(0.10+.90/6) = 1/(.1+.15) = 1/.25 = 4 speedup from cache
suppose 80% instead? = 3X speedup

Bandwidth or throughput (tasks per hour) vs. Latency or response time
What is faster? "X is n% faster than Y"=> 1 + n/100 = Perfx/Perfy = Timey/Timex

Notes to lecturer: Amdahl's Law + locality worked well, showing how to use Amdahl's Law.