

Introduction

Technology In Our Everyday Lives

- Semiconductor Industry forecasts \$252 billion in sales for 2007



Computers



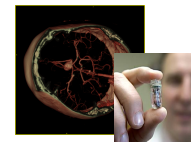
Military



Automotive
20-80 microprocessor controlling break systems, airbags, infotainment, safety, driver assistance, etc.



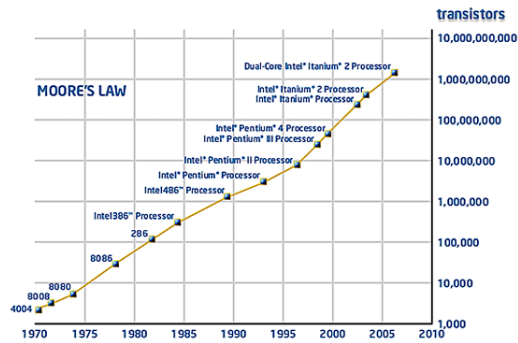
Entertainment



Healthcare
Smart Pills electronically track and instructed to deliver medicine to specific location, better imaging, remote surgery, etc.

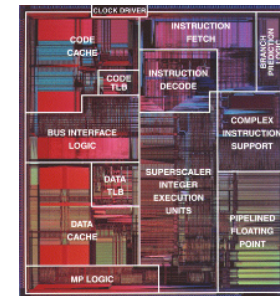
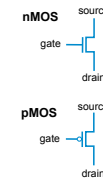
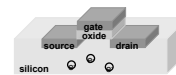
Moore's Law

- Doubling of IC capacity every 18 months
 - Gordon Moore predicted trend in 1965 and continues today



Effects of Increasing Number of Transistors

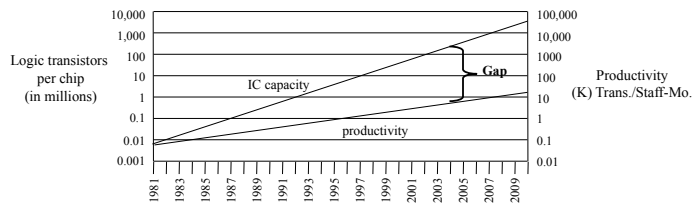
- Transistors are the basic elements in integrated circuits (ICs)
- What does Moore's Law mean?
 - Increasing functionality
 - Increased speed
 - Decreasing costs
 - More compactness



Pentium processor Die Photo

Design Productivity Gap (Crisis?)

- The number of available transistors grows faster than the ability to design them meaningfully
 - Transistors available increase 58% per year
 - Designers are capable of using additional 21% per year

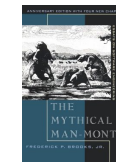
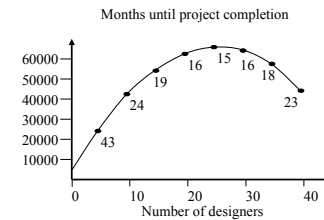


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5 of 16

Can't We Just Hire More Designers?

- Adding designers to team should reduce project completion time
- In reality, productivity per designer decreases due to complexities of team management and communication
 - Mythical man-month
 - At some point, can actually lengthen project completion time!



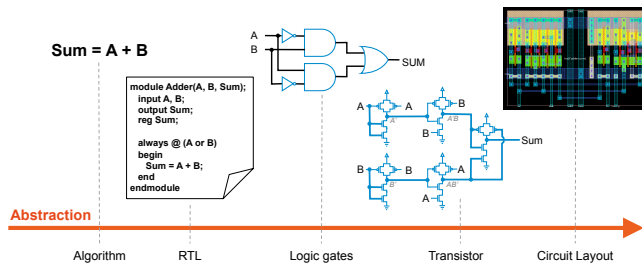
The Mythical Man-Month
Fred Brooks
1975, 1995

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6 of 16

Increasing Abstraction

- Higher abstraction level simplify designer effort
 - Description smaller/easier to capture
 - Don't have to know/remember the low-level details
 - Many more possible implementations available

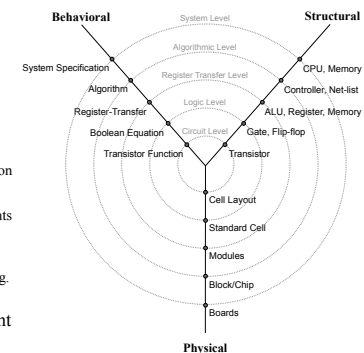


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7 of 16

Y-chart

- Representation proposed by Gajski in 1983 (other variations exist)
 - Captures the relation between different design activities
- Each axis represents type of description
 - Behavioral
 - Defines function of a circuit regardless of its implementation
 - Structural
 - Interconnections of components with known behavior
 - Physical
 - Relates to physical objects (e.g. transistors) of the design
- Within domain there are different abstractions

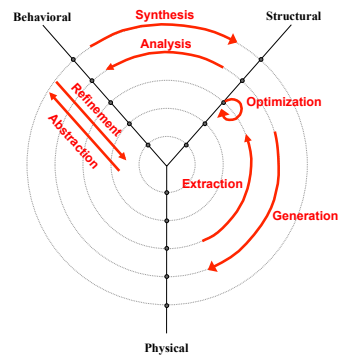


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8 of 16

Y-chart Transformations

- Refinement
 - Transformation of high-level description to a lower-level description (more detail)
- Abstraction
 - Associating a higher-level behavior to hide complex inner details
- Synthesis
 - Process that transforms description of circuit behavior into a structural implementation
- Analysis
 - Abstracting how circuit performs task to what is the overall goal
- Optimization
 - Transformation that improves criteria of interest to us (area, delay, cost)
- Generation
- Extraction

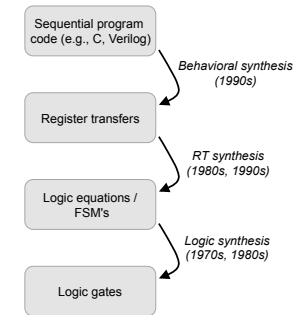


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9 of 16

Why CAD?

- Computer-Aided Design (CAD)
 - Large scale management through abstraction
 - Design optimization
 - Reduced design time
 - Bridges the gap between different views of abstractions/domains
- Hardware design evolution
 - Logic synthesis
 - Converts logic equations or FSMs into gates
 - Register-transfer (RT) synthesis
 - Converts FSMDs into FSMs, logic equations, structural components (registers, adders, ALUs)
 - Behavioral/High-level synthesis
 - Converts sequential programs into FSMDs



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10 of 16

To do list

- Extended lab hours forms – PRINT NEATLY
- Participation point 1 (1 pt)
 - Submit a Word or PDF document providing a short bio via D2L using the appropriate DropBox. Your bio should include your name, University email address, a photo of yourself, and at least random tidbit about yourself (e.g. favorite movie, favorite food, an unusual talent, etc.).
- Participation point 2 (1 pt)
 - Take the ECE474A/574A Entrance Survey currently available on D2L.

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11 of 16