ECE 571 – Advanced Microprocessor-Based Design Lecture 1

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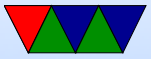
Introduction

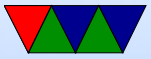
- Go over syllabus (from website)

  `http://web.eece.maine.edu/~vweaver/classes/ece571/ece571_2022f.pdf`



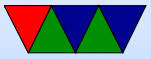
Syllabus – Class Notes

- Please wear a mask for now



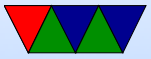
Syllabus – Grading

- class participation (5%)
- 11 homeworks (5% each), one dropped
- 1 midterm exam (20% of total)
- 1 final project (25% of total)
  last week of classes
- No final exam



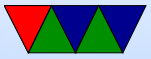
Syllabus – Other

- Book – no book, but for the first half when we review computer architecture, Patterson and Hennesey optional readings are posted. Can "check out" for free from Umaine Library webpage.
- Boilerplate



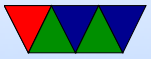
Syllabus – Homeworks

- Due Thursday, before class
- There will be accounts on various Linux machines
  please use them responsibly



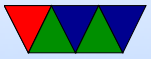
Advanced Microprocessor Based Design

- *NOT* a direct continuation of ECE471 (Embedded Systems) No blinking LEDs on embedded boards. More of a mix of 471 and 473 ideas.
- Power and Energy concerns on modern systems.
- Will involve some computer architecture. Don't worry if not a Computer Engineer, will try to review completely.
- Will involve reading some papers.
- Will involve logging into Linux boxes and running experiments.



Modern CPU Related Topics

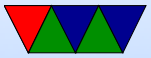
- Modern CPUs (x86? Intel? AMD? ARM? RISCV?)
- Memory (DDR4/DDR5?), NVRAM
- Disk (SSD)
- Graphics (GPUs)



Advanced Microprocessor Based Design

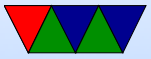
What is an Advanced Microprocessor?

- Desktop?
- Server?
- Supercomputer?
- Embedded?
- They are all converging.



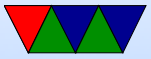
Moore's Law

- Memory Wall
- Power Wall
- Tiny tiny transistors
- More and More Cores
- Something's Got To Give

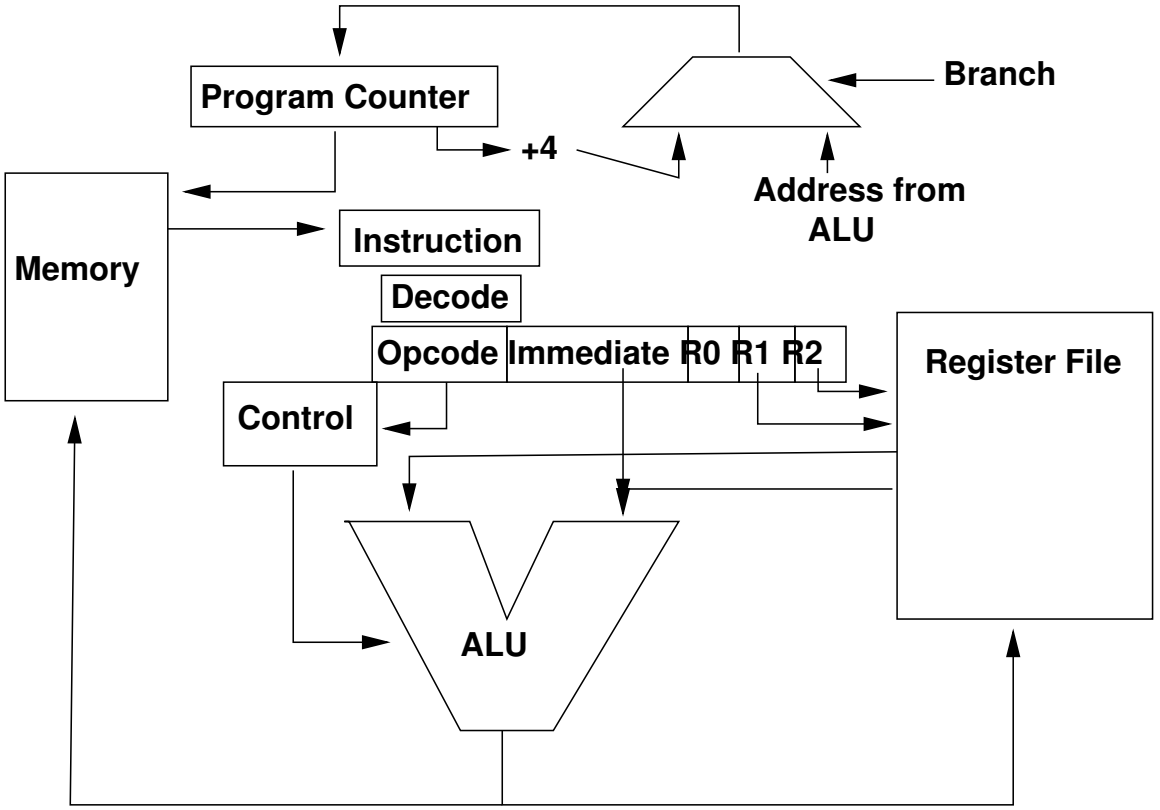


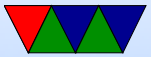
Microprocessors

- Also known as Central Processing Unit (CPU)
- Do the general purpose calculations in a system
- Originally big, multi-cabinet, multi-board, multi-chip
- The first "micro" processor fit on one chip.
  Often regarded as the 4-bit Intel 4004. (history?)
- In the old days you could buy a discrete CPU, plop onto circuit board, hook up some memory and a terminal, and you had a computer.
- These days things are a lot more complex.

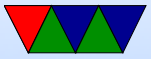


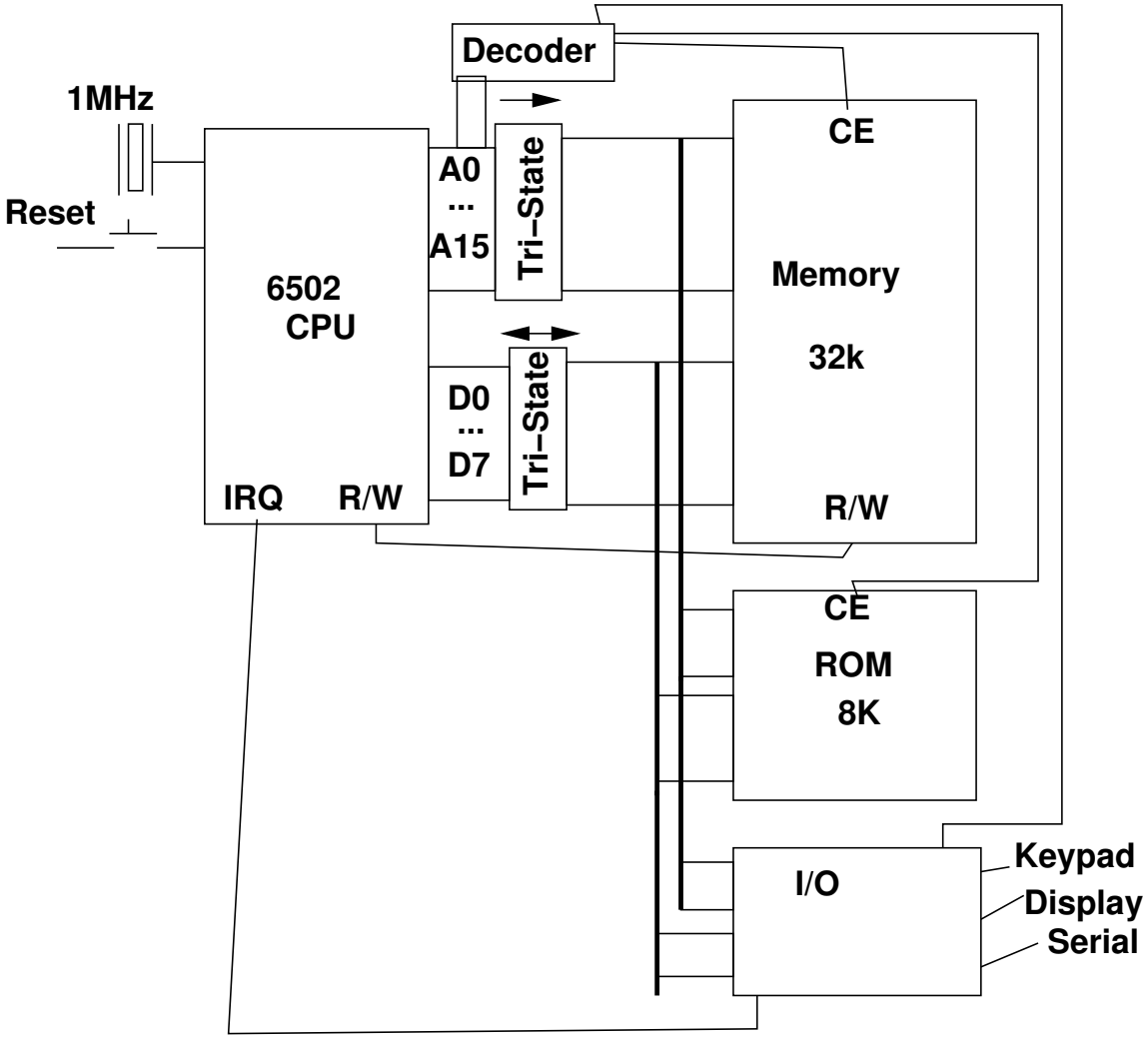
Simple CPU

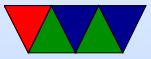

Program Counter
+4
Branch
Address from ALU
Memory
Instruction
Decode
Opcode
Immediate
R0
R1
R2
Register File
Control
ALU



Simple System




Decoder
1MHz
Reset
6502
CPU
IRQ
R/W
A0
...
A15
Tri–State
D0
...
D7
Tri–State
CE
Memory
32k
R/W
CE
ROM
8K
I/O
Keypad
Display
Serial



Describe some early simple systems

- KIM-1
- Atari 2600
- Apple II
- These all have 8-bit 6502 processors
  - Designed by Chuck Peddle, UMaine Alumnus
  - 1MHz, 3 8-bit registers
  - Up to 64k of RAM (could get more with bank switch)
  - 3500 transistors