ARDUINO ARCHITECTURE

JUSTIN BYERS
WHAT IS AN ARDUINO?

• Microcontroller-based prototyping kit
• Easy to use, low cost board for students, hobbyists & professionals
• Many different board types and revisions exist
• Also – a software API and development environment
• Board layout and software is open source
TECHNOLOGY - UNO

• The Uno is one of the most popular Arduinos available
• Based on the Atmel ATmega328 microcontroller
• 14 I/O pins
• USB & power connectors
• 16MHz clock speed
ATMEGA328

- 8-bit AVR RISC-based microcontroller
- 32KB program flash memory
- 1KB EEPROM
- 2KB SRAM
- 20MHz max clock frequency
- 23 GPIO pins
ATMEGA328 – CONTINUED

- 32 general purpose registers
- 3 timers/counters
- Internal & external interrupts
- USART
- 2-wire serial interface
- SPI port
- 6-channel 10-bit A2D
AVR ARCHITECTURE

• Harvard architecture
  • Separate memories & buses for program and data

• Instructions executed in single-level pipeline

• Fast-access register file
  • 32 x 8 bit general purpose registers
  • Single clock cycle access time
  • Single cycle ALU operation
AVR ARCHITECTURE - ISA

- Supports arithmetic and logic operations between registers or between a register and a constant
- Supports single register operations
- Updates status register after arithmetic operations
- Most AVR instructions are 16-bit but can support 32-bit instructions
- Interrupts and subroutines
  - PC stored on the stack
    - Allocated in SRAM
    - Only limited by total SRAM size
    - User programs MUST initialize the SP in reset routine

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AVR ARCHITECTURE – PROGRAM MEMORY

• Split into boot and application memory

• Boot Memory
  • Contains the primary reset vector & starts on chip power up
  • Configures hardware are branches into application memory
  • Can program the application flash memory

• Application Memory
  • Contains the user program
  • Has separate reset vector branched to by boot memory
AVR USAGE IN ARDUINO BOARDS

- ATmega8
- ATmega168
- ATmega328
- ATmega1280
- ATmega2560
- Many different Arduino boards with different Atmega microcontrollers
- All are based on the AVR architecture
DIFFERENCE BETWEEN ARDUINO BOARDS

• Microcontroller used
  • Memory
  • Clock speed
  • Max program size
  • Available RAM

• # of and type of pins
  • Digital
  • Analog
  • PWM

• Board features
REFERENCES

• http://www.edgefxkits.com/blog/arduino-technology-architecture-and-applications/


• https://en.wikipedia.org/wiki/Arduino