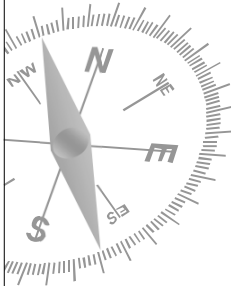




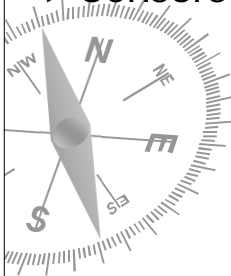
Robot Hardware

Kevin Claycomb
A. A. Arroyo



Overview

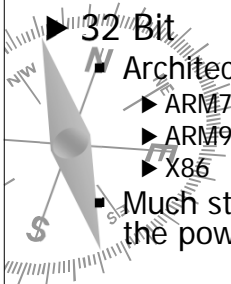
- ▶ Planning
- ▶ Embedded Boards
 - Build (Design) or Buy?
- ▶ Sensors





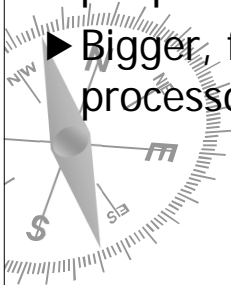
Embedded Computers

- ▶ 8/16 Bit
 - Architectures
 - ▶ 8051
 - ▶ Atmel AVR
 - ▶ PIC
 - Characterized by ease of use and lower learning curve
- ▶ 32 Bit
 - Architectures
 - ▶ ARM7
 - ▶ ARM9
 - ▶ X86
 - Much steeper learning curve, but pays off if you need the power



What to consider....

- ▶ First, a clear scope and task list must be defined.
- ▶ Pick a processor that has enough peripherals to support your tasks.
- ▶ **Bigger, faster, and more complicated processors are not always better!**





Peripherals

- ▶ UART
 - Provides serial communication interface
 - Typically RS232
- ▶ Analog/Digital Channels
 - Many sensor are analog
 - 4 channels minimum
- ▶ SPI/I2C/CAN interfaces
 - Synchronous serial, very common interfaces
- ▶ JTAG
 - Allows in circuit debugging and programming
- ▶ ISP
 - In system programming, serial communication
- ▶ Timers
 - The more the better
- ▶ PWM / frequency generation modules
 - Allows hardware generation of motor driving signals



ATMega 128

- ▶ Most popular here at UF
- ▶ Kitchen sink of peripherals
 - 2 UARTS, 8 channel A/D, multiple counters and PWM channels, SPI/I2C/CAN, ISP, and JTAG
- ▶ RISC based 8Bit core
- ▶ 16MIPS @ 16Mhz
- ▶ Development Software free from Atmel
- ▶ Large Hobbyist user base on the internet



ARM7 LPC

- ▶ 32 Bit ARM7TDMI based core
- ▶ Computational advantage with a much steeper learning curve
- ▶ Massive amounts of peripherals
- ▶ Usually more expensive to develop with
- ▶ Not recommended for beginners!



Buy or Build?

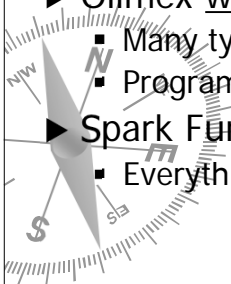
- ▶ Building
 - Not as cost effective as you might think
 - Altium Designer (Protel)
 - Design flaws can kill your timetable
- ▶ Buy
 - May not fit your needs exactly
 - Documentation can help or hurt...





Where to buy your board?

- ▶ Pridgen-Vermeer Robotics
mike.pridgen.pvr@gmail.com
- ▶ BD Micro www.bdmicro.com
 - Mavric IIB ATmega 128 board
- ▶ Olimex www.olimex.com
 - Many types of development boards
 - Programmers
- ▶ Spark Fun Electronics www.sparkfun.com
 - Everything you need is here somewhere!



Sensors

- ▶ Distance
- ▶ Imaging
- ▶ Bump
- ▶ Inertial/Magnetic
- ▶ Environmental

