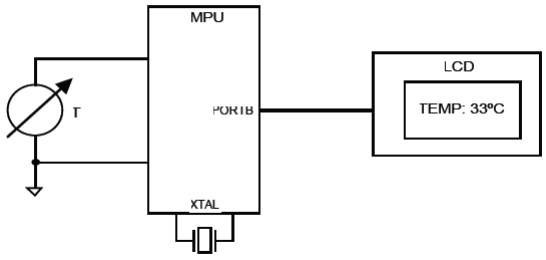
INTRODUCTION TO MICROCONTROLLER

- Microcontroller application
- Microcontroller characteristic
- Microcontroller classification

Embedded System

• Electronic system that consist of hidden micro controller (or embedded) inside itself.



Embedded System – Typical Application

- ***Consumer Electronics***
  Pemain CD, hi-fi, TV, A/C, washing machine…
- ***Medical Monitoring Devices***
  ECG (*electrocardiogram), meter* pump, blood pressure meter …
- ***Security Systems***
  Alarm, remote surveillance, smart card + reader … …
- ***Closed Loop Process Control***
  Motor speed control, robot, SCADA (*supervisory control & data acquisition)* …
- ***Personal Computing***
  Keyboard, printer, USB hub, SCSI HD, energy management …
- ***Automotive***
  Ignition control, A/C, automatic transmission, ABS (*anti-lock brake system),* active suspension
- ***Military***
  Missile, torpedo, ejection seat, intelligent mines …
- ***Communications***
  Hand phone, modem, switch (telephone Ethernet, ATM), radio, radar, laser, sonar, satellite …
- Interesting**...**
  L.A. GEAR lighted shoes
  Microsoft Intellimouse

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Microcontroller Vs Microprocessor

µcontroller	µprocessor
• High integration > used less chips	• Highest performance
• smaller space of Printed Circuit Board(PCB)	• large space for PCB
• Limited expansion	• Most expensive!
• Cheaper	• Flexible > can add as many I/O chips and memory
• Specific architecture	
• Low power consumption	
• More reliable > less connection	
• K.I.S.S > (keep it simple, stupid)	

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Microcontroller

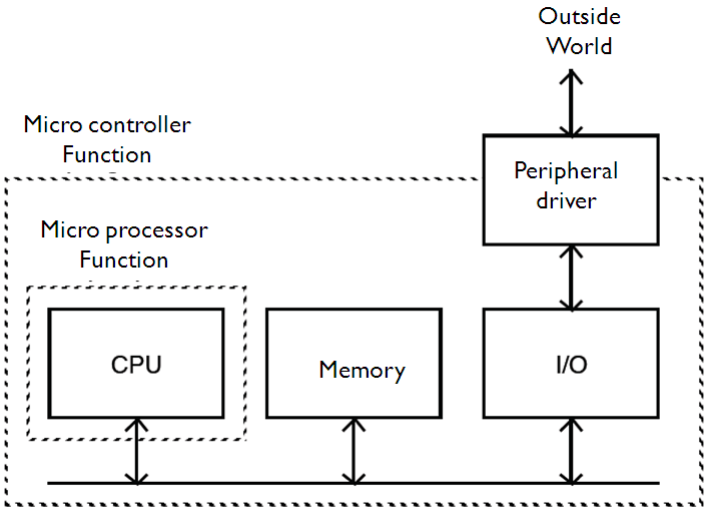
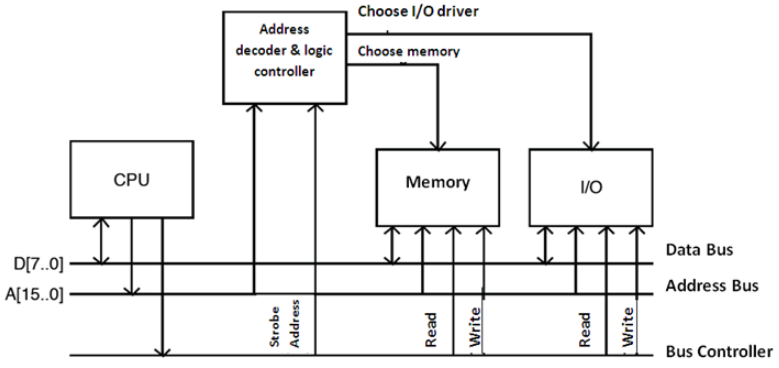


Diagram of common µC Block



8-bit & 16-bit µC

• µC ability is the total of bit that processed by the ALU

• µC handle only 8-bit and 16-bit

8 bit µC

➢Motorola 68HC05, 68HC08, 68HC11
➢ Intel 8051 (and variance like 8031, 8751, 8052-BASIC)
➢Atmel AVR
➢Microchip PIC (and variance like BASIC STAMP)
➢Hitach H8/300, H8/300L

16 bit µC

➢ Intel 8096, 80251
➢Motorola 68HC12, 68HC16
➢Hitachi H8/300H, H8S

Embedded Controller

• Some of the 16-bit controller and most of 32-bit do not combine their memory in the same chip
> called as embedded controller

• EC 16-bit
>Motorola 68EC000 and other 68EC0x0
>Motorola 68328 Dragonball and other 683XX

• EC 32-bit
> Intel 80960, StrongARM & XScale
> Motorola M*Core & ColdFire
> Motorola/IBM PowerPC
> Hitachi SuperH
> ARM ARM7TDMI, ARM9, ARM10
> IDT MIPS

Comparisons of µC

•Intel 8051 (and other variance 8031, 8751, 8052-BASIC, etc)
>Cheap, easy to find, lot of variance, many manufacturer
>The cheapest and minimum system needed 3 chips, Harvard architecture

• Atmel AVR
>Flash memory, in-system programming (ISP), RISC ➡ faster
>Quite new – difficult to find reference, Harvard architecture

• Microchip PIC (and variance like BASIC STAMP)
>Hundreds of variance including OTPROM, cheap, easy to get
>The assembly language is difficult, usually use the C compiler

• Hitach H8
>Can be found most in the Japan equipment
>Hard to find

The advantage of 68HC11

• Have many subsystems – important for 1st course
> ADC, Timer, Interrupt, two types of serial port, Divider
• Easiest assembly language – suit for 1st course
> Using the traditional von Neumann architecture
• Popular
> Vast use in the automotive and robotic field
> Brotherhood with the 68HC05 which sold more than 2 billion units.
• Free software
> Assembler, compiler, simulator and etc
• Expensive equipment is unnecessary for hobbyist
> EPROM programmer, emulator and etc is not needed
> Just need MAX 232 chip and PC serial port
• References is readily available
> Loads of programming and circuit example at web
> Had been in writing in many books