

Cours 1

Introduction aux microcontrôleurs

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Plan de cours

1. qu'est-ce qu'un micro-contrôleur ?

Fabricants, catégories, constituants

2. le PIC16f877

Architecture, méthode de programmation

3. Les GPIO et programmation par scrutation

schema electrique d'un bouton poussoir, schema electrique de commande d'une led,
schema electrique de commande d'un relais/triac

4. La gestion du temps et programmation par interruption

5. conversion A-N

6. UART

7. I2C

8. Architecture NDS, environnement de programmation

émulateur

9. Architecture de l'ARM 7 et 9

10. API et premier programmes

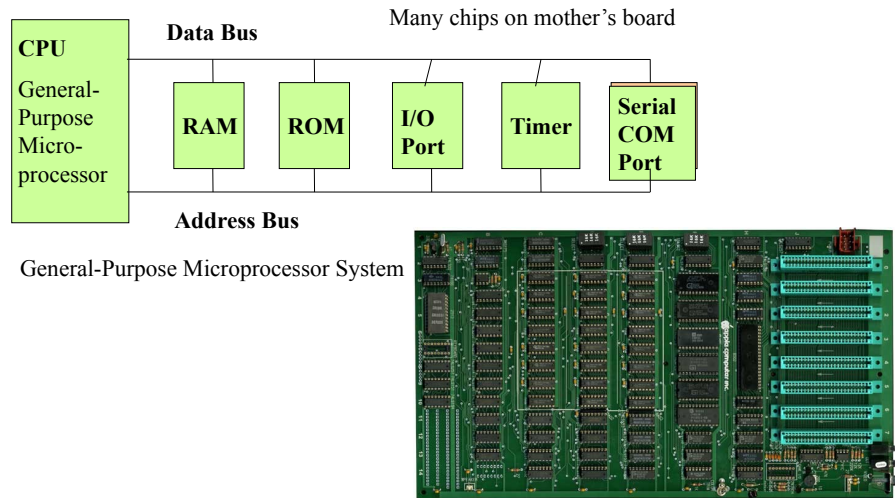
11. Programmation graphique

- **Microprocessors came before Microcontrollers**
- November 1971
 - Intel introduced the world's first single chip microprocessor, the Intel 4004
- April of 1972
 - First 8-bit microprocessor appeared on the market under a name 8008
- April of 1974
 - 8080 became available
 - Addressed 64Kb of memory, had 75 instructions, and cost \$360
- MOS Technology - WESCON exhibit (1975)
 - a pivotal event in the history of microprocessors
 - Announced the 6501 and 6502 at \$25 each

Microcontrôleurs / Microprocesseurs

- Microprocessor – Microcontroller what's the difference ?
- **Microprocessors** can not stand alone
 - instruction decoder, ALU, address/data/ctl. busses, timing logic, (CPU)
 - Has no capability to interact with the outside world
 - memory, I/O ports, UARTS, etc. must be added to make it useful
- **Microcontrollers** are small autonomous computing systems on a single chip
 - Central Processing Unit (CPU)
 - Program memory
 - Random Access Memory (RAM)
 - EEPROM - Electrically Erasable Programmable Read Only Memory
 - A variety of peripheral devices
 - USARTs, Timer/Counters, ADC, DAC, I/O Ports, CANs, SPIs, etc., etc.

Carte à microprocesseur : Apple 2e



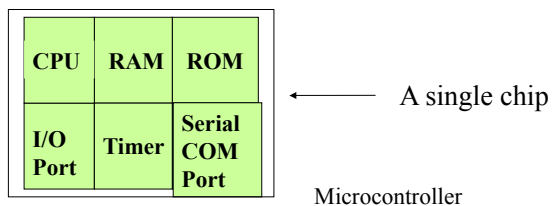
Microcontroller

- They are inexpensive - even in single pieces
- You can design complex functionality in a small package
- Microcontrollers can be viewed as a universal building block
- There are a lot of **free** tools to work with Microcontrollers



Microcontroller

- A smaller autonomous computer
- **On-chip** RAM, ROM, I/O ports...
- Example :
 - Motorola's 6811,
 - Intel's 8051,
 - Zilog's Z8
 - PIC 16X
 - Atmel AVR
 - Freescale Coldfire

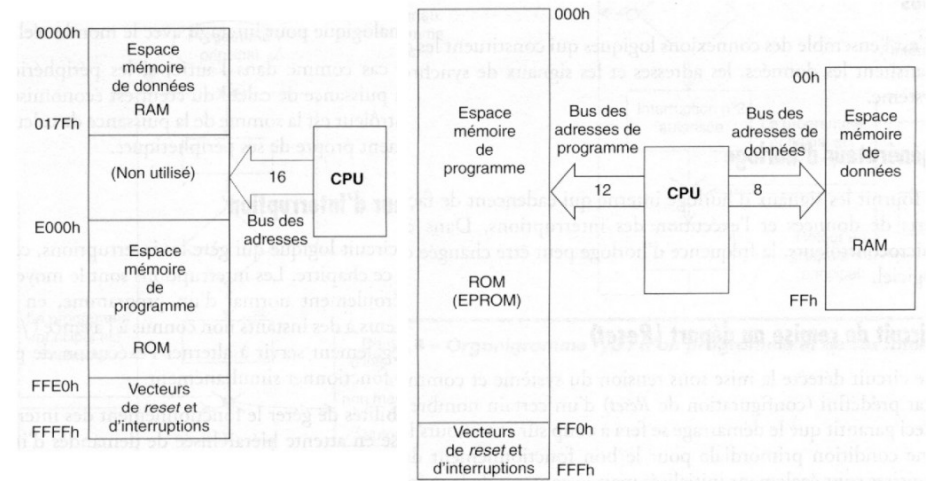


Why Important?

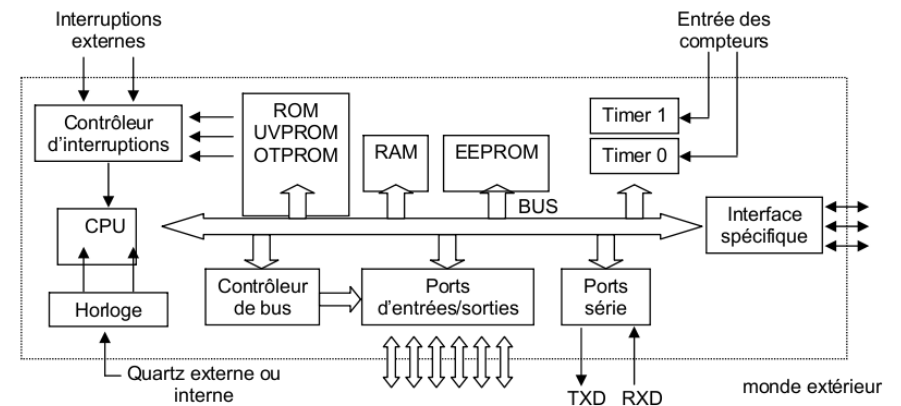
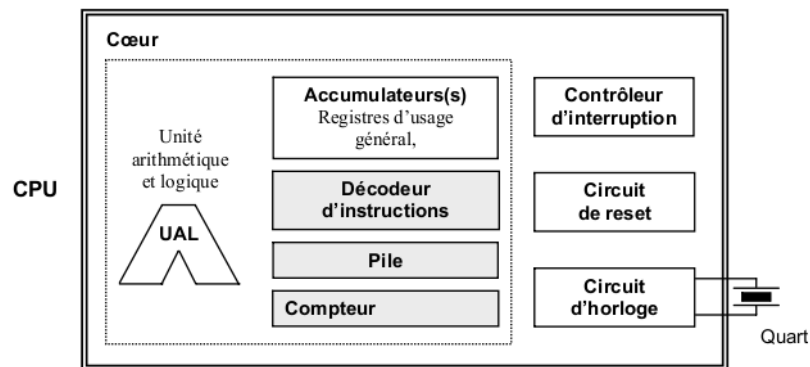
- Embedded Inside:
 - Automotive system
 - Airplanes
 - Toys
 - Medical Devices
 - Furniture
- Billions of units



- The microcontroller is the core of embedded systems.
- Nowadays many communication, digital entertainment, portable devices, are controlled by them.
- A designer should know what types of components he needs, ways to reduce production costs and product reliable.
 - Data size : 8 bits, 16bits, 32 bits
 - Frequency
 - Memory footprint
 - Kinds and # of peripherals

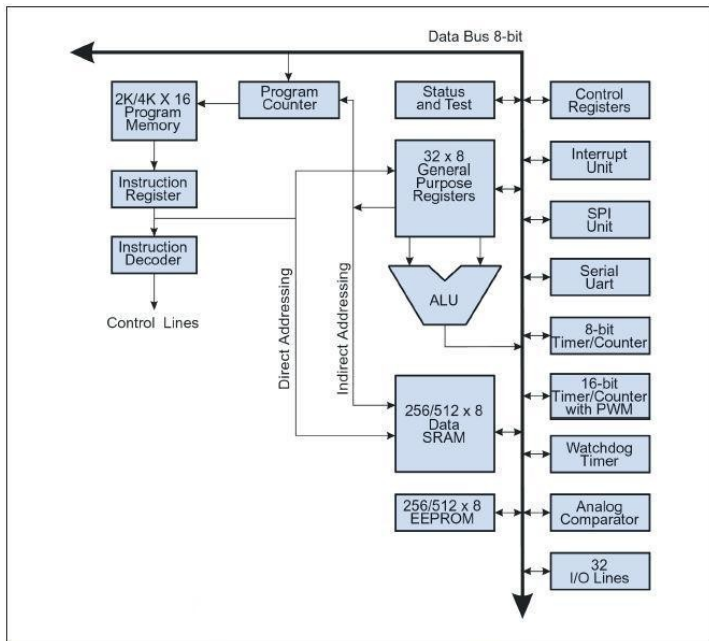
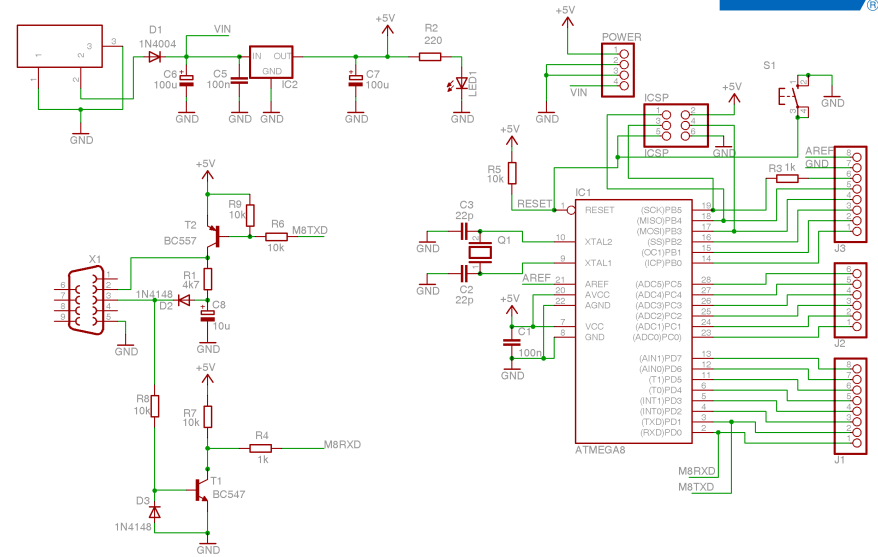
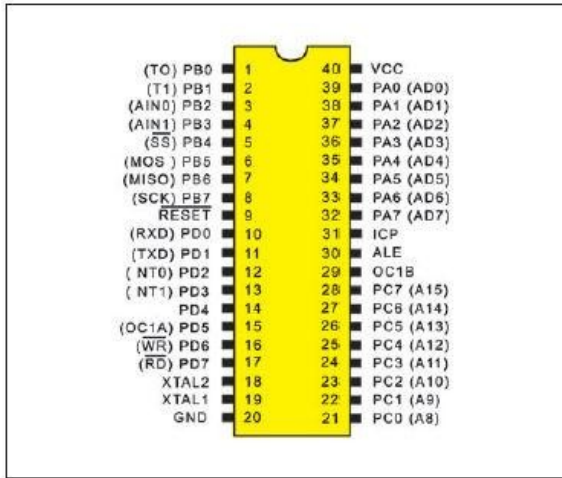


Les parties d'un microcontrôleur



Un système minimal programmable pour fonctionner à besoin :

- d'une unité centrale
- de mémoires *morte* pour le programme (PROM, EPROM,....)
- de mémoires *vive*, pour les calculs, pour stocker les données...
- de circuits interfaces, pour connecter les périphériques qui vont permettre la communication avec l'extérieur



ATmega8 test circuit

