

## TD3 : Diagramme de classes

- Define the attribute of the following classes  
(Point of view: which characteristics are important?)
  - An water pump
  - A chip
  - An ADC converter
  - An optical encoder
    - The AEDB-9140 series are three channel optical incremental encoder modules offered with a code wheel. When used with a code wheel, these low cost modules detect rotary position. Each module consists of a lensed LED source and a detector IC enclosed in a small plastic package. Due to a highly collimated light source and a unique photo detector array, these modules are extremely tolerant to mounting misalignment. The AEDB-9140 has two channel quadrature outputs plus a third channel index output. This index output is a 90 electrical degree high true index pulse which is generated once for each full rotation of the code wheel. The AEDB-9140 provides sophisticated motion control detection at a low cost, making them ideal for high volume applications. Typical applications include printers, plotters, tape drives, and industrial and factory automation equipment. *[source AEDB-9140 datasheet]*
    - Features:
      - Resolution from 100 CPR to 500CPR (Counts Per Revolution)
      - Low Cost
      - Small Size
      - Operating Temp.: -10°C to 85°C
      - TTL Compatible
      - Single 5V Supply

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- PWM
  - The Pulse Width Modulation (PWM) module of the C167CR signals can be generated within a wide range of output frequencies, which depends on:
    - CPU clock frequency ( $f_{CPU}$ )
    - counter resolution ( $f_{CPU} / 1$  or  $f_{CPU} / 64$ )
    - operating mode (edge/center aligned)
    - required PWM resolution (1-bit ... 16-bit)
  - Main involved registers
    - PP PWM Period and PW PWM Pulse Width
    - PT PWM Counter Register
    - PWMCON<sub>0</sub> PWM Control Register
      - Bit PTR : run/stop PWM and Bit PTI : counter resolution
    - PWMCON<sub>1</sub> PWM Control Register
      - Bit PM : mode
  - PWM OUT
    - P7.x,  $x \in [1..8]$
    - The PWM signals are XORed with the respective port latch outputs before being driven to the port pins
- On an use case diagram, define use cases, actors and system of interest
- On a class diagram, define a class “PWM” with
  - Attributes and methods
  - Visibility information

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- Define relation types between these components
  - Microphone
  - Charger
  - Warranty
  - Display
  - Speaker
  - Owner
  - Instructions

## TD3 : Diagramme de classes

- Use the method provided in lecture to find the classes and actors in the following textual description. Define a use case diagram and a class diagram.
  - Direct memory access (DMA) is a feature of modern computers that allows certain hardware subsystems within the computer to access system memory independently of the central processing unit (CPU). Without DMA, when the CPU is using programmed input/output, it is typically fully occupied for the entire duration of the read or write operation, and is thus unavailable to perform other work. With DMA, the CPU initiates the transfer, does other operations while the transfer is in progress, and receives an interrupt from the DMA controller when the operation is done. This feature is useful any time the CPU cannot keep up with the rate of data transfer, or where the CPU needs to perform useful work while waiting for a relatively slow I/O data transfer. Many hardware systems use DMA, including disk drive controllers, graphics cards, network cards and sound cards. DMA is also used for intra-chip data transfer in multi-core processors. Computers that have DMA channels can transfer data to and from devices with much less CPU overhead than computers without a DMA channel. Similarly, a processing element inside a multi-core processor can transfer data to and from its local memory without occupying its processor time, allowing computation and data transfer to proceed in parallel. DMA can also be used for "memory to memory" copying or moving of data within memory. DMA can offload expensive memory operations, such as large copies or scatter-gather operations, from the CPU to a dedicated DMA engine. An implementation example is the I/O Acceleration Technology.

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- Cruise control
  - On a class diagram, define
    - Classes
      - Methods
      - Attributes
    - Interfaces
    - Signals

