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| ***What are THE different types of signals And their features ?*** |
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# Introduction

The **treatment of signal** is the domain who developed the tools and techniques allowing of manipulate and understand signals. I can to summarize around of 4 functions:

* + Transform a signal
	+ Analysis a signal
	+ Create a signal
	+ To transmit a signal

A signal is a **representation physical** of a information has to transmit, the more often below **shape electric** . Signals are classified into 3 big types :

* + Signals logical
	+ Signals analog
	+ Signals digital

# The different types of signals

## The signal logic

A signal logic, also called " **signal binary** " Or signal " **everything Or nothing** ", is a signal whose magnitude can only take two values: **“0” or “1”** . We will generally talk of level high and of level down (Low) For to qualify the two states.

1

t

0

### Figure #1 : Example of a signal logic

Example : A switch can be open or off, a lamp can be lit or off.

## The signal analog

A signal analog designates a signal who represented a information by there variation of a

**greatness physics** , by example there variation of a temperature.

Température

Signal

t

t

### Figure #2 : Example of a signal analog

By extension, a greatness is said analog if its measure given **a number real varying continuously** . There are an infinity of values for an analog quantity (which is not the case of a greatness logic or digital).

## The signal digital

A digital signal is made up of **several logical signals** . It is therefore the whole logical signals that represent information. Generally speaking, binary information is encoded using multiple bits, the so-called data format (8, 16, 32 bits or more).

A0 A1 A2 A3 A4 A5 A6

A7

$49 $C6 $9C …

### Figure #3 : Example of a signal digital

The result is most of the time expressed in **hexadecimal** to make it easier to read. Example : The coded ASCII is coded on 7 bits to which we adds generally a bit of parity.

# The features of a signal

## The domain temporal

The domain temporal elates to the analysis of physical signals modeling any variation **over time** . The value of the signal is known, either at a few points discreet of there duration analysis, or possibly, For all the real numbers . it is visualized using an oscilloscope.

*Amplitude*

*maximale*

*Amplitude*

*crête à crête*

*Amplitude*

*moyenne*

**0**

**t**

***T***

***T***

### Figure #4 : Example of signal In THE domain temporal

* The **period** of a signal is the time interval T which separates two consecutive moments when the signal reproduces identically to itself. The period is expressed in **second** .
* The **frequency** F represents the number of periods T in one second. The frequency is expressed in **Hertz** (Hz) and is calculated from period : F = 1 / T.
* The **maximum amplitude** V max is the maximum value that the signal can reach during a period. The maximum amplitude expresses in **Volt** .
* The **peak-to-peak amplitude** Vcc is the difference between the maximum value and the minimal value. The peak-to-peak amplitude is expressed in **Volt** .
* The **average amplitude** V avg corresponds to the average of the values measured over a period. The average amplitude is expressed in **Volt** .

Certain signals, called rectangular or pulse signals, have a characteristic additional called the **report cyclical** .

**tH**

t

**T**

### Figure #5 : Example of signal rectangular

The report cyclic designates, For A signal periodic, the ratio between there duration of signal has the high state And there duration of the period.

Some periodic signals have a very specific name, such as the rectangular signal, it exist also the signal triangular and the signal sinusoidal.

t

t

**Triangulaire**

**Sinusoïdal**

**Figure #6 : Example of a signal triangular and sinusoidal**

## The frequency domain

The frequency domain relates to the analysis of physical signals exhibiting a frequency, this means that it is **the frequency which will carry the information** . There representation is done using a **frequency spectrum** . It is visualized using a spectrometer.

HAS leave of a signal temporal, it is necessary of retain two features : **its maximum amplitude (V max ) and its frequency (F).** It is due to these characteristics that it will be possible to trace the spectrum frequency of this signal.

Vmax

Vmax

t

**f0 = 440Hz**

**f**

**T0 = 2,27ms**

**Représentation temporelle**

**Représentation fréquentielle**

### Figure n°7: Example of temporal representation and its correspondence In THE domain frequency

In the frequency representation, the shape of the signal is no longer represented. For a signal perfect sinusoidal, this does not pose a problem since it will be very easy to reconstruct it knowing its amplitude and its frequency. Nevertheless, a signal sound is **there sum of a frequency set** . For the same note played on different instruments, the spectra will be different because each instrument has its own "timbre", this is what will allow recognize the instrument in question.