Al-Mustaqbal University College
Department of Medical Instrumentation Techniques Engineering
Class: 3rd
Subject: Digital Signal Processing
Lecturer: Dr. Rami Qays Malik
Lecture: 1- Introduction

Digital Signal Processing (DSP)

Introduction:

DSP is the mathematics, the algorithms, and the techniques used to manipulate these signals after they have been converted into a digital form. This includes a wide variety of goals, such as: enhancement of visual images, recognition and generation of speech, compression of data for storage and transmission, etc.

1-Signal: is a piece of information explained a function of time for examples voice & video signal. For example: **Cardiogram signal** as shown in figure 1 and **Image processing** which is shown in figure 2

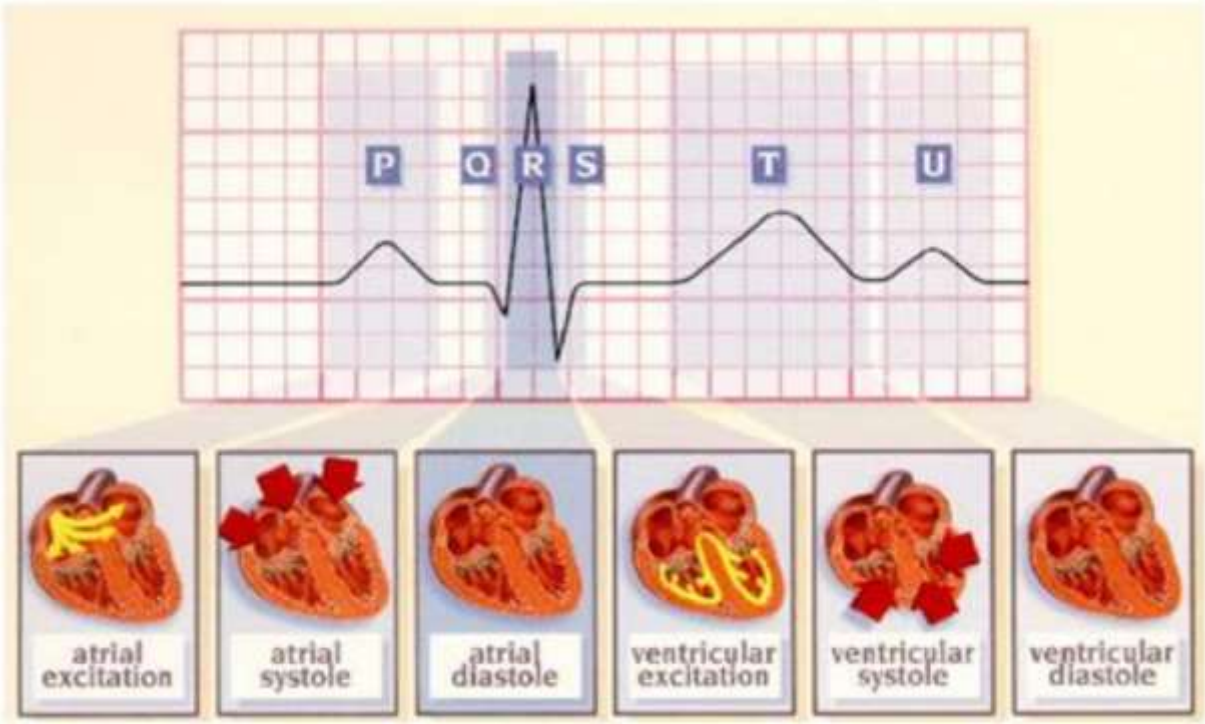

Fig.1: Cardiogram signal

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Fig 2: Image processing

2-System: is physical or mathematical (hardware or Software) that perform operation on Signal to extract or modify information for example a low-pass filter is a system to remove a high frequencies content from a signal.

Basic elements of DSP:

Most signals in nature are analog such as voltage, temperature, pressure, ECG, speech signals, …etc. Usually a transducer (sensor) is used to convert the non-electrical signal to the analog electrical signal (voltage). In its most general form, a DSP system consists of three main components, as illustrated in Fig.3.

• The analog-to-digital (A/D) converter transforms the analog signal x(t) at the system input into a digital signal x[n]. An A/D converter can be thought of as consisting of a sampler (creating a discrete-time signal), followed by a quantizer (creating discrete levels).

• The digital system performs the desired operations on the digital signal x[n] and produces a corresponding output y [n] also in digital form.

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• The digital-to-analog (D/A) converter transforms the digital output y[n] into an analog signal y(t) suitable for interfacing with the outside world.

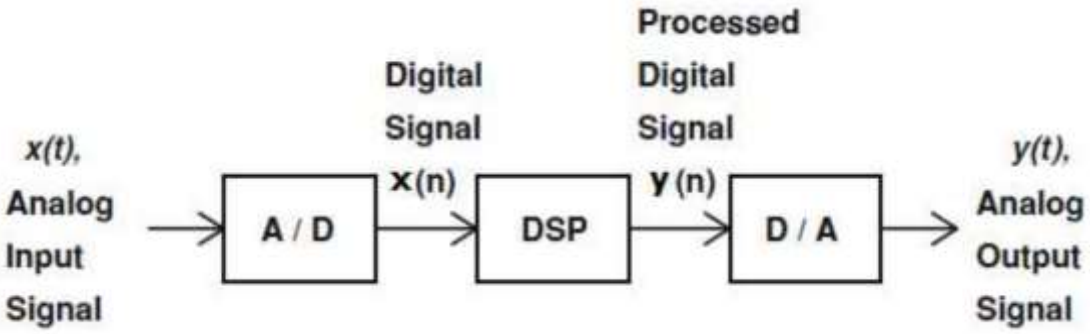

Fig 3: Block diagram of a generic signal processing system.

Digital Signal Processing Versus Analog Signal Processing

DSP has a number of advantages over analog signal processing (ASP),

namely:

Advantages:-

1- More flexible.

2- Often easier system upgrade.

3- Data easily stored in memory.

4- Better control over accuracy requirements.

5- DSP is less susceptible to noise and power supply disturbances than ASP.

Limitations:

1- A/D & signal processors speed: wide-band signals still difficult to treat

(real-time systems).

2- Finite word-length effect.

3- Cost/complexity added by A/D and D/A conversion.

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DSP Applications:

The figure below shows the DSP applications. Many more areas are increasingly being explored by engineers and scientists. Applications of DSP techniques will continue to have profound impacts and improve our lives.

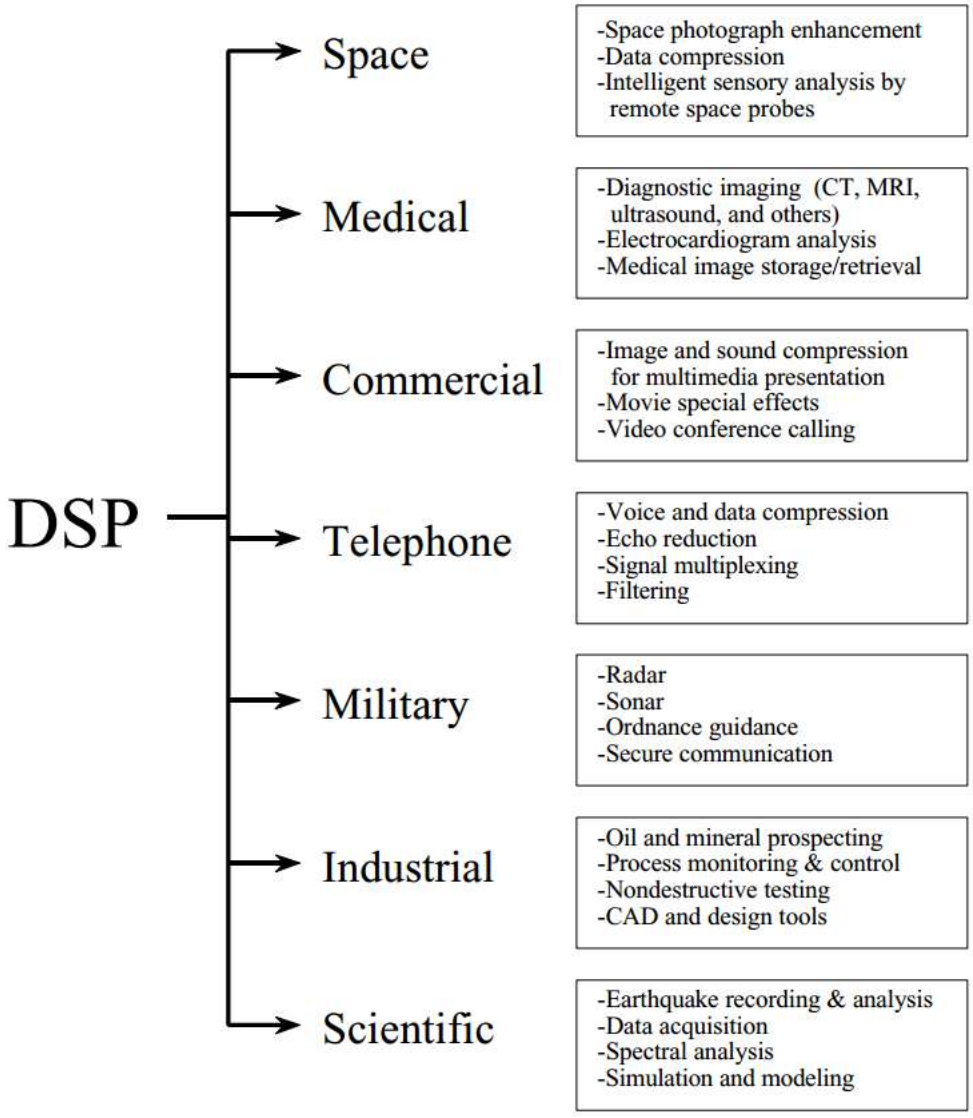

Fig 4: DSP Applications