Characteristics of biosignals

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Introduction

A biosignal can be defined as a physiological phenomenom, a body variable that can be measured and monitored. Since the number of physiological mechanisms is nearly unlimited, the diversity of biosignals is huge. This can also be justified by the fact that there are many ways to classify the biosignals:

- PERMANENT/INDUCED (INTRINSIC/EXTRINSIC TO BODY)
- Static/Dynamic
- Origin

As referred the variety of biosignals is nearly unlimited, this makes a unique classification of biosignals impossible. Their classification is based on their characteristics.

Classification

Intrinsic/Extrinsic to body

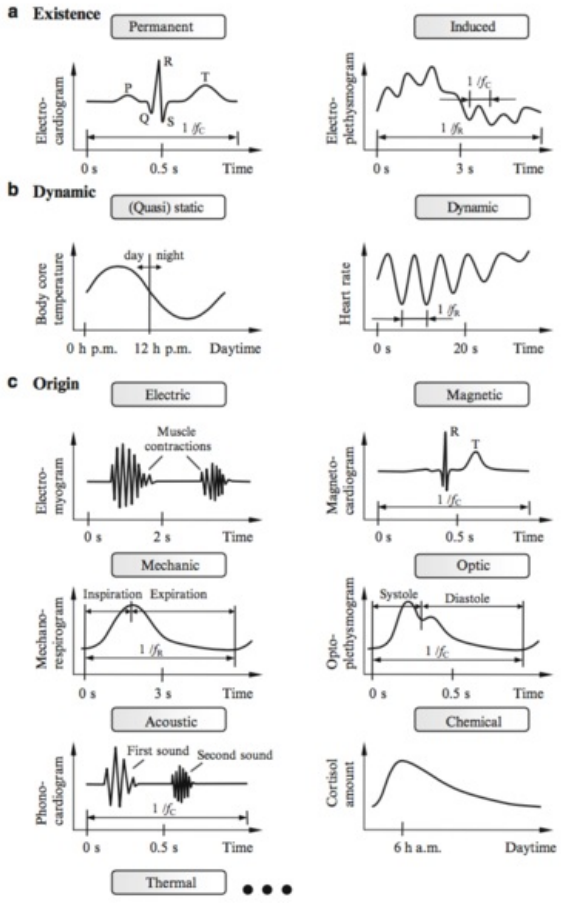
This first method takes the existence of biosignals as a way to classify them, dividing the biosignals into:

- **Permanent Biosignals**

This kind of Biosignals exist without any excitation from outside body and are always present in the Human Body because source is inside the body. One example is the electrocardiographic signal (ECG) induced by electrical heart muscle excitation with the peaks P-Q-R-T-S.

- **Induced Biosignals**

This group of biosignals includes biosignals that are artificially induced. In contrast with the permanent biosignals this ones exist only during the excitation. It means that, when the artificial induction is over the induced biosignal decays with a time constant determined by the body properties. One example is electric plethsysmography, here an artificial current is induced in the tissue.



Dynamic

The second method takes in consideration the dynamic nature of the biosignal according to:

- **Static Biosignal**

Static biosignals carry information during their steady-state lever wich may show slow changes over the time. For example the body temperature, which shows slightly changes during the day, that's why we can consider it a static biosignal.

- **Dynamic Biosignal**

Dynamic biosignals show big changes during time, for example the heart rate. The course of the heart rate represents a highly dynamic biosignal.

Origin

The last method is using the origin of the biosignal as a basis for their classification, here are some examples:

- **Electric Biosignals**
- **Magnetic Biosignals**

- **Mechanic Biosignals**
- **Optic Biosignals**
- **Acoustic Biosignals**
- **Chemical Biosignals**
- **Thermal Biosignal**

Active vs Passive

Biosignals can also be divided in two main groups according to their source for measurement: **Active** and **Passive**.

Active

These are biosignals where the energy source for measurement is the patient himself. Here we have two types of "sub" biosignals:

- Electrical Biosignals: ECG; EEG; EMG.
- Non-electrical biosignals: Thermography and pH for example.

Passive

These ones, the energy source for measurement is not the patient e.g. wrist oximeter.

== Electric Biosignals == WHAT HAS THIS GOT TO DO WITH CHARACTERISTICS OF SIGNALS???

Knowing the different signals from the brain and from other parts of the body is very important to understand the reason of many physiological and pathological functions of these same ones. Electric biosignals can be defined as a change in the electric current across a specialized tissue, organ or cell like the nervous system for example. Some examples of eletric biosignals are:

- Electrocardiogram (ECG)
- Electroencephalogram (EEG)
- Electromyogram (EMG)

ECG

The electrocardiogram is a graphic which is produced by an electrocardigraph. This device records the heart activity over the time. When the electrical waves which cause the heart muscles to contract passthrough the body, they can be measured by the electrodes placed on the patient skin, providing a view of the hearth muscle activity. A typical ECG tracing is a cycle of three entities:

- **P wave** (atrial depolarization)
- **QRS** (ventricular depolarization)
- **T wave** (ventricular repolarization)

Electrocardiography

EEG

Electroencephalography is the measurement of the brain electrical activity, recordede from electrodes placed on the scalp. When these signals are analyzed they are used as a diagnostic tool to detect pathologies associated with strange electrical behaviour.

References

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