Abstract

Physiological systems generate electrical signals during normal operation. These signals can be recorded and represented, constituting a key element of aid to the diagnosis in current clinical practice. However, the visual inspection of these signals is not enough to extract the important information. Several processing automatic techniques are designed to maximize the quantity and quality of the data from these physiological records. Among all the non-linear methods, those related to the estimation of the regularity of the underlying signals are remarkable. These non-linear methods are offering over the years very significant results in this area. However, they are very sensitive to interferences in signals, having an appreciable degradation of their diagnostic capability if biomedical signals are contaminated. Short impulses show up quite often in physiological records contributing to this degradation. They are known in this context as *spikes*.

This paper is intended to address the problems associated with the presence of *spikes* in biosignals, characterizing its influence on several regularity measures, in order to foresee this degradation and apply the appropiate countermeasure. In particular, the regularity measures characterized are: *Approximate Entropy* (ApEn), *Sample Entropy* (SampEn), *Lempel Ziv Complexity* (LZC) and *Detrended Fluctuation Analysis* (DFA). All these methods have given satisfactory results in the field of biosignal processing. This characterization is carried out through a complete experimental study in which the presence of *spikes* is controlled and applied to different physiological records. After that, the influence from the *spikes* is analysed quantitatively and qualitatively.

The results show that the *spikes* properties, as well as the parameters of the regular measures, affect in different ways. In general, LZC is the more robust measure among all the signals considered and contaminated with *spikes*. DFA is more vulnerable. However, the ability to discern between classes remains in many cases, despite the changes generated in the absolute entropy values.