

Online Texture Analysis Tutorials applied on Medical Images

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Abstract

Image representation through relevant and discriminant descriptors is one of the most important topics in the image processing field. This work aims to create a set of tutorials on texture analysis to facilitate its understanding and to improve its usage on medical images applications.

Key words: Texture Descriptors, Medical Images, Image Analysis

Introduction

Image representation is a relevant topic in the image processing field that aim to represent an image through relevant and discriminant descriptors. There are three types of descriptors that can be extracted from an image: color, shape or texture.

The image representation through texture analysis have been largely applied in medical imaging problems in order to study and/or characterize abnormalities, or to segment structure or tissues [1,2]. These methods, called Computer Aided Diagnosis (CAD), aim to help specialists in the proper interpretation of medical images.

The main goal of this work is to develop tutorials that facilitate the understanding of methods that compute texture descriptors, using medical imaging examples in a web environment. These tutorials present a description of the texture extraction methods, its proper usage and interpretation of results.

Results and Discussion

We generated four different tutorials containing a description of texture analysis methods: image histogram, run length matrix, gray level gradient, local binary pattern [3]. Each tutorial contained a brief introduction about the method, python implementation, statistics that may be extracted from each method, medical images examples, and equations. These tutorials were developed and are available on an online environment called Adessowiki [4].

Two examples of texture descriptors applied on medical images are shown on Figure 1: the run-length tutorial presents an image, its run-length matrix and some statistics that may be extracted from this matrix to represent the image; the local binary pattern tutorial demonstrates that this method is invariant/robust to illumination variations in the original image. This invariance is relevant since in medical images applications it is usual to

have illumination variations due to different settings on the acquisition equipment.

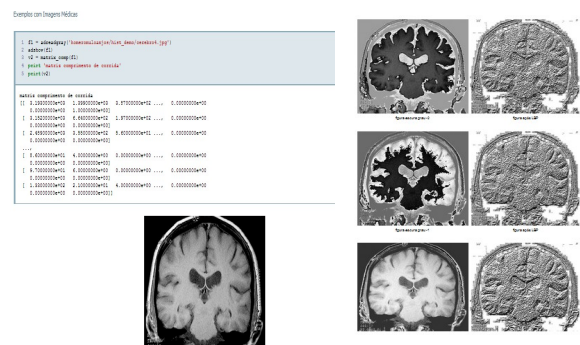


Figure 1. Texture analysis applied on brain magnetic resonance imaging: original image and its corresponding run-length matrix on the left; demonstration of local binary pattern robustness to illumination variations on the right.

Conclusions

The development of texture analysis tutorials improves its understanding, motivates its usage in several applications, and amplifies the disponibility of these type of material online. Besides, the examples using medical images showed the potential of using texture descriptors to analyze and represent images, and its possible usability in CAD tools that aim to help specialists in the patient's diagnosis and follow-up over time.

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