Automatic vertebrae identification and segmentation procedure in spinal column CT scans

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ABSTRACT

Segmentation and identification of the different tissues from CT scans presents a significant role in many medical imaging applications. In particular, the segmentation and identification of vertebrae is relevant in the diagnosis of spine related diseases [1]. As manual segmentation is a time-consuming process that depends on an external operator, the pursuit of an automatic procedure is a highly active research field. Such task poses many challenges due to the complex shape of vertebrae. Most commonly straightforward techniques, such as thresholding and region growing, generally lack of the required precision [2].

In the present work, a methodology aiming at the automatic identification and segmentation of vertebrae in spinal column CT scans with minimal manual user intervention is proposed. Using databases, available to the research group, of pre-identified and segmented vertebrae, a procedure that orientates each sample vertebra in a consistent manner is developed. Then, after every vertebra is properly normalized, vertebrae geometric modes are extracted through the use of a Machine Learning algorithm. On the basis of the information extracted from that geometric modes, it is possible to identify vertebrae in new CT scans not belonging to the initial databases.

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REFERENCES