

A 3d and 4d anatomical study of the human heart: analysis by direct volume rendering technique

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In this report we demonstrated an innovative use of 3D and 4D volume rendering, processing the data set images obtained by CT on heart of subjects not affected by any cardiologic disorders. This method is a direct technique for visualizing primitive volumes without any intermediate conversion of the volume data to surface presentation. Here, we are able to highlight all anatomical structures of the heart examining them contemporarily in the same image or selecting a tissue type. The present report demonstrates how the manipulation of appropriate algorithms permits to meliorate the interactive anatomical morphology visualization, observing the heart within thorax, contemporarily, and creating a good perception of depth. Besides, it was possible to study the integrity of papillary muscles, or the fibrous tissue of cardiac valve and cordae tendineae, or finally to designate the exact morphology and location of coronary arteries studying and describing their wall morphology. Furthermore, by 4D analysis it was possible to obtain three-dimensional images in movement, highlighting both the movement of the vessels during cardiac phases and the modification of internal cardiac structures during these phases. Our results demonstrated that one of the greatest advantage of algorithmic modifications of volume rendering is that this method provides all the necessary informations in a single radiologic study, meliorating anatomical description of all cardiac structures. Moreover, avoiding the invasive diagnostic methods as well as coronarography this methods allows to meliorate clinical study of the region also facilitating the therapeutic plans of the cardiac disease.