

LABELING METHODS IN MEDICAL IMAGING

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Labeling techniques are used in medical information visualization applications. These techniques are relevant in assessing the patient's health, in establishing diagnosis and in making decisions on the treatment required in each case. Labeling techniques, including tags, annotations and bookmarks, are an effective way to assimilate knowledge, both in training future doctors and in continuing medical education (CME). Moreover, labels and annotations are necessary in telemedicine, teleradiology, teleoncology, telehealth and teleeducation. Also are particularly useful in collaborative decisions. This paper aims to identify and investigate different labeling techniques of medical data. The emphasis is on 2D slice views and 3D representations health data techniques. The data can be of different categories: bone structures, organs or vasculature. Using these techniques it can be represented as 3D rendered volumes of information. Information can be achieved from different medical equipment. This equipment use technologies like magnetic resonance, tomography computer or angiography. From the medical data properties and their representation points of view, all these techniques are targeting the clear association of labels with visualized structures. These labels must be visible, legible, but in the same time not to affect the quality or representation of other anatomical structures. For example, in the presentation of an intestinal occlusion, abdominal tags marking different structures should not overlap with the tag which is identifying the patient's acute problem. Under industry standards and medical data representation (surface, slice, 2D/3D visualization, waveform, s.o.) we drew some guidelines in choosing the best labeling method. In the specialty literature, labeling term refers to the automatic identification of anatomical structures, based on the prediction techniques, and on the manual labeling process. Thus, by means of probabilistic models based on Gibbs distribution applied to the images obtained using the magnetic resonance, the spatial information is determined to detect abnormal discs and spine vertebrae [1]. Using the *Maximum a Posteriori Probability (MAP)* method, the cerebral arteries forming the Willis Circle (*CoW*) are modeled as a relational and bifurcated graph whose knots are defined as points in a Riemannian space and labeled, with an accuracy of 95%, on the images obtained after performing a magnetic resonance angiography [2]. Regarding the manual tagging, we identified five methods of labeling: internal, external, necklace maps, boundary and eccentric labeling. These techniques are applicable depending on the type of medical data: medical data containing tubular structures (vessels, arteries) or specific types of representations such as surface-based, slice rendered or volume-based. In [3] is shown an automatic extraction method of tracheobronchial tree, obtained after tomography (*CT*) investigation and an automatic identification and labeling using internal labels of bronchial branches. A necklace type approach is presented in [4] where the authors define a map made up of different sets of colored forms surrounding the cancerous tumor and represents a cluster of voxels exhibiting similar perfusion characteristics.

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