

Multimodal Medical Image Fusion: Medical Modalities, Multimodal Databases, Fusion Techniques, and Quality Metrics

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Abstract

Over the past two decades, medical imaging has been extensively applied to diagnose diseases. Medical experts continue to have difficulties in diagnosing diseases with a single modality owing to a lack of information in this domain. Image fusion maybe use to merge images of specific organs with diseases from a variety of medical imaging systems. Anatomical and physiological data may be included in multi-modality image fusion, making diagnosis simpler. It is a difficult challenge to find the best multimodal medical database with fusion quality evaluation for assessing recommended image fusion methods. As a result, this article provides a complete overview of multimodal medical image fusion methodologies, databases, and quality measurements. In this talk, a compendious review of different medical imaging modalities and evaluation of related multimodal databases along with the statistical results is provided. The medical imaging modalities are organized based on radiation, visible-light imaging, microscopy, and multimodal imaging. The medical imaging acquisition is categorized into invasive or non-invasive techniques. The fusion techniques are classified into six main categories: frequency fusion, spatial fusion, decision-level fusion, deep learning, hybrid fusion, and sparse representation fusion. In addition, the associated diseases for each modality and fusion approach are presented. The quality assessments fusion metrics are also encapsulated in this article.

This survey provides a baseline guideline to medical experts in this technical domain that may combine preoperative, intraoperative, and postoperative imaging, Multi-sensor fusion for disease detection, etc. The advantages and drawbacks of the current literature are discussed, and future insights are provided accordingly.