

Identification and Segmentation of Multi-Panel Images in Biomedical Journal Articles

B. Srinivasan, S. Antani, D. Demner-Fushman, G. R. Thoma

Abstract:

Essential information is often conveyed pictorially (images, illustrations, graphs, charts, etc.) in biomedical publications. Use of image information in search for evidence for clinical decision support may improve retrieval quality. In addition user experience may be improved by showing relevant images along with the bibliographic reference. Articles often contain multiple images in a single figure, called multi-panel images, which are often identified through subfigure labels, e.g., “Figure 1(a), ... Figure 1(b), ...”, in the figure captions or text mentions. Single image panels are necessary, however, to classify image modality and annotate them for evidence-based utility. We present results for multi-panel image detection and segmentation based on image characteristics and application of Natural Language Processing techniques for parsing of figure captions. The latter are used as an estimate for initializing a two-phase algorithm. The method uses a progressive refinement approach that looks for strong white or black lines and sharp transitions between image panels at border separating pixels. Initial experiments on 516 figure images resulted in 95.54% accuracy in correctly identifying and segmenting the sub-images. The method also identifies potential segmentation errors and flags them for supervised segmentation.