

A new human heart vessel identification, segmentation and 3D reconstruction mechanism

ABSTRACT

Background: The identification and segmentation of inhomogeneous image regions is one of the most challenging issues nowadays. The surface vessels of the human heart are important for the surgeons to locate the region where to perform the surgery and to avoid surgical injuries. In addition, such identification, segmentation, and visualisation helps novice surgeons in the training phase of cardiac surgery. **Methods:** This article introduces a new mechanism for identifying the position of vessels leading to the performance of surgery by enhancement of the input image. In addition, develop a 3D vessel reconstruction out of a single-view of a real human heart colour image obtained during open-heart surgery. **Results:** Reduces the time required for locating the vessel region of interest (ROI). The vessel ROI must appear clearly for the surgeons. Furthermore, reduces the time required for training cardiac surgery of the novice surgeons. The 94.42% accuracy rate of the proposed vessel segmentation method using RGB colour space compares to other colour spaces. **Conclusions:** The advantage of this mechanism is to help the surgeons to perform surgery in less time, avoid surgical errors, and to reduce surgical effort. Moreover, the proposed technique can reconstruct the 3D vessel model from a single image to facilitate learning of the heart anatomy as well as training of cardiac surgery for the novice surgeons. Furthermore, extensive experiments have been conducted which reveal the superior performance of the proposed mechanism compared to the state of the art methods.

Keyword: 3D model; Heart surgery; Image enhancement; Vessel segmentations