A Method for Fast Browsing of Coronary Angiography Studies

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Cardiologists interpreting 2D coronary angiography videos often have to browse thousands of medical images for visual interpretation and diagnosis. Angiography studies are organized into several (20-30) video runs depicting the coronary arteries from different viewpoints. Currently, a specialist successively opens up each of the video run, and examines all the frames in the sequence for vessel anomaly-depicting images. Fast browsing methods that allow visually indexed navigation of the content, can help lower the burden on clinicians and reduce the time to diagnose.

We present a method to organize images from video runs of a coronary angiogram study into a storyboard by deriving a set of key images that represent the relevant coronary arteries being depicted. Specifically, a measure of vessel visibility is developed based on the number of tube-like vessel structures detected within images of the sequence. Curves extracted from edge-filtered images are paired to form tube-like structures using a variant of dynamic time warping. Changes in the vessel visibility measure are then tracked through the sequence to identify salient peaks and their corresponding images are chosen as key frames. Each key frame is annotated by its study, run and image number so that the section of the raw video sequence between consecutive key-frames from the same run can be displayed by selecting the key frame, thus serving as a visual index.

Using a ground truth database of 3647 video runs with 85022 images corresponding to 91 studies for 70 patients with various forms of coronary artery disease, we recorded the reduction in diagnosis time by physicians using the storyboard-based browsing. We recorded an 84.3% reduction in time for diagnosis using our method in contrast to raw browsing of video runs of coronary angiogram studies, thus proving the value of fast browsing methods in reducing the diagnosis time.