AbstractID: 6724 Title: Automatic skin and chest-wall edge identification in breast portal images using PTGs trained by AHK I

Since the advent of the EPIDs (Electronic Portal Imaging Devices), semi-automatic portal image verification systems have been developed for clinical applications. For those systems to be clinically feasible for the real-time patient setup verifications, they should be accurate, fast, robust, and fully automatic. The edge-based matching techniques, such as the Chamfer matching method, satisfy the first two criteria, but still need human interaction in order to prepare reference images and fail to detect relatively large errors in positioning. Automatic anatomic identification methods may eliminate the human interaction in preparing reference images, increase robustness by widening the attraction basin around the global minimum in the search space, and eliminate the human error introduced while contours are drawn using computer input devices.
In this study, three pairs of PTGs (Polynomial Threshold Gates) of order one, two, and three were trained by AHK I (Adaptive Ho-Kashyap I) methods to identify the skin and chest-wall edges in breast portal images. Nine edge and edge-relation features were extracted from 328 breast portal images of 15 patients to train the PTGs. The identification results were overlaid in the enhanced portal images and the number of misidentifications was counted. The results showed less than 2% misidentification for both skin and chest-wall edge identifications. Though this method has not been fully optimized, it reduces the human interaction and increases the accuracy of the verification systems.