ABSTRACT

Medical image acquisition technologies such as CT Scan have become the main equipment in the world of medicine. This technology can acquire images of internal organs, so it is very helpful for doctors to carry out an in-depth analysis of diseases in a patient. One of urology diseases that utilizes CT Scan technology is the field of Urology where the resulting CT Scan images are stored in the DICOM format which is an international standard. This medical image is then converted to an RGB image format for processing and the diagnosis process determines the presence or absence of kidney stones and the size of the stone. This information becomes a reference for taking further action. Currently, the diagnosis of kidney stones on CT scans by doctors is still manual. Doctors see slice per slice CT Scan image, if in a slice of kidney stones, then the next step is to measure the cross-sectional area of kidney stone. This method requires a relatively long time, doctor’s accuracy in determining the area of kidney stones and the resulting area is still not in accordance with the actual size.

This dissertation research proposes “Development of Kidney Stone Detection System and Calculation of Area of View in CT Scan Images”. This system consists of: methods and algorithms for detection and segmentation of kidney stones using an automatic and semi-automatic model approach; and an algorithm for calculating the area of a cross-section of a kidney stone. Abdominal CT scan image data used are from patients with kidney stones from children to adulthood. The automatic method consists of 9 stages consisting of: the first stage of conversion of DICOM images into gray images, the second reverses the color of the image, the third image intensity settings, the four stages of morphology with binary approach, the fifth ROI detection, the six ROI cropping, the seventh edge detection, the eighth segmentation kidney with age approach, ninth kidney stone detection and kidney
stone area segment calculation. The semi-automatic method consists of 3 stages: first the conversion of the DICOM image into BMP, the second is the determination of 4 points of cropping the kidney area manually, the third segmentation of kidney stones and the calculation of the segment of kidney stone areas.

The system has been tested on 44 CT images which were acquired from 18 patients suffering from radiopaque kidney stones, and as many as 5 CT images that did not have radiopaque kidney stones. From the analysis of the entire image of the test results, it can be concluded that the automatic detection method has not been successful in precisely detecting all kidney stones contained in each image, but instead the semi-automatic method successfully detects kidney stones from all input images and marks the stone area in the kidney. Calculation of the cross-sectional area of kidney stones produced from the semi-automatic method precisely matches the actual area of the image and is more accurate than the manual method by the doctor and the automatic method.

Keywords: CT Scan Image, Kidney Stone, Automatic Method, Semi-Automatic Method, Detection, Segmentation, Cross-sectional Area of Kidney Stones.