Characterize Image Segmentation at Dental Periapical Radiograph using Receiver Operating Characteritistic Analysis

Bernard Y. Tumbelaka, Heru Wandira, Suhardjo Sitam[1]

Departments of Physics, Faculty of Mathematics and Natural Sciences, and [1]Radiology Dentistry, Faculty of Dentistry, University of Padjadjaran, Jatinangor, Indonesia

Email: btumbelaka@ymail.com

Abstract

Objective: Normally, dental periapical radiography could not be directly used to help a dentist diagnosing the stages of the pulp such as the normal pulp, reversible and irreversible pulpitis and necrotic and judging to be in need of treatment. Image segmentation could be applied to identify its region of interest (ROI) in order to find its original feature extractions with an acceptable accuracy. Our research aims to characterize image segmentation at dental periapical radiography using receiver operating characteritistic (ROC) analysis when various decision attitudes, from interventionist to non-interventionist are held. **Material and Methods:** Twenty of periapical radiographs were shown to a dentist, who was asked to specify, for the stages of the pulp such as the normal pulp, the reversible and irreversible pulpitis and the necrotic could be extracted. Feature extraction analysis is treated by applying bilateral filter of an image sampled to find the best contrast of the filtered image. It was needed to tabulate data using a descriptive statistical method. These secondary data could be obtained by processing through classification as well as the operational criteria.The original image segmented with an acceptable accuracy could be constructed by plotting the sensitivity (or true positive prediction) of decisions made against the false positive prediction (equivalent to 1-specificity). **Results:** Image segmentation validated by the ROC curve had been compared with its original image segmentation where it was found the range of accuracy from 98% to 99%, sensitivity from 90% to 99%, and specificity between 98 % and 99%. **Conclusion**: Image segmentation using ROC analysis has been acceptable to the sensitivity and the specifivity but the sensitivity tends to be improved cause the lower intensity if only if the periapical radiography is characterized at the frequential domain.

Keywords: periapical radiography image, region of interest (ROI), receiver operating characteritistics (ROC), bilateral filter, frequential domain.

1. Introduction

The computer science and technology developments have caused, the digital image processing has become very important to be used to help a dentist reading the dental X-ray periapical radiograph both diagnose and therapy best. Image processing as an acceptable tool has been developed to process the radiograph easier and to search the hidden information automatically that it could not be found directly with the eyes. The image density is filled by the true and false information that must be filtered both spatial and frequential.domains then characterize the image structure through a segmentation image processing [1]. Image segmentation is used to separate an object to the other object with its background, so that it gives the image segmented that represented more simple and easier to be analized.