UNIVERSITI TEKNOLOGI MARA

FAULTY DETECTION ON BROADCASTING EQUIPMENT USING THERMAL INFRARED IMAGING APPROACH

MOHD RIZMAN BIN SULTAN MOHD

Thesis submitted in fulfillment
of the requirements for the degree of
Master of Science
(Electrical Engineering)

Faculty of Electrical Engineering

November 2019

ABSTRACT

Thermal infrared is a non-invasive method for sensing temperature on specific time frame of its region of interest. It had been widely used as faulty detection on many applications including electrical transmission grid and electronics board. Broadcasting equipment operates 24-hours per day and yet sensing the faulty on fully functional equipment requires a non-invasive method. Broadcasting equipment separated into two; studio site and transmission site. Radio broadcasting equipment in studio sites has five main stages. This research has focused on the equipment inside the on-air studio. The broadcasting equipment in the studio is further classified into several section and sub-section. Acquiring thermal infrared images requires image processing method. Since the thermal infrared camera captures thermal images in grey-scale images, it must be converted into pseudo-coloured images for hot spot detection. Before conversion take place, raw thermal images must be processed for a noise cancellation process called histogram equalization method. This method used to adjust the histogram level of thermal images to enhance its quality. These converted pseudo-coloured thermal images then processed in image segmentation method. The thermal images separated and segregated into its own cluster based on the L*a*b colour space. This segmentation applies to differentiate the focus point from the whole images to ease the faulty detection. This study presents various method of image segmentation for pseudo-coloured thermal images. Based on the result, it is shown that k-means clustering had given the best evaluation measurement of PSNR, MSE and SSIM compared with fuzzy c-means clustering. This image processing method performed in MATLAB R2015a software and average time to execute is less than 1 seconds.

ACKNOWLEDGEMENT

Firstly, I wish to thank God for giving me the opportunity to embark on my Master and for completing this long and challenging journey successfully. My gratitude and thanks go to my supervisors Dr. Sukreen Hana Herman, and co-supervisor, Dr. Zaiton Shariff. Thank you for the support, patience and ideas in assisting me with this project.

I also would like to express my gratitude to the staff of Jabatan Penyiaran Malaysia Negeri Perak, especially, Mrs. Nor'ain Bakir, Mr. Mohamad Ariff Ismail and Mr. Mohd Zulbairi Ghazali for providing the facilities, knowledge and assistance. Special thanks to my colleagues and friends for helping me with this research.

Finally, this thesis is dedicated to my wife and both of my parents for the vision and determination to educate me. This piece of victory is dedicated to you. Alhamdulillah.

TABLE OF CONTENTS