ABSTRACT

Radio frequency ablation (Radio Frequency Ablation) is a minimally invasive therapy method that uses high-frequency currents to produce heat energy to damage or destroy abnormal tissue [1]. Radio frequency ablation devices (RF ablation) are generally equipped with an integrated temperature measurement mechanism and are assisted by an MRI, CT Scan, or Ultrasonography system guidance. However, the use of these devices has not been efficient due to high costs and not yet equipped with an appropriate network temperature monitoring system. By monitoring the temperature on the network, temperature distribution information that can be used as a reference for the implementation of ablation and the ablation procedure used can be more effective.

In this study, a temperature detection device was designed for the distribution of electrodes and tissues during the ablation process using a thermal camera sensor as a temperature detector with a measuring range of 55ºC-100ºC. The sensor will be placed over the ablation area with an FOV of 55º from the object. The temperature distribution in the ablation area will be monitored by a non-contact thermal camera sensor and an infrared thermometer as a comparison of data. The evaluation of the temperature distribution will be monitored in real time through the Raspberry Pi interface to a computer with the output in the form of a thermal image of the temperature distribution on the electrodes and the ablation area on the test medium (beef liver).

The results of this study indicate that the detection system for radio frequency ablation electrode distribution and liver phantom using a non-contact thermal camera sensor has an error value of 8.1% in its reading. The detected temperature changes are around 52.1ºC – 65.3ºC with temperature changes influenced by the distance between the camera sensor and the optimal test object at a distance of 10 cm and the increase in power also affects changes in the temperature gain value on the test object. As well as image processing using image segmentation based on K-means klustering, the optimal cluster value is obtained at K=5.

Keywords: Radio Frequency Ablation, Thermal Camera Sensor, Temperature Distribution, Image Segmentation, Cluster.