A Semi-Automatic Approach For Thermographic Inspection Of Electrical Installations Within Buildings

A.S. Nazmul Huda[a], Soib Taib[a,*], Mohd Shawal Jadin[b], Dahaman Ishak[a]

[a] School of Electrical and Electronic Engineering, Universiti Sains Malaysia, 14300 Nibong Tebal, Pulau Pinang, Malaysia, [b] Faculty of Electrical & Electronic Engineering, Universiti Malaysia Pahang, 26600 Pekan, Pahang, Malaysia

Abstract

Maintaining the reliability of electrical installation has become part of the energy efficiency practices in building. The degradation of electrical installations can cause overheating, which can lead to subsequent failure of the equipments that can potentially result in unplanned power outages, possible injury and fire hazard. In addition, the efficiency of an electrical system becomes low prior to failure, thus energy is spent generating heat and causing unnecessary energy loses. Therefore, early prevention is required to avoid this situation by monitoring the reliability of the electrical installations through energy audit practices. This article proposes a semi-automatic approach for evaluating the thermal condition of electrical installations within the building in Malaysia by analyzing its infrared image. Initially the interest regions of the images are manually segmented. Then the statistical features of first order histogram and gray level co-occurrence matrix features as well as the differences of feature parameters between hot and reference regions are extracted from segmented regions. Principle component analysis is applied for the best features selection and at the final stage, the condition of electrical equipments will be classified using multilayered perceptron neural network. The performances of multilayered perceptron networks have been compared and tested with various training algorithms. The classification accuracy of multilayered perceptron networks are also compared with discriminant analysis classifier and it is found that the multilayered perceptron network using Levenberg–Marquardt algorithm gives the best testing performance. The result shows that the maximum testing accuracy 78.5% was obtained.

Keywords: Electrical installation; Infrared image; Multilayered perceptron; Statistical features; Conditions classification; Building

DOI:10.1016/j.enbuild.2012.09.014