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Inspection

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With the development of high-voltage transmission grids, both urban and rural areas are paved with electricity transmission networks to provide power support. The transmission networks are supported by power transmission tower, insulators, where insulators, as insulation modules, are suspending the transmission lines. Thus insulators play an important role in protecting the safe operation of transmission line networks by avoiding short-circuit grounding through the tower. When the insulators are broken (or otherwise damaged), the transmission network would be exposed to danger. Since the broken insulator emits ultraviolet photons, an ultraviolet photon sensor can be used to inspect whether an insulator is broken. However, there may exist multiple insulators in the image because of the restricted incident angle of the sensor. Therefore, an intelligent identification system for insulators recognition need to be designed.

To build the intelligent identification system, the images of insulators in the transmission line towers are studied carefully. Firstly, traditional image processing methods are used, including morphological method and filter method. The optimal binary images are attained from preprocess for further segmentation.

Secondly, image segmentation is processed by Hough line detection and affine transformation method. The regions of interest are extracted for identification.

Finally, the SVM (supporting vector machine) classifier and CNN (convolution neural network) classifier is applied to classify the image segmentation. With the original location of image segmentation, the insulator recognition result can be carried out. This method can effectively reduce the labor work for locating insulators and provides an insulator recognition method based on image processing for transmission line inspection.

Keywords: Image processing, Insulator identification, Image segmentation, SVM, CNN