Intelligent Manufacturing Management Systems: Operational Applications of Evolutionary Digital Technologies in Mechanical and Industrial Engineering

Chapter 8

Smart Vision-Based Sensing and Monitoring of Power Plants for a Clean Environment

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Summary

The processing of image and artificial intelligent system of Internet of Things (IoT) could do major evolution in the energy production sector. As primary part, a flame monitoring system is designed with artificial intelligence techniques, to identify the flame features which subsequently can be co-related with emission of Oxides of Nitrogen (NOx), Oxides of Sulphur (SOx) levels, temperature and further more. Among the total 102 flame images from the boiler power control room, 51 images were taken for the training and 51 images used for testing under the category of class 1 complete combustion, class 2 partial combustion and class 3 incomplete combustion. In this section, simple and combination with parallel architecture were used. The classifier Fisher Linear Discriminant Analysis (FLD) analysis has not affected the performance, other classifier were used such as Back Propagation Algorithm (BPA), Radial Basis Function (RBF) and Parallel Radial Basis Function and Back Propagation Algorithm (PRBFBPA). As different feature combination were used to categorize, but then we found misclassification were shown in the output of combustion category. However, it is found that one of the pattern such as three features input to BPA

and four features input to RBF has showed the better classification on the basis of combustion quality. The performances were compared for precision and recall for the same classes 1, 2 & 3. The combustion quality, emissions of NOx, SOx were compared used image classifier by FFNN using BPA and ACO. From the performance matrices, ACO showed the better result when compared with precision and recall values. This method would directly help to monitor and ultimately reduce the emission of harmful gases to the global. Thus this monitoring the system will be efficient, thereby reducing the emission of hazardous gases.

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