

Embedded Character Recognition System using Random Forest Algorithm for IC Inspection System

Chong Wei Jian, M.Z. Ibrahim, Thum Wei Seong, Ting Ei Wei, S. Khatun

Faculty of Electrical and Electronics Engineering, Universiti Malaysia Pahang, 26300 Pahang, Malaysia

ABSTRACT

Character recognition system based on human inspection is unpractical due to lack of accuracy and high cost. Therefore, investigating on automated character inspection system by computer is needed to improve the accuracy, reduce the cost and inspection time. In this project, a Beagle Bone Black (BBB) was used as a processing device and Logitech webcam was used for as an image acquisition device. Total of 1080 training samples will undergo the image pre-processing, character segmentation, feature extraction and training using random forest classifier. The optimal parameter values of random forest classifier are determined by computing crossvalidation misclassification rate. The maximum number of splits, number of trees, and learning rate that yields the zeromisclassification rate is 1, 39 and 0.10 respectively. The process of testing random forest classifier was done using SN74LS27N chip under five different illuminations: no LED, one LED, two LED, three LED and four LED. From the experiments, it shows that the proposed system able to achieve 90.00% of accuracy within 1second to recognize characters on the SN74LS27N chip compared to 65.56% accuracy of human inspection.

KEYWORDS:

Beagle Bone Black; Character Segmentation; Character Classification; Embedded System; Random Forest Algorithm

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REFERENCES

1. Yang, Hua, Buyang Zhang, and Yang Hu, "A real-time marking defect inspection method for IC chips." In Seventh International Conference on Graphic and Image Processing. International Society for Optics and Photonics. 2015.
2. Bhatia, Er Neetu, "Optical character recognition techniques: a review." International Journal of Advanced Research in Computer Science and Software Engineering 4, no. 5, 2014.
3. Dervisevic, Ivan, "Machine Learning Methods for Optical Character Recognition." University of Novi Sad, 2006.
4. Deselaers, Thomas, Tobias Gass, Georg Heigold, and Hermann Ney, "Latent log-linear models for handwritten digit classification." IEEE transactions on pattern analysis and machine intelligence 34, no. 6, pp. 1105-1117, 2012.
5. Pal, Umapada, Partha Pratim Roy, Nilamadhava Tripathy, and Josep Lladós, "Multi-oriented Bangla and Devnagari text recognition." Pattern Recognition 43, no. 12, pp. 4124-4136, 2010.