

Title of the Thesis

Some Studies on Image Analysis Techniques for the Detection and Classification of Defects in Woven Fabrics

Abstract

The objective of the thesis is to develop efficient and simple defect detection techniques with higher defect detection accuracy. The techniques which are yet to be tried or tried in limited way in the field of defect detection on woven fabric are mainly explored. The work in Chapter 2 is focused on the technique of sub image based singular value decomposition (SVD) for defect detection in fabric. Chapter 3 deals with fabric space management for achieving reduced coefficient fabric space, required for fabric defect detection in an efficient way. A rough set based approach is undertaken for fabric classification in Chapter 4. Optimum number of parameters representing a fabric class is obtained using rough set theory. Once the optimum parameters are known, the trained ANN provides the parameters required for binarization and morphological opening based reconstruction operation of a certain fabric class and class of fabric defect for fabric defect detection (Chapter 5). For classification purpose Euclidian distance classifier, multi class support vector machine (SVM) and K- nearest neighbor (KNN) classifiers are used. Lastly in Chapter 6, an altogether different approach is explored using three dimensional Fourier transform. A three dimensional cylindrical filtering is used to detect the defects in fabric. The radius of the filter along with the energy threshold value, required for noise elimination is obtained by particle swarm optimization (PSO) technique. All the proposed methods are tested on a standard fabric database TILDA for their validity and satisfactory results are obtained in almost all cases. In Chapter 7, it is concluded that no single method can fulfill all the required criteria simultaneously and hence a numbers of off line methods are studied in this thesis in the field of defect detection in woven fabric to evaluate their efficacy.