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Ph.D. Topic:	**An Investigation into Digital Image Forgery Detection Techniques**

Ph.D. Research Findings:

The aim of digital image forgery detection (DIFD) techniques is to expose the malicious image manipulations in digital images. In this Thesis, three methodologies have been proposed to strengthen the DIFD techniques with main emphasis on copy-move forgery detection, color filter array (CFA) based method for the identification of forged images, and the selection of digital image forensic (DIF) tools using Fuzzy Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS). A method has been developed for the detection of copy-move forgery in digital images using Discrete Cosine Transform (DCT). In this method, initially, the input image is converted into gray scale image. The gray scale image is then divided into overlapping block size of 8×8 to get the useful information from the digital images. The DCT is used for feature matching; and different feature sets have been generated by considering the 16, 9, and 4 zig-zag sequences of the DCT block of an image. In addition to these sequences, the DC coefficient is also considered to extract the features from the gray scale image. The K-means++ algorithm has been used to speed up the block matching strategy. The radix sort has been employed for sorting the similar blocks in the images. To check the similarity of two blocks, the correlation coefficient was computed. Based on threshold value $T_d = 0.9999$, the similarity of two blocks is identified. The distance between block i and block $i + 1$ is calculated to mark the matched regions in the image. The proposed method was implemented using MATLAB software. Several images were tested after the implementation. The second method focuses on the detection of forged images using CFA interpolation. Before generating the color images, the CFA images are produced by a digital camera in which missing values of the pixels are computed by using different demosaicking algorithms. In CFA based methods, different Bayer patterns are used for the analysis of the digital images. In the proposed method, different images have been analysed to detect the forgery using CFA Bayer patterns. During the analysis, it was found that CFA Bayer patterns play an important role for the identification of the forged images. In the third method, fuzzy TOPSIS has been applied for the selection of DIF tools namely FotoForensics, JPEGsnoop, Forensically, Ghiro, and Izitru based on 18 identified criteria. The closeness coefficients value of each tool using fuzzy TOPSIS was computed to decide the ranking order of the DIF tools so that best tool for the analysis of the images can be selected.