ABSTRACT

Today, we are living in a technological era, where digital image appears to be the most common entity for conveying information. In most of the information standard such as internet, newspapers, magazines, scientific journals etc., image expresses more information in affluence. Storage and transfer of visual information is also likely possible by the digital image which is a strong proof against various crimes. However, with the widespread use of the digital images because of the advantageous digital photography, increasing number of tools and software's for manipulating the images are also evolved. The image manipulation gives rise to large amount of faked images which are developed by altering the original information of the image. Such faked image leads to sensitized news, scandals, controversies, etc. which are unacceptable in the courtrooms, politics, medical field etc.

One of the principal problems in image forensics is determining the authenticity of the image. This can be a crucial task when images are used as basic evidence to influence judgement in court of law. In order to meet this goal, this thesis presents three different techniques like geometrical representation; Vanishing point computation and fuzzy set based segmentation.The utmost intent of this research is to design a forgery detector based on collection of cues in the image formation process.

In this thesis, the first contribution introduces a new forensic detection algorithm to identify the manipulation in image with consistent shadows using the vanishing point distance. The image alterations are detected in this method by combining the geometrical representation of faked image with shadows using various image analysis methods such as morphological image analysis, thresholding segmentation, and super pixel segmentation. From the segmented images, constraints related to the vanishing points are extracted and the distance of the vanishing point of the original image and shadow is measured to verify the authenticity of the image. The second focus of this thesis is, a new forgery detection algorithm for detecting the forgery in image with reflection

inconsistencies is presented. In this method, primarily, the images are geometrically represented and then analysed using the image segmentation process such as top-hat filtering, gray scale reconstruction, morphological binary image analysis and thresholding techniques followed by super pixel segmentation. The parameters and constraints of the original and fake images count on to reflection points are estimated in this method and the distance of the reflection points are measured to verify the authenticity of the image. The third focus of this thesis is, a new forgery detection algorithm with shadow segmentation and reflected image segmentation is employed. In this method, shadow points and reflection points from the images are identified using the map based segmentation and FCM clustering. The consistency features from the shadow and reflection pints are extracted using LVP operator. The extracted features are used to classify the authentic and fake images utilizing a neural network classifier with a new training algorithm called ABCLM which is developed by integrating the artificial bee colony algorithm and Levenberg-Marquardt training algorithm.

To evaluate the performance of the detection algorithms, the experimentation is performed over publically available datasets. The manipulations are made in the collected data set by application of the image altering tools such as Adobe Photoshop etc. According to our experimental results the proposed methods are very encouraging in authenticating the fake images. The detection accuracy of near perfect is achieved in detecting the forgery in image with shadow and reflection inconsistencies. The performance of the proposed method is evaluated with the existing works utilizing measures such as accuracy and MSE. From the experimental analysis, the fact is evident that the proposed technique obtained the maximum accuracy in detecting the fake images. Thus in this dissertation, three different methods have been proposed to detect the image forgery in passive manner centred on the physically based detection techniques (shadow) and geometric based detection techniques (reflection).