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Fingerprint Liveness Detection From Single Image Using Low-Level Features and Shape Analysis

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***Abstract*- — Fingerprints are good source for individual identification by biometric authentication. Password based authentication systems are less secure than that of the fingerprint authentication where fingerprints and Iris are unique for every Individual.to reduce the fraud cases in biometric authentication ,we propose a static approach where we extract low level gradient features and texture analysis using dynamic score level integration algorithm.The proposed method is very much helpful to reduce the spoofing attacks in fingerprint authentication.**

***Index Terms*— low level features, texture analysis, fingerprint authentication.**

I. INTRODUCTION

Biometric based authentication systems have been more common in the security domain . The research has been proven that it is easy to spoof standard optical and capacitive sensors.So,the hardware approach would be expensive but less secure and software approach is difficult to create an algorithm which can discriminate distinct features between fake and live fingerprint. Software algorithm is a challenging approach and significant method for fingerprint liveness detection. Due to human errors fraud cases have become common and the fake fingerprint that has been made by the gelatin or latex will have more intensity of ridges than live fingerprint which somehow gets easy access to authentication systems.

To reduce the limitations of the software based fingerprint authentication ,we propose a static software approach in which the algorithm extract features which are unique for each and every individuals. The features that are extracted from a fingerprint image can be given as SURF, PHOG and gabor wavelet.These features are well determined to discriminate between fake and live fingerprints.The gabor wavelets show optimal properties in both frequency and spatial domain which inorder reduces the human based errors in the authentication systems

II. MODULES

We divide the system into three main sequential blocks:

(a) IMAGE PRE-PROCESSING
(b) FEATURE EXTRACTION
(c) IMAGE CLASSIFICATION

Block Diagram

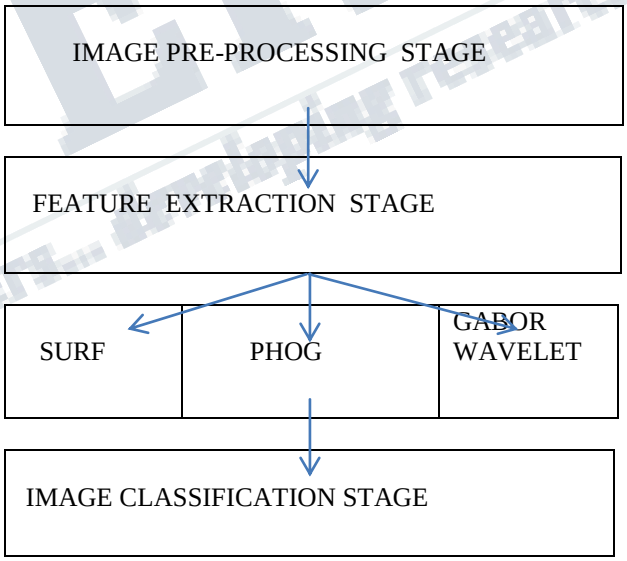

Image Pre-Processing

Normally, the fingerprint image consists of noise and exhibits smudged lines due to human errors. This errors would majorly occur at the time of image capturing due to moisture of the skin whether it is wet or dry. The captured image should be enhanced to reduce the errors .Noise reduction and image enhancement are the main factors of pre-processing stage. In this stage the captured image is cropped and then the noise is removed to enhance the

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image. This stage is useful to reduce the errors caused due to capturing and makes easy to process the image.

Feature Extraction

We use different scanners to capture the fingerprint image due to which identifying different scales and rotations would be difficult. This stage is introduced because due to human impatience the image would be partially captured This makes the detector to make misclassification about fingerprint whether it is fake or original.

This stage extracts minute features to identify the fingerprint. Thethree main features that are extracted are SURF(speeded-up robust features), PHOG, Gabor wavelet.

SURF

This feature works as both detector and descriptor.
Tthe key points are located by detector and the features of the key points to construct feature vectors are described by
descriptor.By using the sum of Haar wavelet SURF responses to describe the key point feature. The intensity distribution is decribed by Haar wavelet.

PHOG

It is used to extract the local shape attributes.
Shape and appearance of an image is decribed by HOG by capturing the intensity gradients and edge directions.
The main advantage of this feature is it is constant to geometric and photometric transformations.

GABOR WAVELET

For texture analysis gabor wavelet is used to extract features from fingerprint images .In both frequency and spatial domain gabor filters has localization properties .

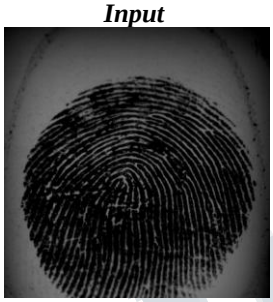
Image Classification

For selecting the best classifier during decision making we use dynamic score integration algorithm in this. The predicted score for live and fake fingerprints are above 0.6 and below 0.4 respectively. Misclassification lies majorly in the range of 0.4 and 0.6. We use SVM classifier for predicting the correct score in the predicted threshold range .Dynamic score integration helps to analyze the score between the classifiers and gives the decision making score by which live or fake fingerprint are determined.

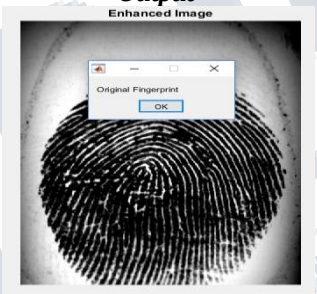
III. RESULT

(a)Real fingerprint :

Input

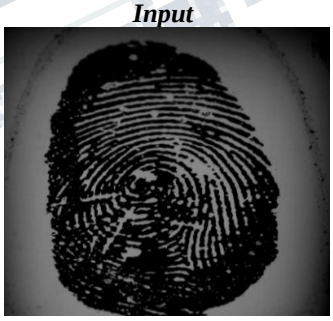


Output



(b)Fake fingerprint:

Input



Output

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IV. CONCLUSION

In this method detection of fingerprint can be done by extracting low level gradient features and texture analysis. We use dynamic score level algorithm to predict the exact score of classifiers to determine live or fake fingerprint. The result is made by decision making device which combines the score from classifiers. By this method spoofing attacks would be reduced and also helps to detect frauds.

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