

Face Spoof Detection Techniques to Differentiate Spoofed and Non Spoofed Faces: A Review

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Abstract: The number of algorithm are used to do image processing on any image i.e. digital is known digital image processing. Face can be identified and detected as a known face or unknown, this task is known as face recognition. Many improvement has been compassed in face recognition but it still suffers from various types of attacks like 3d mask and video attacks like 3D mask and video, replay attack, photo attack. Because of these attacks system should require a face spoof detection. The detection of spoofed face, when a forgery face is introduce in front of camcorder is called face spoof detection. In today's world face recognition method is used to validate the face like for unlocking mobile phone, banking, attendance tracking and providing access to the services but some interrupter use various conspiracy to crack the authentication system by presenting the artificial face in front of authenticating system from face spoof attack. The various attack on image can be receive by some feature eradication and allocation techniques like SVM, KNN, Decision Tree, ANN, LBP, LDA, PCA etc.

Keywords: Face recognition, Face detection, Biometric system, Digital image processing.

1. INTRODUCTION

An arranged combination of horizontal and vertical square pixel i.e. rows and columns respectively is called as image [1]. Images are used at various specific places for authentication and security purpose. The task of producing input image in a specific place is called imaging [2]. Digital images with the help of information processing system are processed in a field i.e known as digital image processing. Digital image or picture data is a set of limited number of constituent commonly known as picture element, pels or pixels [3]. In image processing input will be a given image like photograph or video. The output will be in an image or set of characters that are given in an image. Digital image processing allocate with influence of digital image through information processing system [4]. Digital image processing has different applications: computer vision, remote observation, face detection, optical character recognition, face recognition, biometric verification [5]. Process of detecting faces from a source image or video is called as face detection [6]. It has two function: weather human face appear in given image, where these faces are located at given images [7]. Face detection have some disadvantages: as human face marks are extract from image, each mark contain 1000 of pixels and contain different camera alignment, facial expression, illumination, occlusion which can be overcome by extraction of features together all of these contribute in robustness of recognition system. [8].



Fig. 1: arrangement of general face recognition structure [8]

From fig. 1 we come to know that first, take a picture by a digital camera than identify the person, and location of person face, and identification of the person with respect to this procedure of face recognition can be explained into 3 main steps:

- Face detection: the main purpose of this step is to regulate, whether human face appear in given image, where these faces are located at [6, 7].
- Feature extraction: after face detection human face patches are extracted from given image [8].
- Face recognition: various images are taken for each person and countenance are excerpt and database is used to store it. Then input face image comes perform face detection and feature extraction operation on it and compare the features to each face store in the database. Face recognition play a momentous act in our constantly lives such as access control, credit card verification and video surveillance system etc. It deals with security and privacy [9]. The area, configuration, and dimensional relationship between the attributes of face like eyes, and eye brows, nose, lips, eyes, and chin serve as the base for recognition of face.

Face recognition is classified into two types:

- Identification: Identification means image of face is given we want to tell who he or she is.

- Verification: it means we want the system to tell true or false about the guesses [10].

The recognition of human face can be done on physical or behavior characteristics then a system is called biometrics [11]. In the biometrics system when deception face is presented by someone in the front of camera it intervention on face recognition system and accredited user's artificial faces pave the path for fake person to provide an approach to the biometric system. These type of attack are called spoofing attack. These attack are very easy to carry with the help of printed photographs and videos display on the screen [12]. Conceding that individually want to differentiate real face and artificial face the face liveness, motion based and clue based detection technique are used. Different description of classifiers are used to find original and artificial faces [13].

2. LITERATURE REVIEW

Prashasti Raval, et, Al," Face spoof detection using image distortion analysis," 2017

In this paper researcher used SVM and ANN techniques on training data base to find their comparative effectiveness. Face spoof detection is not based on conventional method of recognition but on image misinterpretation analysis. Some important features like specular consideration, Blurriness, bright movement, color diversity serve as important base of detection while analyzing it. These features are concatenated and results are then fed to SVM and ANN. These systems are used for analysis of images whether the images are spoofed or non-spoofed. After the result analysis SVM gives better result than ANN. SVM showed 94.4% effectiveness while ANN is 88.8% [14].

Azeddine Benlamoudi, et, Al," Face spoof detection using local binary pattern and fishers score,"2015.

In this paper the technique, to distinguish or find difference between live face and fake face generally known as anti- spoofing. Face is detected by viola jones algorithm and also apply Active Shape Model with Stasm to locate landmarks. The landmark on image are helpful in adjusting image size like cropping the image. After that divided the face region into 3*3 overlapping regions and apply LBP operator and fishers face on these regions and finally used nonlinear SVM classifier for the determination of liveness of image with radial basis action kernel [15].

Samarth Bhardwaj, et, Al," computationally efficient face spoofing detection with motion magnification," 2013.

A new approach using motion magnification has seen in this paper. Which is used for the enhancement of expression of face that are shown in capture video by subject in it. This approach is used to add to the facial expressions commonly show by subjects in a capture video. The algorithm are proposed in which other features are extracted as there are many texture based approaches but configuration of LBP has provided the improved performance among those. This approach is also used with hoop descriptor. Print attack and replay attack databases are used. This frame work improve state of art performance and error rate is 0% to 2.5% [16].

F Sthevanic, et, Al," spoof detection on facial images recognition using LBP and GLCM combination, "2018.

This paper present facial image spoofing detection method by analyzing image texture. The proposed mechanism for texture inquiry combine the Eigen faces and gray elevation co-occurrence matrix mechanism. In this paper research showed that the spoofing detection using LBP algorithm has a better accuracy than that of using GLCM algorithm and the eyes and nose area has an important features to detect spoofing on facial biometrics. LBP algorithm gave the accuracy 99.07%, while the GLCM algorithm only gave accuracy 92.82% [17].

Tanvi Dhawanpatil, et, Al," face spoofing detection using multiscale local binary pattern approach,"2017.

In this paper research gave main attention on face authentication system that can be made robust by using Morrie pattern detection. Researcher use NUAA likeness imposter database consisting of 15 samples of printed photo attacks are used for testing. MLBP, SIFT descriptors are used along with LBP descriptors. Thus spoof attack can be easily detected. The main ambition of this paper is to detect spoofing attack on face authentication system used in desktop. [13].

Deepika, et, Al," novel approach for face spoof detection in image processing,"2018.

In this paper DWT algorithm was used to examine the textual elements of the test image for the recognition of the face spoofing. SVM classifier helped to distinguish spoofed or non-spoofed image. The similarities among textual characteristics is major hindrance

which decrease its accuracy. Researcher used another algorithm for prediction purpose i.e. KNN. SVM gives accuracy 88.0% and KNN give accuracy 96.05%. SVM takes execution time 1.3 and KNN take 1.35 [2].

Shivakumar dalali, et, Al,” An efficient face spoofing detection technique for big data,”2017.

In this paper author proposed a design to implement robust face spoofing detection system for big data. The proposed design has enormous use in biometric authentication, law enforcement, and government services. Researcher used viola jones technique for face detection. Weber Local Descriptor used for features extraction. ART classifier is used for face detection whether the image is spoofed or not. Detection accuracy is 99.31%, recognition accuracy is 97.8% [18].

TABLE 1. ABRIDGE ALL RESEARCH PAPERS

Name of author or year	Face recognition approaches	Feature extraction approaches	Classification	Types of attacks	Databases	Accuracy	Error
Azeddine benlamoudi et.al.(2015) [19]	Local Approach	LBP	Nonlinear SVM	Printed Photo	NUAA	LBP without STASM = 97.31 %. LBP with STASM= 98.41 %. Manual =99.61%	EER = 3.9 EER= 2.4 EER= 0.6
Sakshi Jha(2018) [20]	Local Approach	Gabor filter, LBP	KNN, SVM	3-D mask , Video, Printed photograph	NUAA	KNN= 98.85% SVM= 90%	-
F Sthevanie et.al. (2014) [17]	Global Approach	LBP, GLCM	KNN	Imprinted photo	NUAA	LBP = 99.07% GLCM = 92.82%	-
ShivaKumar Dalali et.al. (2017) [18]	Global Approach	Weber Local Descriptor	ART	Printed Photo	Yale-B	97.8%	-
Prashasti Raval et.al. (2017) [14]	Global Approach	LBP, IDA	SVM, ANN	Printed Photo Videos	MSU MFSD, REPLAY ATTACK, CASIA	SVM = 94.4% ANN = 88.8j%	FAR = 0.1 FAR=0.1
Md –rezwan Hasan et.al. (2019) [2]	Global	LBPV, LTP	SVM	Phone face Video	NUAA	LTP = 91.1% LBPV=99 %	HTER =7.4, 0.39% FAR= 5.1, 0.35% FRR = 9.7, 0.43%
Hari Krishna Lppili, ep.al.[23]	Local	LBP, LPQ, CoALBP, SID	KNN	Printed photo, video, Mask	-	-	-

Naveen Kumar et.al. (2018) [24]	Global	DWT	SVM, KNN	Printed Photo	-	SVM= 88% KNN= 97%	-
Raghavendra RJ.et.al (2019) [25]	Local	LBP	SVM	Printed photo attack	NUAA	98%	EER = 0.5% HTER = 8.98%
Name of author or year	Face recognition approaches	Feature extraction approaches	Classification	Types of attacks	Databases	Accuracy	Error
Samarth Bhardwaj et.al.(2013)[16]	Global	LBP+TOP+ HOOF+LDA	SVM	Printed photo, Video	NUAA	-	HTER = 0 % & 1.25%
Nelsi Erdogmus et.al. (2013) [12]	Local	LBP, tLBP, mLBP, dLBP	SVM(linear) Chi2 LDA	Printed photos, vedio	Morpho Database, 3D Mask Attack Database	97.0%, 74.9%, 94.5%	EER= 5.0% EER= 27.1% EER= 7.0%
Azeddine Beniamoudi et.al.(2015)[15]	Local	LBP	SVM	Printed Photo	NUAA, CASIA		EER = 1%, EER =7.2%

3. CONCLUSION

This paper has tryout to review different papers to cover the current development in face spoof detection and how it is used in enhancement of security of biometrics system. Various techniques are applied to check spoofed faces. Previous researchers have used miscellaneous techniques or methods to extract best features from the images and classify it into spoofed or non-spoofed, among those techniques SVM classifier and LBP descriptor are widely used. In maximum research the results shown by SVM are good but the efficiency of it is decreased when similarities are observed among textual characteristics of spoofed images. During parametric study it is analyzed that some other techniques like LDA, KNN, and ART differentiate more efficiently between spoofed and non-spoofed faces than SVM with same databases.

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