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Detection of Liveness Face recognition and Spoof face Detection Based on Image Quality Assessment Parameters

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ABSTRACT

Face identification is an important task for security purposes. Most of the organizations follows this method to authenticate the individual person for proper security. Many times the process of recognition is deviate or degraded by influence of non-real faces and spoofing attacks. Due to this liveness detection is also very difficult. Hence the proposed research based on image quality Assessment (IQA) and authenticated with a database having 80 images taken under unconstrained environment.

Keywords : Face detection, Liveness, Image, Quality, Spoofing.

I.INTRODUCTION

In the field of biometric or Security authentication face detection plays a vital role for identifying in individual person's distinctiveness. But the spoofing is a major source for influencing the actual information during the course of identification. In order to optimize this problem the liveness detection should be performed before face recognition. The liveness detection module adds an additional layer of security because it uses macro level features of eye and mouth actions. The consistency of liveness module is tested by using the image or video or mask of the registered individual. Here the multispectral method, client identity information method single image through diffusion speed model for proper detection. Most of the researchers used the traditional methods for detecting liveness where they adopt training process and estimate the Mean, Eigenvectors and covariance. By considering these parameters the relationship between each individual feature is presented. This scheme of identification was not suitable for the liveness dynamic images. Hence three new methods namely Multispectral Scheme, Client definite scheme and single image via diffusion speed model as stated earlier. Author in [1] represent Multispectral scheme for liveness detection where a monochrome camera captures the ambient light and image.

II. PROPOSED METHOD

The proposed method uses an Image Quality Assessment (IQA) Parameters where IQA attempts to assess the errors in input face image. The parameters are consider here are Peak Signal to Noise Ratio (PSNR), Mean Square Error (MSE), Normalized Absolute Error (NAE), Signal to Noise Ratio (SNR), Total Edge Difference (TED), Maximum Difference (MD), Structural Similarity Index (SSI) and Average Departure (AD). Each of these eight IQA parameters are presented in Table-1.

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Table-1: IQA Parameters

Acronym	Description	Reference
PSNR	$PSNR(I,\hat{I}) = 10log\left(\frac{Max(I^2)}{MSE(I,\hat{I})}\right)$	[1], [2]
MSE	$MSE(I,\hat{I}) = \frac{1}{NM}\sum_{i=1}^{N}\sum_{j=1}^{M}(I_{i,j} - \hat{I}_{i,j})^2$	[3],[5]
NAE	$NAE(I,\hat{I}) = \frac{\sum_{i=1}^{N}\sum_{j=1}^{M}\lvert I_{i,j} - \hat{I}_{i,j}\rvert}{\sum_{i=1}^{N}\sum_{j=1}^{M}\lvert I_{i,j}\rvert}$	[4], [6], [7]
SNR	$SNR(I,\hat{I}) = 10\log\left(\frac{\sum_{i=1}^{N}\sum_{j=1}^{M}(I_{i,j})^2}{NM.MSE(I,\hat{I})}\right)$	[8]
TED	$TED(I,\hat{I}) = \frac{1}{NM}\sum_{i=1}^{N}\sum_{j=1}^{M}\lvert I_{E_{i,j}} - \hat{I}_{E_{I,J}}\rvert$	[9]
MD	$MD(I,\hat{I}) = Max\lvert I_{i,j} - \hat{I}_{I,J}\rvert$	[10],[11]
SSI	$SSI(x,y) = \frac{(2\mu_x\mu_y + C_1)(2\sigma_{xy} + C_2)}{(\mu_x^2 + \mu_y^2 + C_1)(\sigma_y^2 + \sigma_y^2 + C_2)}$	[3],[4]
AD	$AD(I,\hat{I}) = \frac{1}{NM}\sum_{i=1}^{N}\sum_{j=1}^{M}(I_{i,j} - \hat{I}_{I,J})$	[5],[6]

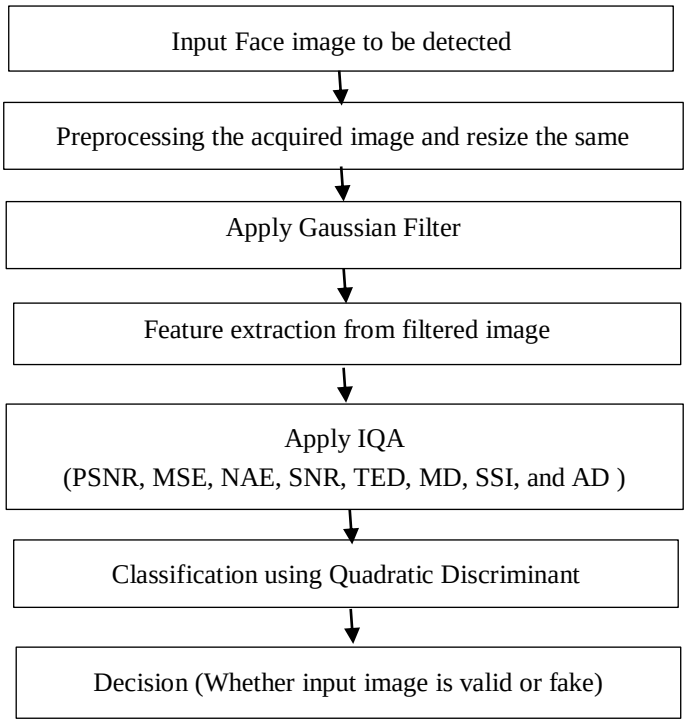

Figure-1: Flow chart for the proposed scheme

The proposed method comprises of following modules as Query Image, Preprocess, Feature extraction and classification as presented in figure-1. In image query stage the face image to be detected is acquired and then by application of filter the noise present in the acquired image is optimized and the same image is resized. During the process of feature extraction PSNR, MSE, NAE, SNR, TED, MD, SSI, and AD etc. are

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considered as image quality assessment parameters. Similarly in the course of classification Quadratic Discriminant Analysis (QDA) is used for categorization if the given input is live or fake. QDA models the inclination of each class as Gaussian distribution.

III. RESULTS AND DISCUSSIONS

To check the efficiency of the proposed model used for face liveness identification a data base is containing 80 genuine pictures is developed. The graphical representation of the various IQA parameters for the same is presented in figure -2 to figure-9. Figure-10 illustrates step by step process of proposed scheme implemented for liveness identification when input is a true picture.

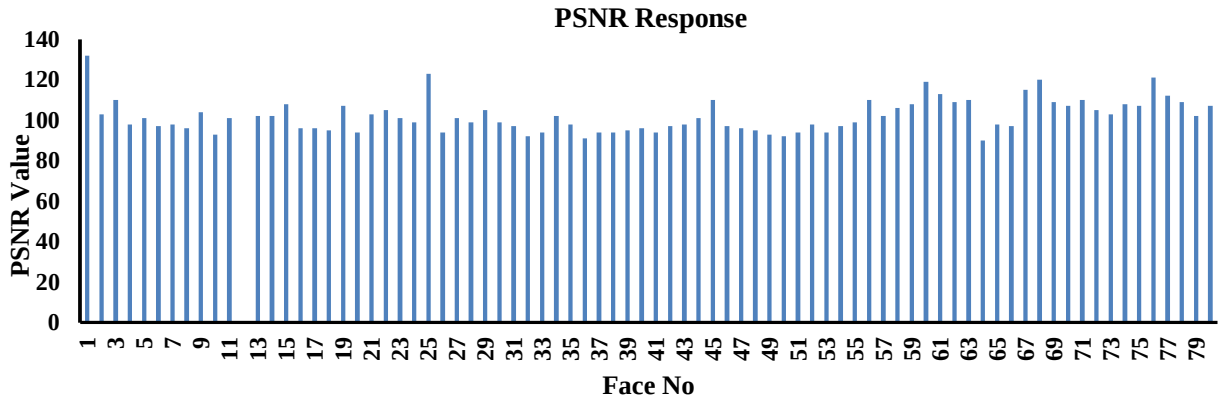

Figure -2: PSNR Response for 80 Face images

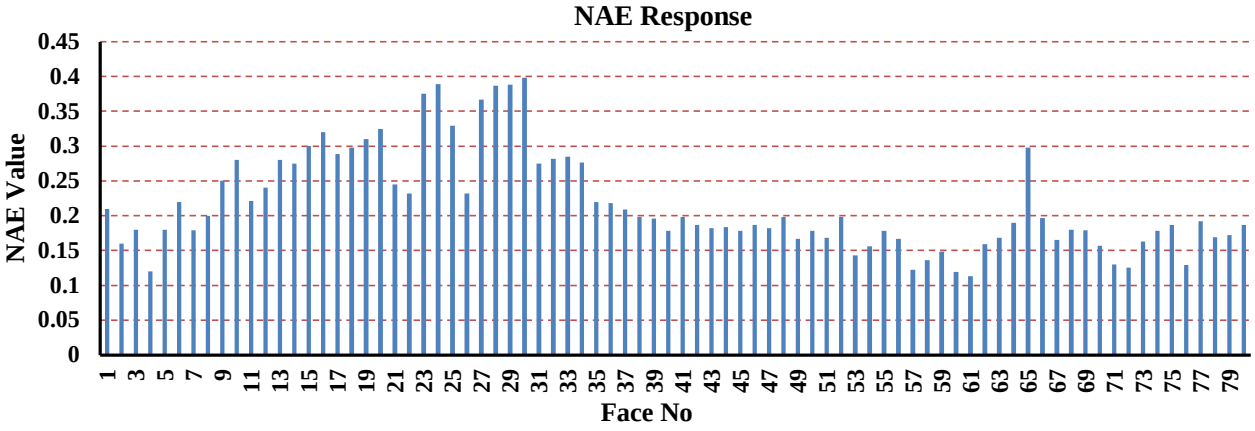

Figure -3: MSE Response for 80 Face images

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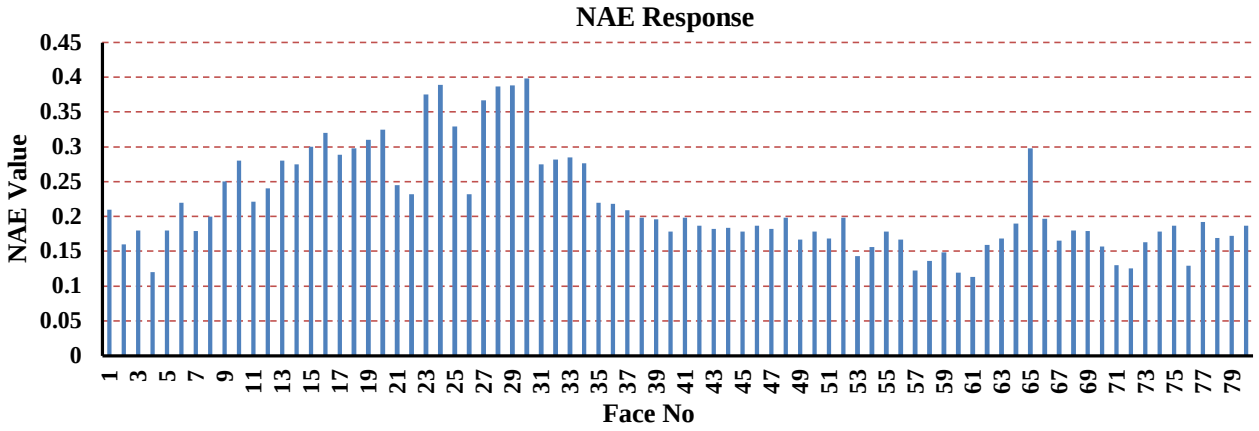

Figure -4: NAE Response for 80 Face images

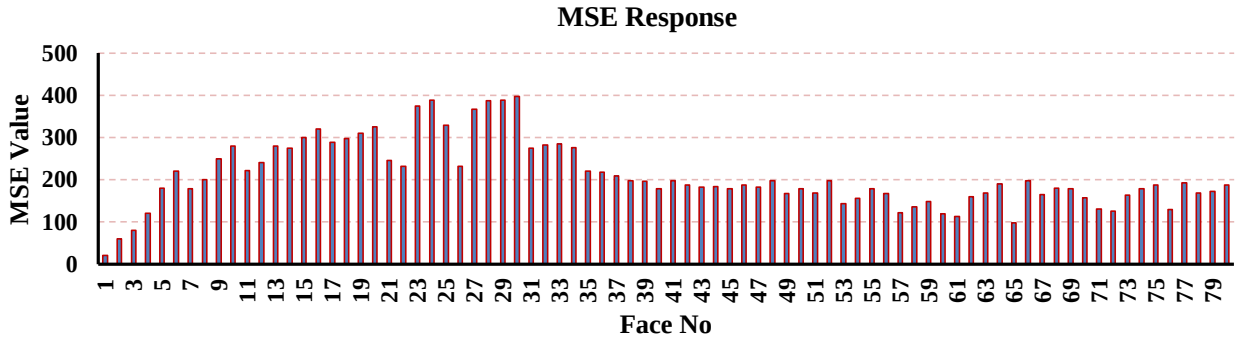

Figure -3: MSE Response for 80 Face images

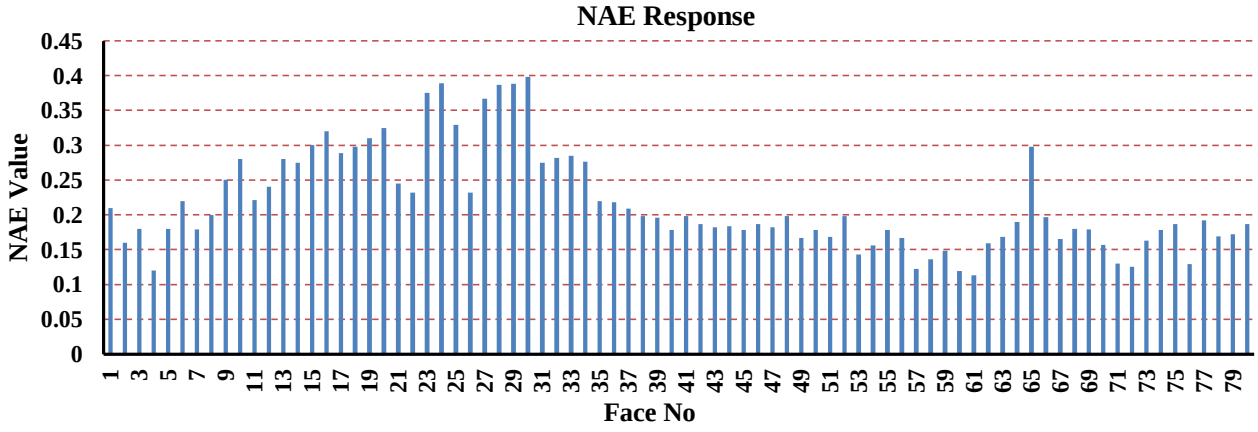

Figure -4: NAE Response for 80 Face images

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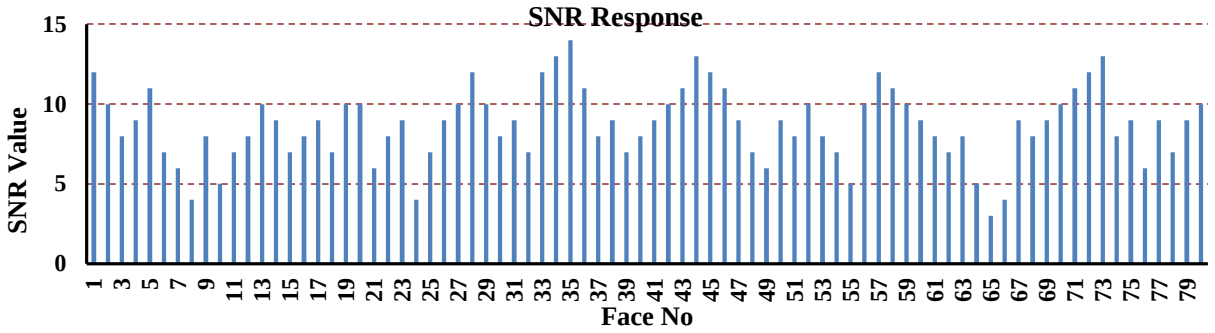

Figure -5: SNR Response for 80 Face images

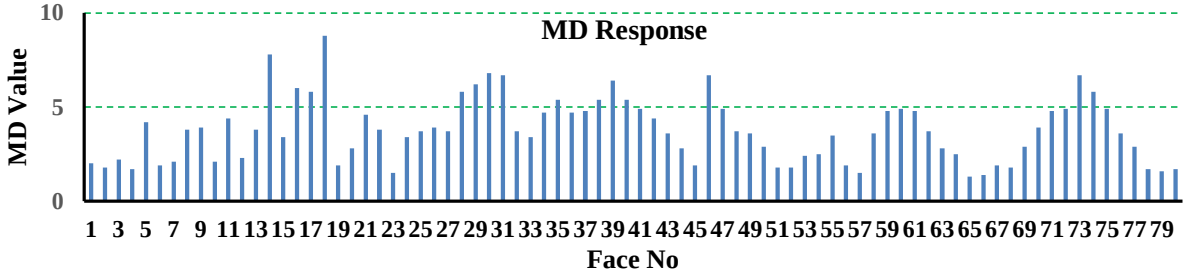

Figure -6: TED Response for 80 Face images

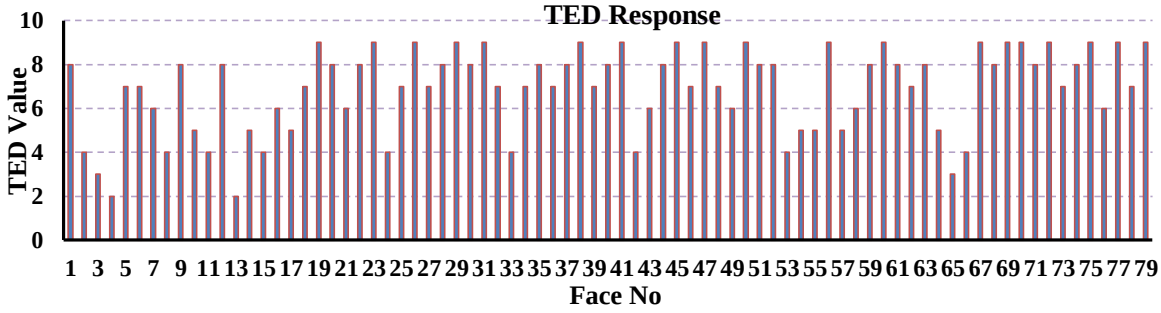

Figure -7: MD Response for 80 Face images

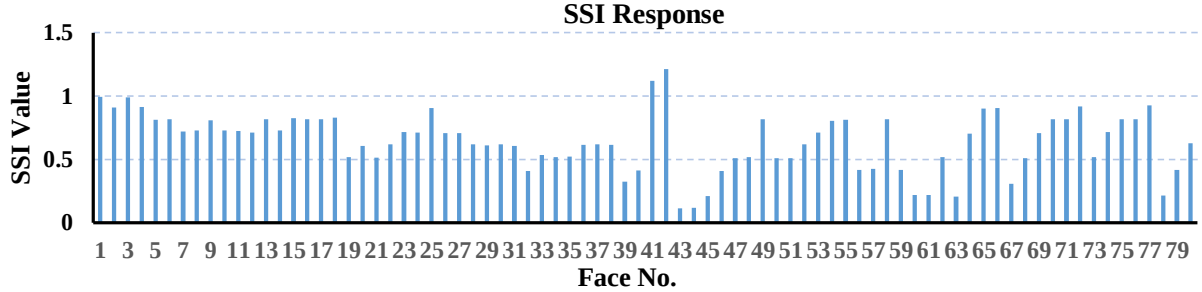

Figure -8: AD Response for 80 Face images

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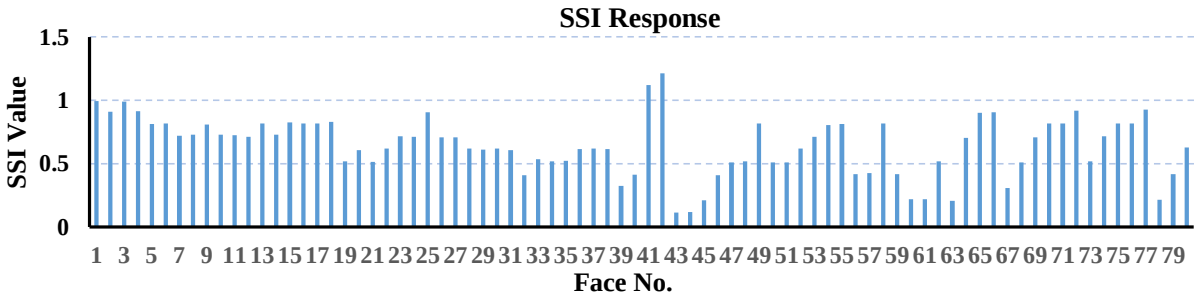

Figure -9: SSI Response for 80 Face images

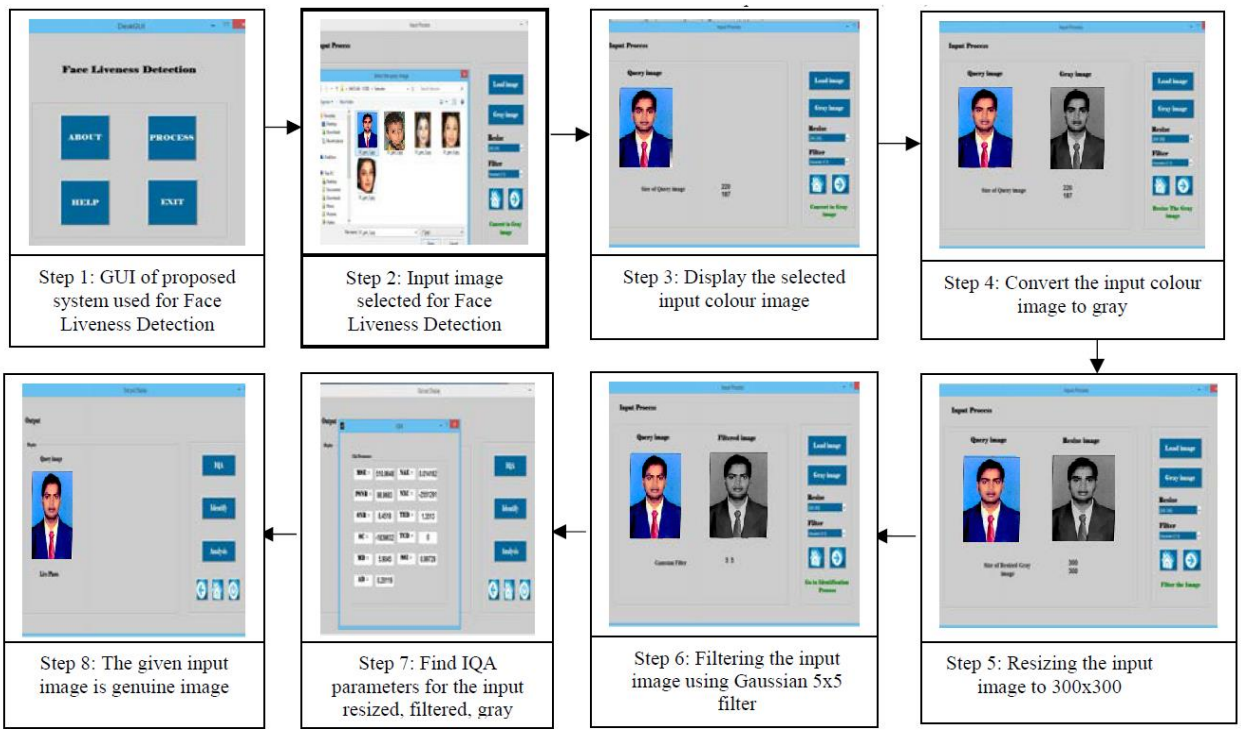

Figure -10: step by step process of proposed scheme implemented for liveness identification

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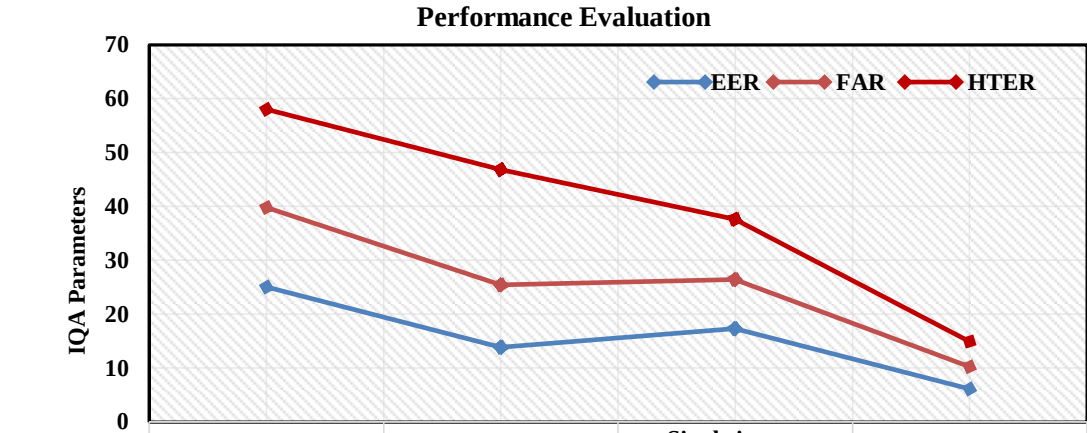

	Multispectral Scheme	Client Identity Scheme scheme	Single image through diffusion speed	Proposed Scheme
HTER	18.23	21.43	11.12	4.68
FAR	14.78	11.58	9.12	4.12
EER	24.99	13.82	17.33	6.12

Different Schemes

Figure-11: Comparison between the traditional scheme and the proposed scheme

IV.CONCLUSION

The proposed scheme considered 8 different IQA parameters to invention an inspection platform for proper detection of liveness of faces. Considering the traditional different scheme like Multispectral Scheme, Client Identity Scheme, Single image through diffusion speed scheme for the same face detection, it is observed that the proposed scheme has the better response as compared to the above stated scheme. The Comparison between the traditional scheme and the proposed scheme in terms of EER, FAR and HTER is presented in figure-11.

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