

# A Study on Face Recognition Techniques with Age and Gender Classification

Sandeep Kumar, Sukhwinder Singh, Jagdish Kumar

Novosibirsk State University

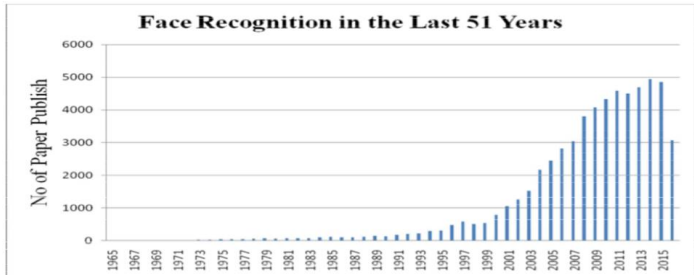
23 April 2020

Mukul Vishwas

- ▶ This paper give insight of various FR technique.
- ▶ We will look existing techniques based on their performances.
- ▶ Future directions for further research.

- ▶ Bio-metrics is the unique measurable characteristics of recognizing. it based on their physical and behavioral characteristic.
- ▶ Physical parameters: fingerprint, face, palm, iris and DNA.
- ▶ Behavioral parameters: signature, keystrokes, and voice.
- ▶ Nowadays the biometric driven systems are expanding exponentially all over the world.
- ▶ The biometrics market was 400 Million dollar in 2000 and grew to 5 billion dollar in 2011 and estimated 23 billion dollar in 2019, currently 65.3 billion dollar.

- ▶ FR is most popular as it doesn't require the physical interaction of user hence considered most friendlier.
- ▶ 1960 Woody Bledsoe gave the first semi-automated facial recognition technique.

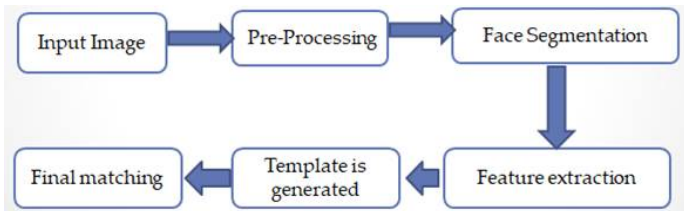


## CHALLENGES OF FACIAL RECOGNITION

- ▶ The major challenges which any FR techniques face are the skin color segmentation and the facial segmentation accuracy.
- ▶ The facial segmentation accuracy depends on the pose, expression, occlusion, noise, lighting conditions, distance between the object and the camera and different facial feature.

## TYPES OF FACIAL RECOGNITION

- ▶ Face recognition is the sub-area of pattern recognition research.
- ▶ Overview of face recognition system



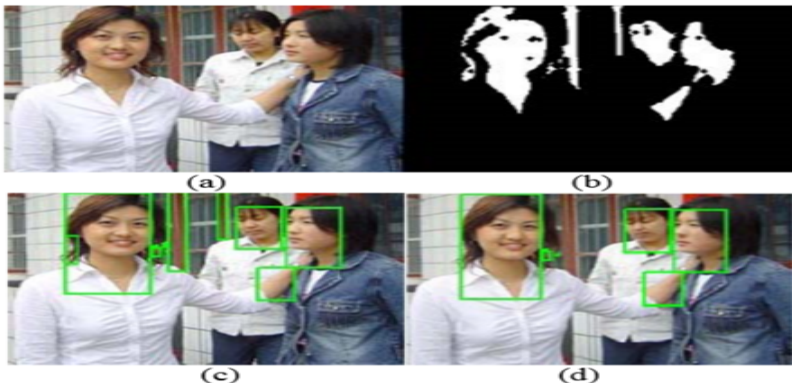
## Knowledge-based methods

- ▶ The knowledge-based techniques are based on the geometry of the face and arrangement of the facial features.
- ▶ It describe the shape, size, and texture of face.
- ▶ Problem with this techniques is that the accuracy effected by pose or head orientations.



## Feature invariant approach

- ▶ This technique find structural features of the human face even with lighting conditions varying.
- ▶ This methods are very sensitive to illumination, occlusion, the existence of skin color regions, and adjacent faces.





## Feature invariant approach

- ▶ A template of general face was used to detect face.
- ▶ It is sensitive to pose, scale and shape variation of the human body.
- ▶ Deformable template methods have been proposed to deal with such variations of pose, scale, and shape of the body.

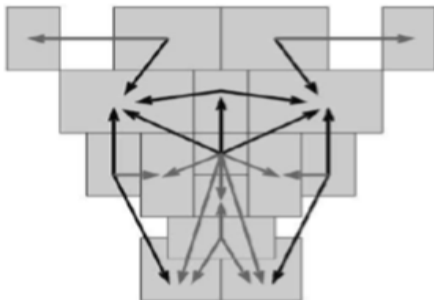


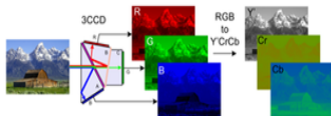
Fig-6: A 14x16 pixel ratio template [8]

- ▶ The methods used for face detection are Eigenfaces, Linear Discriminant Analysis, Neural Networks, Support Vector Machine, and Hidden Markov Models.
- ▶ During template matching, appearance-based methods will come in the picture.
- ▶ According to literature survey, face detection techniques have low accuracy (as 2017) so there is a scope of improvement in term of accuracy.
- ▶ Till now (2017) performance is not optimum so there is a scope of further improvement in feature extraction techniques.

## Comparison of FR technique

- ▶ Adaboost : <https://www.youtube.com/watch?v=-DUxtdeCiB4>
- ▶ Canny Edge:  
<https://www.youtube.com/watch?v=17cOHpSaqi0>

Ref	Segmentation Techniques	Dataset	Performance
[12]	RGB Colour Space	Self-prepared 120 Images	Detection Rate = 80%
[16]	YcbCr + RGB + Canny Edge	FRGC 302 Images	Detection Rate = 82.7%
[17]	Skin Colour	Self-prepared	Detection Rate = 88.9%
[18]	Adaboost & SVM	MIT + CMU (2500 Images)	Detection Rate = 94.5%
[19]	RGB-H-CbCr	Self-prepared	Detection Rate = 90%



## FEATURE EXTRACTION TECHNIQUES

- ▶ Haar  
Feature: <https://www.youtube.com/watch?v=F5rysk51txQ>
- ▶ Viola/Jones paper: [http://bit.ly/C\\_RapidObjectDetectPaper](http://bit.ly/C_RapidObjectDetectPaper)

Ref	Segmentation Techniques	Feature Extraction	Dataset	Performance
[20]	Haar Features and Adaboost	LBP	CK+ and JAFFE	Accuracy=89.64%
[21]	Adaboost	LBP and MCT	FDDB and MIT + CMU	Accuracy=91%
[22]	Skin Color	ANN	LFW and PEAL	Accuracy= 89.5%
[23]	Viola-Jones	SVM	Self-prepared 300 Images	Training time period 60% increases
[24]	Hough Transform	SVM	AR database	FR rate increased by 7.7%

LBP: Local Binary Pattern, ANN: Artificial Neural Network, SVM: Support Vector Machine, MCT: Modified Census Transform

## AGE CLASSIFICATION

Ref	Feature Extraction	Database	Accuracy
[31]	SVM	FG-NET MORPH	95.6%
[32]	PCA+USA	FG-NET	94.87%
[33]	Deep NN	eWIT	65.8%
[34]	NTCA+LBP	FG-NET MORPH	83.8%
[35]	PCA/SVM	CACD MORPH	94.2%
[36]	Gabor/HOG	WhoIsIt FG-Net	80%
[37]	KDCV / NN	FG-NET	93%
[38]	SVM	LFW	89%
[39]	AAM	FG-NET	95%
[40]	GOP+SVM	Passport	70%
[41]	GB	FG-NET	82.7%
[42]	RMIR	MORFH	MAE=8.6
[43]	DML	FG-NET	84%
[44]	SSE	FG-NET	MAE=5.21
[45]	AMF	YGA	MAE=8(M), 7.8(F)

SVM: Support Vector Machine, PCA: Principal Component Analysis, LBP: Local Binary Pattern, NN: Neural Network, HOG: Histogram of Oriented Gradient, AAM: Active Appearance Model

## CONCLUSION

- ▶ This paper presents a comprehensive survey of face recognition and various challenges in the last 51 years.
- ▶ This literature analysis showed continuously increasing interest and research in the field of face recognition.
- ▶ Well-known problems during FR, have attained a lot of attention in the research community of computer vision and pattern recognition.
- ▶ Various types of techniques have been proposed to resolve all those issue but still needs improvement and further research.

Thank you for your  
attention.