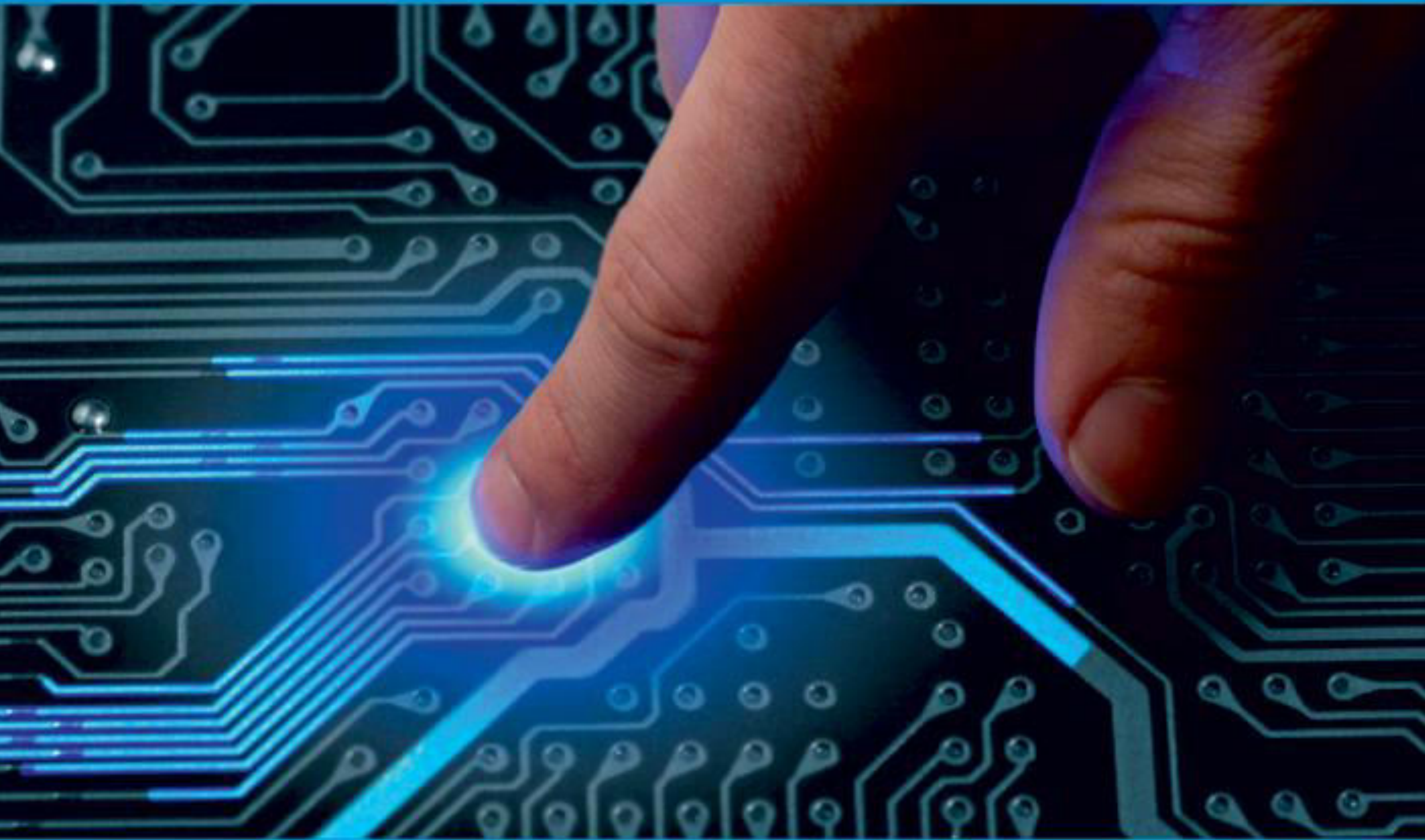
IJIRCCE

e-ISSN: 2320-9801 | p-ISSN: 2320-9798



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

Volume 10, Issue 6, June 2022

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 8.165

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.165 |

|| Volume 10, Issue 6, June 2022 ||

| DOI: 10.15680/IJIRCCE.2022.1006168|

A Detailed Study on People Tracking Methodologies in Different Scenarios

Nakul Nalwa[1], Shalini Bhadola[2], Kirti Bhatia[3], Rohini Sharma[4]

[1]Student, Sat Kabir Institute of Technology and Management, Haryana, India,

[2]Assistant Professor, Sat Kabir Institute of Technology and Management, Haryana, India,

[3]Assistant Professor, Sat Kabir Institute of Technology and Management, Haryana, India,

[4]Assistatnt Professor and corresponding Author, GPGCW, Rohtak, India

ABSTRACT: Face recognition is a simple activity for humans but is difficult for machines to accomplish. The rapid progress of face identification technology is made possible by the recent tremendous expansion of computational resources. To detect faces, numerous cleverly designed algorithms have been put out. A thorough analysis of the relevant algorithms, though, goes unnoticed. In this study, we describe face detection methods in four different ways.We investigate a wide range of face detection technologies that are currently available.In each individual technique, we give a comparative evaluation of various algorithms. In order to provide an all-encompassing perspective, we have also included thorough comparisons amongst the technologies.But in our study, we go into in-depth technical details of many contemporary neural network sub-branches and face identification techniques. We offer in-depth contrasts between the algorithms in sub-branches and overall. We present the advantages and disadvantages of these methods as well as a fresh literature review that covers their application beyond face identification.

KEYWORDS: Face Detection and Recognition, Features, Appearance, Knowledge, Template

I. INTRODUCTION

Face detection, which counts the number of faces in a photograph or video without memorizing or storing specifics, is an essential component of face recognition. It may specify some demographic information, such as age or gender, but it cannot identify specific people [1].Face recognition compares a face in a photo or video with a list of known faces to identify it. It is true that faces must be entered into the system in order to build the collection of distinctive facial traits. After then, the system separates a new picture into its essential components and analyzes them to the data kept in the repository.Initially, the computer looks at a still or moving image and attempts to tell faces apart from any background items. A computer can do this by employing techniques that account for lighting, camera distance, and orientation. The face detection algorithms may fall into two or more of the 4 groups into which these techniques are grouped. Fig 1 illustrates 4 basic types of face detection methods.Identifying the region in a picture where a face or faces are involves the major steps of face detection technology. Blockage, illuminations, and complicated backgrounds are the biggest problems in face detection. To address these issues, numerous different algorithms have been put forth. The existing techniques can be broadly classified into two categories: feature-based and image-based methods. Picture-based approaches rely heavily on image scanning while feature-based approaches locate characteristics.

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.165 |

|| Volume 10, Issue 6, June 2022 ||

| DOI: 10.15680/IJIRCCE.2022.1006168|

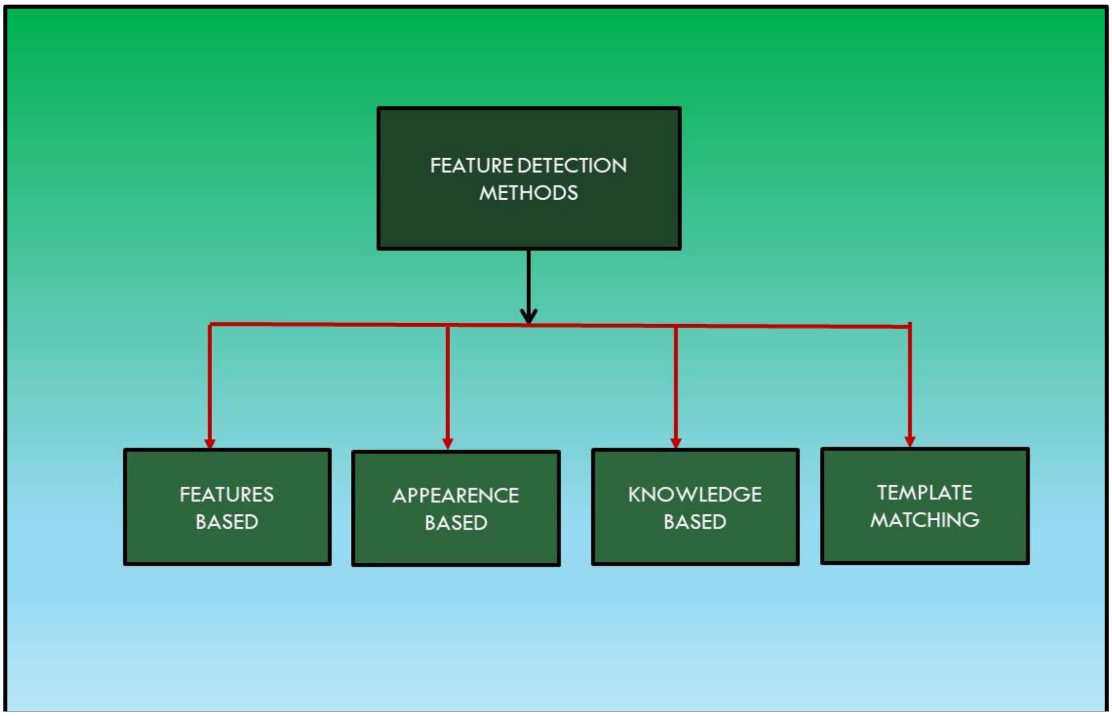


Fig 1: Basic Types of Face Detection Methods

II. RELATED WORK

Several survey studies have mentioned facial detection techniques.In 2009, researchers from [2] did a study on face detection methods. They examined six face detection methods as well as four face detection-related difficulties, including database size and type, lighting tolerance, variance in facial gestures, and position variances. Authors in [3] provides a detailed overview of all types of face detection algorithms. Authors in [4] examined a few modern face detection techniques. A comprehensive comparison of several algorithms and the relevant databases was presented with a performance evaluation focus. The work, though, solely utilised ANN. The survey studies by authors in [5] and authors in [6] stood out among the rest as being reliable and well-explained. Both works lack the latest and most effective face detection techniques, like analytical and neural network subbranches.

KNOWLEDGE-BASED FACE DETECTION

This approach is based on a system of laws created by people, as far as we know. We are aware that the nose, eyes, and mouth must be in relation to one another at specific angles. The challenge with this approach is creating a suitable set of rules. The algorithm generates a lot of false positives if the rules are either too generic or too specific. It is not universally applicable and is dependent on the lighting, which can alter the precise shade of a person's skin in a photograph.

International Journal of Innovative Research in Computer and Communication Engineering

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.165 |

|| Volume 10, Issue 6, June 2022 ||

| DOI: 10.15680/IJIRCCE.2022.1006168|

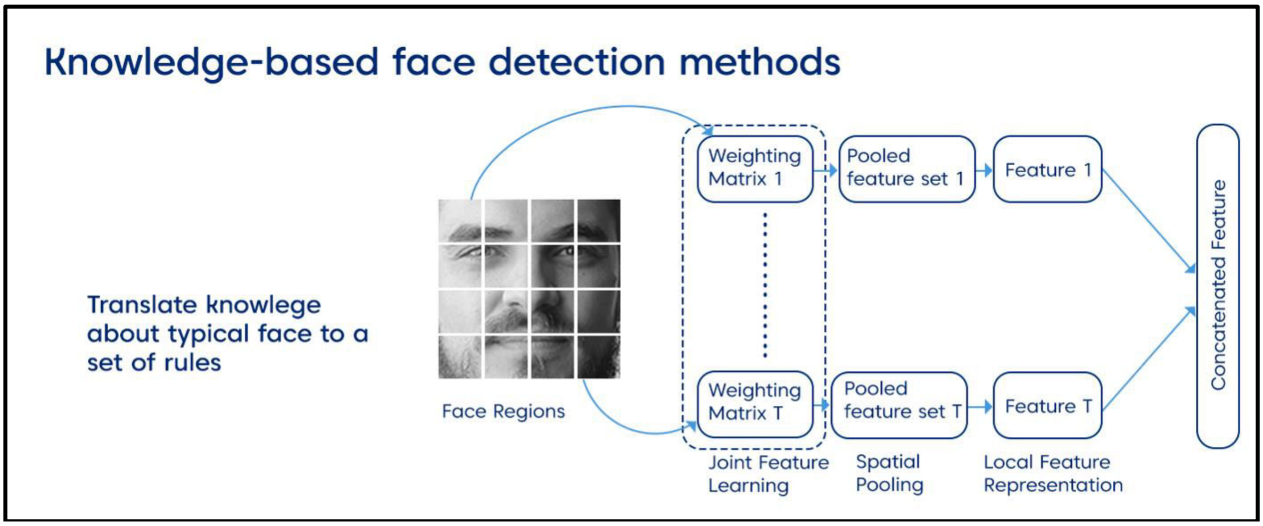


Fig 2: Knowledge based Face detection method [1].

TEMPLATE MATCHING

The predefined or parameterized face templates are used in the template matching to discover or identify faces by correlating the input photos with the predefined or deformable templates. The edge detection approach can be used to build the face model from edges.

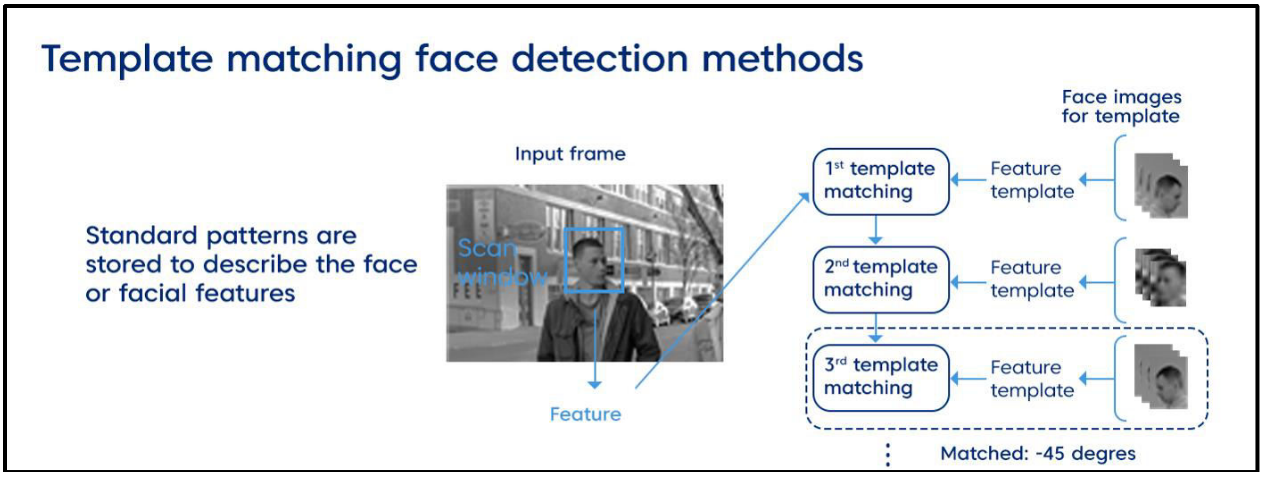


Fig 3: Face Detection Using Template Matching

The controlled background technique is a version of this strategy. You can eliminate the background and leave the facial borders if you are fortunate enough to have a frontal face image and a plain background.For this method, the programme features a number of classifiers for identifying different front-on face types as well as some for identifying profile faces, including detectors for eyes, a nose, a mouth, and in some circumstances, even an entire body. Although the method is simple to use, it is frequently insufficient for facial recognition.

FEATURE-BASED FACE DETECTION

The morphological characteristics of the face are extracted using the feature-based technique. It is used to distinguish between facial and non-facial regions after being trained as a classifier. Color-based face detection is an illustration of this technique; it examines coloured photos or videos for regions with typical skin tones before looking for face segments.In order to find matches from facial features, Haar Feature Selection uses similarities between human faces, including the position and size of the eyes, the mouth, the nasal bridge, and the oriented gradients of pixel intensities. To get the total of 6061 characteristics from each frontal face, there are 38 layers of cascaded classifiers.A feature extractor for object detection is called Histogram of Oriented Gradients (HOG), fig 3. The distribution (histograms) of the image's gradients' orientated directions are the features that were retrieved.We are able to identify those places

International Journal of Innovative Research in Computer and Communication Engineering

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.165 |

|| Volume 10, Issue 6, June 2022 ||

| DOI: 10.15680/IJIRCCE.2022.1006168|

thanks to gradients, which are often large, rounded edges and corners. They calculate the frequencies of gradient vectors to describe the light direction in order to locate image segments rather than taking into account pixel intensities. To minimize errors, the method employs overlapping local contrast normalization. Fig 4 gives a detailed classification of Feature based protocols.The active shape models handle complicated and flexible shapes by iteratively deforming them to fit a specific example. Segmentation is carried by using pixel data in low level analysis, and it often focuses more on the distinct parts of a face. Feature analysis, includes arranging face features into a global viewpoint while taking the facial shape into consideration.

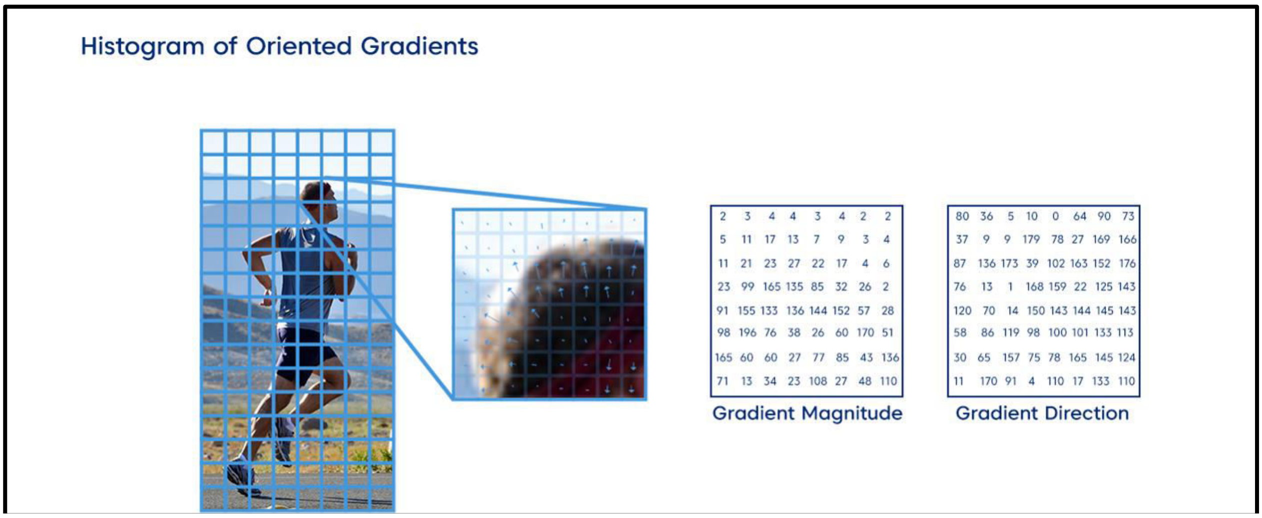


Fig 3: HOG

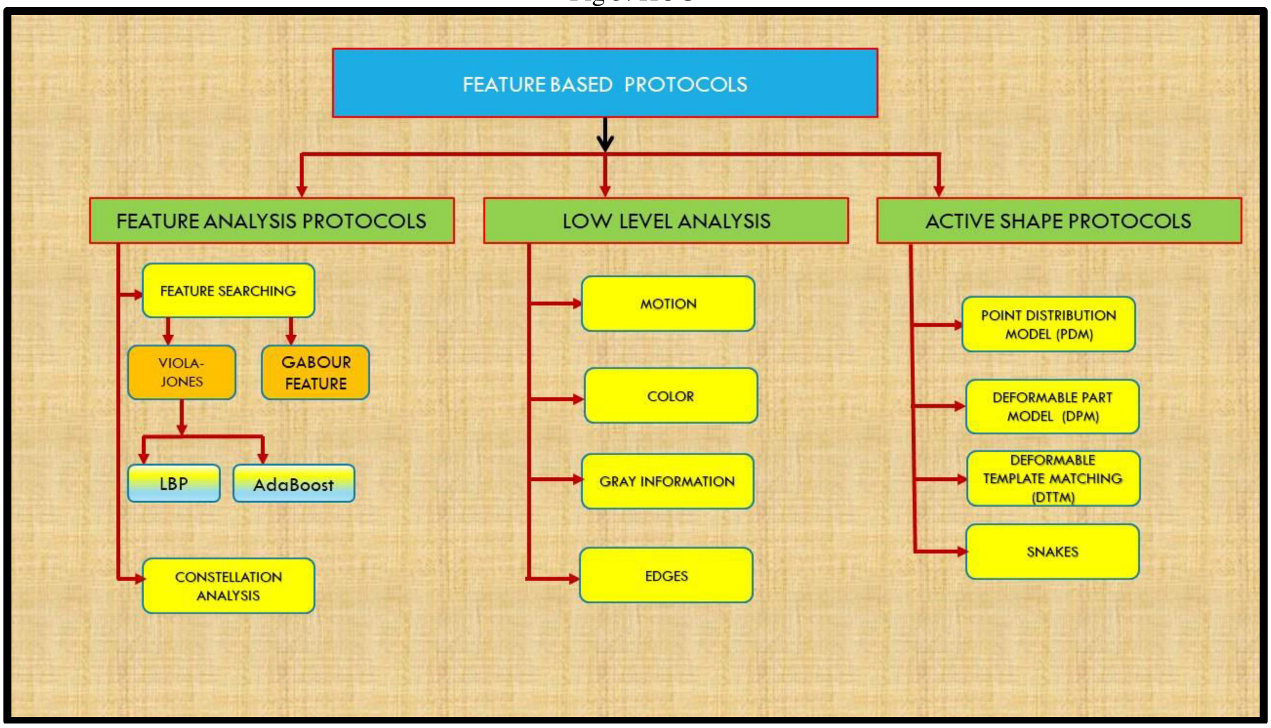


Fig 4: Feature Based Protocols

The actual substantial and thus higher-level manifestation of features is exemplified by active shape protocol. As soon as the system detects a close proximity with any of these features when viewing a picture, it links with facial features like the nose, mouth, and so forth. These sections' coordinates are used to create a map, from which a mask is

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.165 |
|| Volume 10, Issue 6, June 2022 ||
| DOI: 10.15680/IJIRCCE.2022.1006168|

constructed. One can manually alter the mask. Even if the system chooses the shape, the user can change it. It is possible to create a better map by training with more photos.

In 1987, Kass et al. originally introduced snakes, which are general active contours [7]. The head borders are frequently located using snakes [8]. A snake is approximated countersigned around the head region in order to complete the task.DTM ensures improved extraction since it integrates local and global information. It can also be used in real time [10] and is accommodating of any shape in the provided data [9]. The energy terms' weights, however, are challenging to extrapolate. The reduction method takes an enormous amount of time to run repeatedly.

For face detection, DPM makes use of the pictorial structure, which was first put forth in 1973 by authors in [11]. DPM is frequently used to identify human faces [12] as well as identify faces in comic books [13]. A training-based model is the DPM. In DPM, a face mask is created by modelling discrete, rigid elements (such as the eyes, nose, etc.) one at a time. These components are subject to a set of geometric limitations. A detailed analysis on face recognition methods is given in [14-19].

PDM is a method for describing shapes. In PDM, points are used to characterize a face's form. PDM depends on landmarks. The annotation of any image into any certain form on the photos from the training set constitutes a landmark point. By putting landmark markers on the contour of a face in the training image set, the shape of a face in PDM is created. The model is typically constructed with a face shape that includes the formations of the eyes, ears, nose, and other facial features.Due to the fact that PDM blueprints the features as it creates the global face, it reduces the calculation time for searching face features [20]. Additionally, since other information on the face makes up for the occluded area, compact global face information with features reduces the difficulty of occlusion of any face feature [21]. PDM offers a compact structure of a face and can be fitted with a variety of facial shapes. However, the tedious and frequently mistake-prone procedure of creating training sets by identifying the landmarks of the face and facial traits is unavoidable. In order to ensure that the path of action is linear, the control point movements are also limited to straight lines.

The main need for motion-based face detection is a large number of continuous image frames or video sequences. Moving objects and targets offer useful information that can be utilised to find faces. Moving picture contours and frame variance analysis are two of the most used methods for spotting visual motion. Any sort of background can be used in frame variance analysis to identify the moving forepart. By thresholding the gathered frame difference, moving objects that include a face can be identified [22,23].

When compared to processing other facial features, colour processing is substantially faster. Therefore, at certain lighting conditions, the colour orientation is unchanging. However, colour information is sensitive to changes in luminance, and colour values from various cameras fluctuate noticeably. The algorithm produces poor correctness for faces seen from the side [24].

While colour information is processed in 3D, grey information is processed in 2D. Consequently, this needs less computing complexity (requires less processing time). Gray information processing was used in multi-target tracking by authors in [25].A probability function for the grey level is constructed based on the prior knowledge.

A face may be identified in an edge-based face detection system with a minimal amount of scanning [26], and the technology is also reasonably reliable and affordable. Despite this, edge-based face detection cannot be used for noisy images because it only looks at edges at certain scales.

III. CONCLUSION

There isn't a face detection technique that works perfectly every time. Yet, the comparisons in this article will assist in determining the best method to apply based on the particular issues and difficulties. Knowing each method's explanation will help you comprehend it in its entirety.DPM performs well in identifying different facial shapes because it effectively recognizes faces in a real-time setting. It can also deal with differences brought on by varied views and lighting conditions and detect faces in a variety of stances. Nonetheless, DPM has trouble expanding to new object or face categories and encounters speed bottlenecks or slowness.Face detection technology has certain significant obstacles that lower its detection accurateness. Face occlusion, strange emotions, scale and position variations, complicated backgrounds, low resolution, and an excessive number of faces in a picture are the main problems. To improve accuracy and detection rates, many algorithms address the problems in various approaches.

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.165 |

|| Volume 10, Issue 6, June 2022 ||

| DOI: 10.15680/IJIRCCE.2022.1006168|

REFERENCES

[1]https://medium.com/sciforce/face-detection-explained-state-of-the-art-methods-and-best-tools-f730fca16294.
[2] Ismail, N.; Sabri, M.I.M. Review of existing algorithms for face detection and recognition. In Proceedings of the 8th WSEASInternational Conference on Computational Intelligence, Man-Machine Systems and Cybernetics, Kuala Lumpur, Malaysia, 14–16, December 2009; pp. 30–39.
[3] Md. Khaled Hasanet al., Human Face Detection Techniques: A Comprehensive Reviewand Future Research Directions,Electronics 2021, 10, 2354.
[4] Al-Allaf, O.N. Review of face detection systems based artificial neural networks algorithms. arXiv 2014, arXiv:1404.1292.
[5]Hjelmås, E.; Low, B.K. Face detection: A survey. Comput. Vis. Image Underst. 2001, 83, 236–274.
[6] Kumar, A.; Kaur, A.; Kumar, M. Face detection techniques: A review. Artif. Intell. 2019, 52, 927–948.
[7] Kass, M.;Witkin, A.; Terzopoulos, D. Snakes: Active contour models. Int. J. Comput. Vis. 1988, 1, 321–331.
[8] Nikolaidis, A.; Pitas, I. Facial feature extraction and pose determination. Pattern Recognit. 2000, 33, 1783–1791.
[9] Yuille, A.L.; Hallinan, P.W.; Cohen, D.S. Feature extraction from faces using deformable templates. Int. J. Comput. Vision 1992,8, 99–111.
[10] Wang, W.; Huang, Y.; Zhang, R. Driver gaze tracker using deformable template matching. In Proceedings of the 2011 IEEEInternational Conference on Vehicular Electronics and Safety, Beijing, China, 10–12 July 2011; pp. 244–247.
[11] Fischler, M.A.; Elschlager, R.A. The representation and matching of pictorial structures. IEEE Trans. Comput. 1973, 100, 67–92.
[12]Ranjan, R.; Patel, V.M.; Chellappa, R. A deep pyramid Deformable Part Model for face detection. In Proceedings of the 2015 IEEE7th International Conference on Biometrics Theory, Applications and Systems (BTAS), Arlington, VA, USA, 8–11 September 2015.
[13]Yanagisawa, H.; Ishii, D.; Watanabe, H. Face detection for comic images with deformable part model. In Proceedings of the TheFourth IIEEJ International Workshop on Image Electronics and Visual Computing, Samui, Thailand, 7–10 October 2014.
[14] Sanju, Kirti Bhatia, Rohini sharma, An analytical survey on face recognition systems, International Journal of Industrial Electronics and Electrical Engineering, Volume-6, Issue-3, Mar.-2018, pp. 61-68.
[15] Sanju, K. Bhatia, Rohini Sharma, Pca and Eigen Face Based FaceRecognition Method, Journal of Emerging Technologies and Innovative Research, June 2018, Volume 5, Issue 6, pp. 491-496.
[16] Ankit Jain, Kirti Bhatia, Rohini Sharma, Shalini Bhadola, An Overview on Facial Expression Perception Mechanisms, SSRG International Journal of Computer Science and Engineering, Volume 6 Issue 4 - April 2019, pp. 19-24.
[17] Ankit Jain, Kirti Bhatia , Rohini Sharma**,** Shalini Bhadola, An emotion recognition framework through local binary patterns, Journal of Emerging Technologies and Innovative Research, Vol -6, Issue-5, May 2019.
[18] Jyoti, Kirti Bhatia, Shalini Bhadola, Rohini Sharma, An Analysis of Facsimile Demosaicing Procedures, International journal of Innovative Research in computer and communication engineering, Vol-08, Issue-07,july 2020.
[19] Deepak Dahiya, Kirti Bhatia, Rohini Sharma, Shalini Bhadola, A Deep Overview on Image DenoisingApproaches, International Journal of Innovative Research in Computer and Communication Engineering, Volume 9, Issue 7, July 2021.
[20]Boukamcha, H.; Elhallek, M.; Atri, M.; Smach, F. 3D face landmark auto detection. In Proceedings of the 2015 World Symposiumon Computer Networks and Information Security (WSCNIS), Hammamet, Tunisia, 19–21 September 2015; pp. 1–6.
[21] Lanitis, A.; Hill, A.; Cootes, T.F.; Taylor, C. Locating Facial Features Using Genetic Algorithms. In Proceedings of the 27thInternational Conference on Digital Signal Processing, Limassol, Cyprus, 26–28 June 1995; pp. 520–525.
[22] Van Beek, P.J.; Reinders, M.J.; Sankur, B.; van der Lubbe, J.C. Semantic segmentation of videophone image sequences. InProceedings of the Visual Communications and Image Processing'92, International Society for Optics and Photonics, Boston, MA,USA, 1 November 1992; Volume 1818, pp. 1182–1193.
[23] Turk, M.; Pentland, A. Eigenfaces for recognition. J. Cogn. Neurosci. 1991, 3, 71–86.
[24] Boukamcha, H.; Elhallek, M.; Atri, M.; Smach, F. 3D face landmark auto detection. In Proceedings of the 2015 World Symposiumon Computer Networks and Information Security (WSCNIS), Hammamet, Tunisia, 19–21 September 2015; pp. 1–6.

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.165 |

|| Volume 10, Issue 6, June 2022 ||

| DOI: 10.15680/IJIRCCE.2022.1006168|

[25] Cao,W.; Huang, S. Grayscale Feature Based Multi-Target Tracking Algorithm. In Proceedings of the 2019 International Conferenceon Intelligent Computing, Automation and Systems (ICICAS), Chongqing, China, 6–8 December 2019; pp. 581–585.
[26] Anila, S.; Devarajan, N. Simple and fast face detection system based on edges. Int. J. Univers. Comput. Sci. 2010, 1, 54–58.

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING