Survey on Face Recognition with pre filtering Techniques and their comparative study

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Abstract—Face is a very crucial aspect with respect to recognizing as it stands out as a unique feature. The normal human has distinct facial features that can be mapped and remembered. Security and privacy are very important topics given the trend and issues that are being faced by normal people. The face place a crucial aspect in giving out emotions and identification Facial recognition is a very flexible detection method and has the freedom that the subject wouldn't know if he's scanned. The facial features can be systematically analyzed that are common to everyone's face. The distance between the jaw line and the chin, the one between the eyes and nose, position of cheekbones all of these can be taken up as numerical values and analyze these specific features and map it to a person. There are instances where the recognition becomes a tougher due to external factors like variations in poses, emotional variants, non-controllable environmental conditions, ageing etc. In order to understand the techniques in depth and it plays a crucial role in the future of face recognition and its role in privacy and authentication. There are numerous methods that have been constructed and structured and each one has its pros and cons and other important aspects of facial recognition techniques. And we've got the comparative analysis of the available techniques and their advantages and disadvantages. We have put light in to pre-filtering techniques and edge detection methods to optimize the recognition of dicey aspects of a face, the whole idea is to understand the better aspects of the facial recognition with additional techniques that will help the future of this detection mechanism

Keywords— recognition, edge, pre filtering ,formating, style, styling

I. INTRODUCTION

A. Capturing the Picture:

The advanced information of the picture – catching a man's computerized information utilizing a camera. Perform confront identification - (distinguishing the human appearances from the given advanced image).The puts in the picture where there is a huge or a sharp change in the shine are named as an edge. In the given picture confront is perceived or recognized by utilizing the principals of Edge-recognition. For the most part, the face discovery is performed by extricating the force of every pixel and gathering the components, at that point distinguishing the comparative pixels and identifying the face.

B. Feature Extraction:

Highlight extraction (these aides. In highlight extraction, we for the most part identify the edges in the given picture. Different edge identification procedures that are principally utilized are, Sobel, Prewitt, and Watchful and so on. Near examination of edge discovery strategies has demonstrated that vigilant is the most intense edge locator.

C. Face Acknowledgement:

At last, confront acknowledgment (contrasting the procured highlights and the pictures in the database and distinguishing them). There are at on of employments official acknowledgment innovation. It is broadly utilized as a part of security territories, interpersonal interaction like Facebook, and in generally customized advertising. Acknowledgment of face is utilized by Facebook to offer proposals to the client in labeling. His/her companions in the picture, this works by putting away the different attributes of the individual in the database and along these lines contrasting the highlights. These days numerous applications with respect to confront acknowledgment like face-bolt screen, confront vault, Desert spring face, Informal ID were additionally created.

Picture handling utilizes basic systems that can be used for the printed duplicates of printouts and photographs. Picture specialists use an extent of basics of comprehension while in the meantime using these visual strategies. Picture handling isn't exactly as of late limited to a range that must be analyzed however on data of master. Affiliation is another basic system for picture handling through visual techniques. So examiners apply a mix of individual learning and certification the data tothe handling of the picture. Picture preparing is determinedly related to PC vision and PC plans.
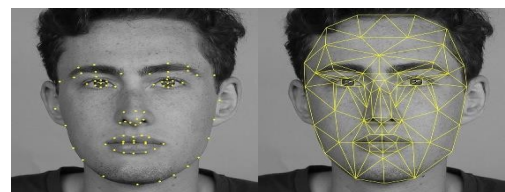

Fig. 1: Points on the face to recognize

Facial acknowledgment is a biometric programming application prepared to do exceptionally recognizing or checking a man by contrasting and breaking down examples in light of the individual's facial shapes. Facial acknowledgment is generally utilized for security purposes, however there is expanding enthusiasm for different territories of utilization. Truth be told, facial acknowledgment innovation has gotten huge consideration as it has the potential for an extensive variety of utilization identified with law implementation and also different undertakings. Facial acknowledgment is otherwise called confront acknowledgment.

There are distinctive facial acknowledgment strategies being used, for example, the sum med up coordinating face identification technique and the versatile local mix coordinating strategy. Most facial acknowledgment frameworks work in view of the distinctive nodal focuses on a human face. The qualities estimated against the variable related with purposes of a man's face help in extraordinarily distinguishing or confirming the individual. With this system, applications can utilize information caught from faces and can precisely and rapidly distinguish target people. Facial acknowledgment procedures are rapidly developing with new methodologies, for example, 3-D displaying, and conquering issues with existing strategies.

There are numerous nodes and points of interest that matches to facial acknowledgement. Comparing and referring with other strategies under biometric authentication, facial acknowledgment is of a non-contact nature. Face images can be caught from a split and can be taken down into small fragments while never requiring any linking with the client/individual. Therefore, no other client can emulate someone else. Facial response can come in as an implausible safety effort for time following and contribution. Facial acknowledgment is likewise shabby innovation as there is less preparing included, as in other biometric procedures.

There are sure downsides related with facial acknowledgment. Facial acknowledgment can just recognize individuals when the conditions, for example, lighting is positive. The application could be less dependable if there should be an occurrence of inadequate light or if the face is mostly darkened.

II. RELATEDWORKS

Face picture evaluation learned with a target and relative face picture characteristics for improved face acknowledgment by Hyung-Il Kim, Seung Ho Lee, and Yong ManRo.Substantial examination endeavors have been finished for face acknowledgment in different true applications. In any case, discolored look pictures, taken in the current-world perspective, make face acknowledgment hazardous. Right now, recommend another face picture quality valuation that intends to create an overwhelming and trustworthy face acknowledgment framework. The proposed strategy investigates two significant viewpoints for visual picture quality, i.e., face quality and bungle among exercise and test face pictures. A face picture quality evaluator is instructed dependent on the two variables to recognize helpful countenances from not valuable ones. The arranged face picture esteem assessment model is energetic and organized to confront acknowledgment frameworks by utilizing an educated appraisal.

Their analytical results on a no-nonsense database show generous improvement in face acknowledgment accuracy by the arranged system. They close by proposing an intelligent FIQ valuation for a fiery and dependable FR framework. By declining the face pictures which can dangerously impact the FR, FR structures with the arranged FIQ evaluation strategy can build FR precision. Through corresponding trials on the invigorating FRGC 2.0 DB, the effectiveness of the arranged strategy was decidedly settled and being approved with the frameworks accessible.

Antiquated biometric confirmation frameworks show horrible showing in separating indistinguishable twins and comparative people beneath reasonable conditions. The resulting methodologies are for relatively indistinguishable twins. Customarily plenty of physical examinations were performed to spot twins and thusly work to recognize their choices with unique excellence, and loads of a ton of frameworks had been existed to show varieties in twins by exploitation finger impression, vocal voice, and retina iris as a piece of the example identification and it becomes more important nowadays for future recognition system and verification all the other purposes that are available in the process .In existing strategies several techniques square measure utilized for twin's distinguishing proof like unique mark, vocal voice and retinitis acknowledgment. The strategy for unique finger impression recognizable proof is utilized to detect the particular people in exchange or associations.

The technique and the structure proposes as a picture taken from the individual and contrast and information or identification and also for verification. The retina iris recognition conjointly same methodology to fingerprints identification. Conclusion of this specific paper to spot the similar faces and twins and exploitation of Dennis Gabor filter and the method Multi scale quick symmetric rework. Dennis Gabor filter is applicable to distinguish someone's face in case they are not the same. Nonetheless multiple scales prompt symmetricity and the rework technique is employed to differentiating similar faces and identical twins and the exploitation of the facial and other aspects. This methodology offers smart aspects like performance and structure to the with respect to the existing Dennis Gabor filter methodology.

Hearty Face Recognition and Classification System B asked on SIFT and DCP Techniques in Image Processing By Mrs.W. Sylvia Lilly Jebarani T.Kamalaharidharini[3]. In current days, there has been an expanding need for acknowledgment of at freedom face pictures, similar to those recovered from the on the web or taken by cell gadgets and visual police examination cameras.

In these kind of intense world situations, images of human faces may be simply blocked or stopped by this and by alternative things that build the face recognition procedure and task that are there as a fancy one and exists this way the required performance has been achieved earlier that was taken up however typically solely within the controlled environments. Nonetheless, it's repetitive to get comprehensive face pictures for at freedom face acknowledgment. Along these lines, in order to dodge the breaking down of face pictures and furthermore the Brobdingnagian varieties as a result of enlightenment, posture, impediment and appearance, a substitution tough Face Recognition approach are anticipated. During this methodology, the incomplete face acknowledgment abuse

Scale Invariant Feature redesign (SIFT) system is blended in with the Multidirectional Multilevel twin Cross Patterns (DCP) procedure that makes the same task as a solid one in contrast with elective face acknowledgment draws near.

At that point, the solid requirement for Set Matching (RPSM) is utilized to coordinate the relating stable key focuses from every one of the display pictures and test face picture. At last, PNN and KNN characterization square measure acclimated order the face pictures even with the nearness of impediment, irregular halfway yield, light, cause, and misrepresented facial highlights. This anticipated examination for face acknowledgment framework is assessed and upheld the exhibition parameters like affectability, particularity, precision, and review.

Right now, a plastic new extreme Face Recognition approach is anticipated exploitation SIFT and DCP strategies. Here, the blend of SIFT and DCP systems leads to removing the right and stable key focuses which at that point experiences an indistinguishable technique utilizing the strategy called RPSM. In the Starting, the Gaussian separating strategy is utilized for the most part for barring the unsettling influence that is the commotion inside the picture. At the point when the facial location strategy, the key parts of the picture conveyances square measure removed from the display picture and test face fix utilizing the SIFT keypoint indicator and DCP procedure. At that point, the removed choices zone unit incorporated along into an improved element vector. At long last, the RPSM technique is applied to fundamentally coordinate these separated capabilities.

The KNN collection system taken to group the photos solid to make, lighting that is enlightenment, impediment and absolutely different faces include conditions. It will expand the prevalence precision of the arranged face acknowledgment in correlation with the diverse existing frameworks. Later on, the very surprising the different grouping philosophies and diverse datasets will be utilized to assess the outcomes.

The Development Trend of Evaluating Face Recognition Technology Caixia Liu. In application, the yield of facial acknowledgment not just relies upon the static face acknowledgment algorithmic principle, anyway moreover relies upon the seriously powerful facial acknowledgment algorithmic standard. During a facial acknowledgment framework, facial picture obtaining instrumentation and algorithmic principle equipment processor likewise will affect the speed and impact of prominence.

Therefore, once evaluating technology, we must always not only perform the static check of the rule, however additionally does the dynamic face acknowledgment investigate real faces? In a comparable occasion, thinking about the part of the impact of equipment setup and the parameters of the design of face acknowledgment items or frameworks should be given extra consideration.

The occasion pattern of assessing face acknowledgment innovation can turn out to be every static investigate rule level and dynamic investigate acknowledgment result to genuine countenances that are there in application-level should be distributed. Indeed, even the recorded face acknowledgment investigates and framework equipment arrangement look at should be allotted at the same time. Therefore, once assessing facial-recognition technology in the coming future, whether or not standard single face-recognition product take a look at, or massive scale multiple face-recognition systems take a look at, we shouldn't be performing the static face-recognition algorithmic rule check, however additionally need to perform the dynamic applied face- recognition take a look at. At the moment, the implication of the hardware configuration of the face-identification produce has to be placed forward, and their merit parameter includes the close attention.

III. ANALYSIS OF FACE ACKNOWLEDGEMENT TECHNIQUES

When there's quantifiable amount of techniques out there to attain a purpose that is single specific there are places it usually turns out to be terribly complicated and it is very time consuming to effectively perceive and detect the methods individually. In that case, it is fundamental to comprehend the techniques and methods effectively. Subsequent of that the explanation of assorted method's used basically for facial recognition and will have extraction and their analysis of the functioning systems diagrammatically like PCA, LDA, ICA, SVM.

Thus we can able to understand that there are multiple ways for facial acknowledgement and have extracting feature. Now, the picking of an accurate and robust technique depends majorly upon the sure parameters like their pros and cons, performance rate. The additional functioning of facial recognition system depends upon sure factors like cause, lighting conditions, expression, occlusion etc.

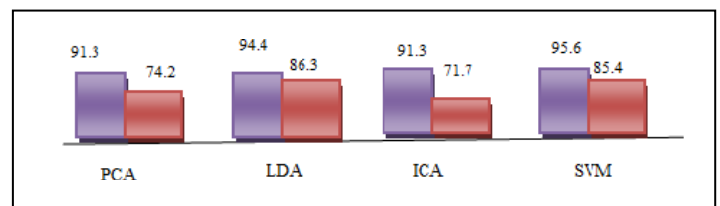The in depth summary for the very same aspect is shown in a tabular format below

Fig.2 Evaluation with different

Table 1: Analysis on Face on different face recognition techniques

#	Approach/		Representative work	Strength	Weakness	Performance
1	Knowledge based		Multi-resolution rule based method, eye region detection and other features	Easy to comprehend	Difficult to translate human knowledge into well defined rules	Quite low
2	Feature Based	Viola-Jones feature searching	Haar like features	Minimizes computational cost and high accuracy and 15 times quicker than all	Sensitive to lighting conditions and rotations.	Better
		Gabor feature searching	Uses Gabor filters	Fast, small training set and acceptable accuracy	High dimensionality, affected by complex background	
		Constellation	Gaussian derivative filter	Practical	Difficult to implement	
		Texture	Combination of statistical and multi-resolution texture features	Can detect non-upright faces with glasses and beards	Face localization is not considered but only texture classification results	
		Skin Color	Adaptive threshold, chroma chart and eye mouth map	Effective feature in face detection.	Skin color alone is not sufficient	
		Motion based	Besides face region, frame differences can be used to locate facial features	Easily locate moving objects using motion information	Little bit difficult to implement	
		Grey- scale based	Local grey minima with segmented facial regions	Gives fine response in complex backgrounds	Involves complexity in understanding	
		Multiple features	Integration of skin color, size and shape	Better than using single feature	It adds extra-computational burden	
3	Template Matching	Predefined face Templates	Templates of eyes and nose	Good recognition rate	High computational complexity	Good
		Deformed Templates	Active shape model including snakes and PDM	Flexible and able to change their size to match data	Must be initialized in the proximity of object of interest	
4	Appearance Based	Principle component analysis(PCA) along with back proportion neural network/Eigen face method	Fractional Eigen faces and dual supervised PCA	Recognition, implementation is simple and easier and No knowledge of geometry of faces is required	Restriction on size and position of face and Learning is time consuming	Recognition rate and performance decreases under varying pose but best recognition rate
		Linear discriminate analysis(LDA)/Fisher face method	Encodes discriminating information	Solves illumination problem and Optimizes low dimensional representation of objects.	Singularity problem- fails when all scatter metrics are singular and Small sample size problem	Good
		Independent component analysis(ICA)	De-correlates the higher order statistics in addition to second order moments	Exploits higher order statistics and allow better characterization of data in n-dimensional space	Difficulty in arrangement of data	Good
		Support vector machine	SVM with polynomial kernel and two level hierarchy of SVM classifiers	Very effective when have high dimensional spaces	Efficient only for small no. of sets and Time and memory consuming method	Good recognition rate with theoretical support
		Neural Network	Convolution neural networks	Reduces mis-classification among neighborhood classes and easy to implement and understand	Implementation is expensive and result become quite low on increasing no. of classes	very high performance
		Naïve bayes classifiers	Intensity projection, profile and edges are combined	Better estimation of conditional density function of sub-regions	Don't work well for non frontal faces	Quite low
		Hidden Markov model	State HMM+SVD coefficients	registration errors are very low	cannot produce good results	Not Good
		Information theoretical approach	Mutual information with maximum relevance minimum redundancy technique	More effective results	difficult to analyze the results	Good
		Statistical methods	Statistical subspace methods	Don't rely on color or size if image	Can't detect if position of eyes is disturbed and only small no. of features can be extracted	

| #	Approach/		Representative work	Strength	Weakness	Performance
5	Model based	2D morph-able method	2D image matching	Optimal linear dimension reduction from 2D to 1D	Eigen vectors are noisy and can't be taken under consideration	Good
		3D morph-able method	PCA model of shape and one of color, camera and a lighting model.	Representation of feature vector space	Matching become difficult problem	
		EBGM	Uses Local features	Low Computational time	Complexity in implementation	
6	Combined techniques	TWR+PCA (CMU-PIE database)	TWR transfers each face image to be close to Gaussian signal, so more suitable for PCA processing	Recognition, implementation is simple and easier	Performance under expressions variations and occlusion is not good.	100% result under lightening variation of q=4 and 91% accuracy rate.
		Gabor filter+SVM (Jaffee and Yale database)	Enhanced performance ratio	Computational complexity is very low	Not good in complex backgrounds	Recognition rate for jaffee is 89.4% and 86%for Yale db
		PCA+ANN (Eigen faces method)	Better and high performance rate with noisy data	Good even for noisy face images	Very sensitive to head orientations	Recognition rate is above 90%
		Local Gabor binary pattern	Local feature Localization	Better than Gabor filter	Color information is not included	Reported accuracy is 99%
		DCT Gabor filter (Jaffee database)	Enhancement over Gabor filter, PCA and DCT	Easy to understand	Processing is complex	Recognition rate is 83%.
		Fast ICA+Contourlet transform(ORL db)	Procedure with high robustness	Cost of implementation is less	Computation time increases to larger extent.	Recognition rate is 98.6%.
		Semi info + Fuzzy LDA	Enhanced performance over LDA	Computation is better	Don't work better with large sampling size problems	For N=40,it is 78%.
		Geometry + ELBT (Jaffee database)	Better than GLCM,LBP	Easy to apply	Overhead in selection of fucidicial points	Recognition rate is very very high

IV. ARCHITECTURE
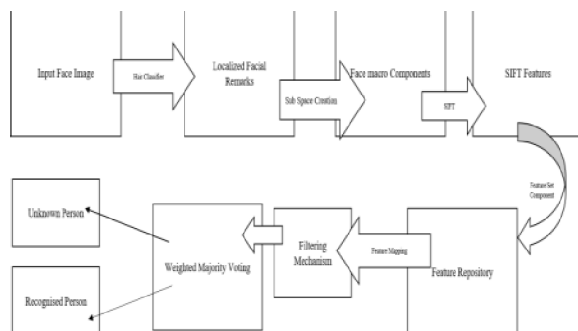
Fig. 3: Architecture

A. Face LandmarkLocalization:

The Hear Classifier is a mechanism that was proposed by Viola and Jones. They use Hear classifier to detect the objects from the images. This feature is used to change contrast values of the object and it also uses the values of the images and to detect the facial features, it is required to find the edges of the images and their intensity. The techniques used Ad a Boost and facial algorithms such as Haar classifiers are used to train the system. SIFT feature are based on 128 dimensional vector. The characteristic pivot invariant assists with making a lattice of 4X4 and proposed alongside the center of key focuses. A few pictures may contain positive and negative pictures that are utilized to characterize the classifier. They dissected 1500 pictures, for various points changes from 0 to 55 degrees for front view in every facial element parts.

The three classifiers that are eye, mouth, and nose have given a superior positive proportion, which shows the decency of the procedure. When the facial component is distinguished, at that point the remainder of the facial element is estimating the scientific likelihood of the square and liable to exist.

B. SIFT FeatureDescriptor:

The SIFT descriptors highlight that utilizes 128 vector dimensional pictures. So as to make the component revolution invariant of 4x4 square is picked with the center of the point key is issued by Lowe. Thus every grid Gradient of neighboring pixels and their magnitude of neighboring pixelsarecalculated.Totalnumberofangleis3600anditis

classified into 8 equal parts is called 450 beans. Each grid consist 16 pixels and with particular pixel orientation classifier. Every pixel orientation values are said to be beans. Therefore, every grid provides us 8 dimensional facial features, and it completely said to be 4X4 grid for window. Themaximumamountof4X4X8=128dimensional vector value is created for feature descriptor.

C. FeatureMapping:

The Minimum distancepair technique (MDPT) is being used for image feature matching and we have three database sets such as mouth, nose and eyes are combined to explain the feature set. The test-set also involves the similar different component's facial features sets. They are Eye, Nose and Mouth. Test For each element 1 to n-number matching is being performed on basis of lesser distance over each class features, it will be assigned for respective class. It has been imitated that the nose elements will match to nose, mouth components will match to their mouth and Eye element will match to eye. The simple process is being applied to all features that are eliminating form image parts. The overall score for the element is computed.

V. FILTERING TECHNIQUES

The product schedule that changes the presence of a picture or part of a picture modifies the shades and shades of the pixels in some way. Channels are utilized to build brilliance and difference just as to mix it up of surfaces, tones and enhancements to an image. See the illustrations channel and Photoshop module.

There are different types of filters. They are

- Gaussian Blur Filter
- Solarizing Filter
- Find Edge Filter
- Embossing Filter

A. Filtering:

A system for altering or improving a picture quality. For instance, you can add series of picture to expel different highlights. Picture preparing tasks are actualized with sifting and incorporate image smoothing, honing, and edge upgrade.

B. Pre-Filtering:

The picture can be figured by thinking about the powers over a specific locale

Fig. 4: Pre-Filtered Image

C. Gaussian blurfilter

In convolution, the two mathematical operates area unit combined to provide another third function. In image process functional area unit are typically said to be kernels. A kernel is nothing quite as block arrays of pixels. Usually, the values within the kernel are added up to at least one and this can be used to create positive number of energyto itssuper imposed- or as long from the picture when the operation takes place.

Specifically, a Gaussian kernel is used for Gaussian blur could be a square array of elements wherever the pixel valuescorrespondtothevaluesofaGaussianshapein2D

Fig. 5: Gaussian Filter Matrix

Every element in the image gets higher by the Gaussian kernel this is often done by including the center element of the kernel on the images and multiplying the values within the original image with the pixels that can overlap the kernel . The values of multiplications are worth with the use of future destination element and with gazing more about the image, you'd multiply the worth at (0,0) as the input array by the worth at within the kernel array, the worth that (1,0) within the input array is worth with the kernel to make the result as (1,1) where every output is stored in the destination element to know this mechanism increases the operational feature of the object and their elements.
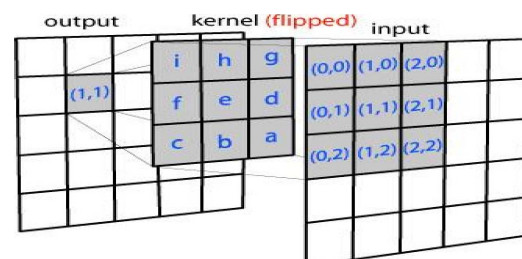

Fig. 6: Kernel Matrix

This is very larger to kernel, the more expensive with the operation. If larger the surface area of the blur, the longer the operation will take to perform the operation.

The convolution is being done by multiplying every input pixel with the obtained kernel. However, the kernel is symmetrical you can also multiply each axis such as x and y independently, which will reduce the number of multiplications. In mathematical terms, the matrix is separable and it can be reduced into (M×1) and (1×N) matrices.

To use the input image with the kernels and to make the addition to every element to make worth for the output element

D. Spatialfilter

The idea of mean filtering is individually to interchange every picture element price in a picture with the average price of its neighbors, as well as itself. This has the impact of eliminating picture element values that are typical of their surroundings. Mean filtering is other- wised to be a convolution filter. Like there are different convolutions it's primarily based on kernel, that represents the form and size of the neighborhood to be sampled once hard the mean vale and typically as 3×3 sq. This filter helps in making the use of contrast of the image and additionally smoothing the image with the filtering.

$\frac{1}{9}$	$\frac{1}{9}$	$\frac{1}{9}$
$\frac{1}{9}$	$\frac{1}{9}$	$\frac{1}{9}$
$\frac{1}{9}$	$\frac{1}{9}$	$\frac{1}{9}$

Fig. 7: 3X3 Matrix

VI. Modules Description

A. Build Detector Module

A build detector framework may be a computer application fit to recognize and check a person from a computerized image or a video to be updated over the application. One in every of the approaches to try this is often being observed selected facial highlights from the picture and a face info. It is often used as a district of security frameworks and might be contrasted with totally different life science, for instance, distinctive finger impression or eye iris acknowledgment frameworks. As of late, it's in addition clad to be current as a business distinctive proof and promoting equipment.
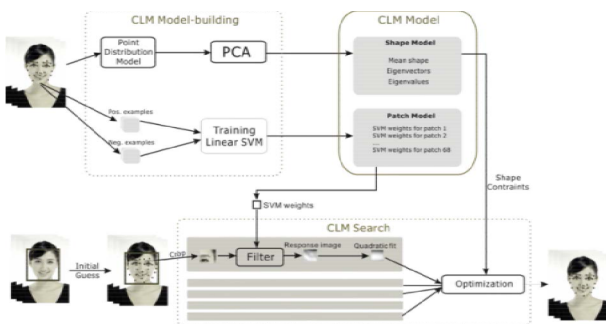

Fig. 8: Build Detection

B. GUI Module

Face identification could be a computerinnovation being used as an area of associate degree assortment of utilization that distinguishes human faces in computerized footage. Face discovery likewise alludes to the mental procedure by which individuals realize and beware of appearances during a visual scene.

C. Feature Points Detection Module

The least distance pair method is utilized to bring out the image feature. We have various element set frameworks such as Mouth, Nose, Lips and Eyes.

D. SIFT Feature Descriptor Module

This feature is used to change the contrast values and features that uses 128 vector dimensional images. To create feature rotating invariants of 4x4 block is selected with the maximum number middle of the point key is given by Lowe. Thus every grid Gradient of neighboring pixels and their magnitude of neighboring pixels are calculated. Total number of angle is 3600 and it is classified into 8 equal parts iscalled450beans. Eachgridconsist16pixelsand with particular pixel orientation classifier. Every pixel orientation values are said to be beans. Therefore, every grid provides us 8 dimensional facial features, and it completely said to be 4X4 grid for window.

VII. Conclusion

In this research, we have evaluated the different face identification methods and algorithms together with the evaluations of a number of methods, which have been evaluated as well. Thus we have analyzed by using the neural network that it was one of the important factor to know about the security for the bio- metric authentication. Computational education, performance advancement, self-management, fault-tolerance, high-performance, enhanced accuracy and efficiency capability to derive means to resolve the user problem and enhance privacy to the active users. Filtering mechanism is used prior to make the compos-ability of the image and to detect more easily with the database. There are many filtering techniques are presented to make more improving in accuracy over the detection of images. Edge detection is an algorithm used to identify the edges of the pictures and to eliminate the portion of the image to make filters over the detected parts of the images. Thus, we conclude that it makes the improvement over the other techniques and increases the performance of the face recognition.

VIII. References

[1] MsAshwiniB.Akkawar,Prof.MayurS.Burange,"Reviewand Comparative study of face recognition using different neural network algorithms", International Journal Of Engineering ResearchandGeneralScience,Volume3(2),March-April,2015

[2] Naveen Kumar Gondhi, Er. Navleen Kour. "A comparative analysis on various face recognition techniques" , 2017 InternationalConferenceonIntelligentComputingandControl Systems (ICICCS),2017

[3] Singh, Avinash Kumar, Arun Kumar, G. C. Nandi, and Pavan Chakraborty."Expressioninvariantfragmentedfacerecognition", 2014 International Conference on Signal Propagation and Computer Technology (ICSPCT 2014),2014.

[4] W. Sylvia Lilly Jebarani, T. Kamalaharidharini. "Robust face recognition and classification system based on SIFT and DCP techniquesinimageprocessing",2017InternationalConference on Intelligent Computing and Control (I2C2),2017

[5] Hyung-Il Kim, Seung Ho Lee, Yong Man Ro. "Face image assessmentlearnedwithobjectiveandrelativefaceimagequalities for improved face recognition",

[6] Kamalakannan, S. (2015). G., Balajee, J., Srinivasa Raghavan.,"Superior content-based video retrieval system accordingtoqueryimage".2015IEEEInternationalConference on Image Processing (ICIP),2015

[7] Ushapreethi,P.,Jeyakumar,B.,&BalaKrishnan,P.(2017). Action Recongnition in Video Survillance Using Hipi and Map Reducing Model. International Journal of Mechanical Engineering and Technology 8 (11),368-375.

[8] Ranjith,D.,Balajee,J.,&Kumar,C.(2016).Inpremisesofcloud computingandmodels.InternationalJournalofPharmacyand Technology 8(3),4685-4685.

[9] Jeyakumar, B., Durai, M. S., & Lopez, D. (2018). Case Studies in AmalgamationofDeepLearningandBigData.InHCIChallenges and Privacy Preservation in Big Data Security (pp. 159-174). IGI Global.

[10] F.Cardiaux,C.Sanderson,andS.Bengio,"Userauthenticationvia adapted statistical models of face images,"IEEE Trans. Signal Processing, vol. 54, no. 1, pp.361-373, 2006.

[11] A.Wagner,J.Wright,Ganash,H.Mohabi,andY.Ma,"Towarda practical face recognition system: ro-bust alignment and illumination by sparse representa-tion," IEEE Trans. Pattern Analysis and Machine Intel-igence, vol. 34, no. 2, pp. 372-386, 2012.

[12] W.Zhao,R.Chellappa,A.Rosenfeld,andJ.Phillips, "FaceRecognition: A Literature Survey," to appear ACMcomputing surveys,2003.

[13] SushmaJaiswal1,Dr.SaritaSinghBhadauria2,Dr.RakeshSingh Jadon3,"EvaluationofFaceRecognitionMethods,"IEEE2010.

[14] Deepshika Bhati, Vandana Gupta, "Survey- A ComparativeAnalysis of Face Recognition Technique", International Journal Of Engineering Research and General Science, Volume 3(2), March-April,2015.