ISSN: 2277-9655
Impact Factor: 4.116

IJESRT

INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH TECHNOLOGY

AGE GROUP CLASSIFICATION USING HAAR FEATURES EXTRACTION AND KNN

Arman Ahmed*, Shivam Batra, Priyank Bahl
* Department of Computer Science and Engineering JSS Academy Of Technical Education, Noida, Uttar Pradesh, India

ABSTRACT

Recognition of the one of the most facial varieties, for example, OCR(character), expression and gender has been broadly contemplated. Programmed age group and foreseeing future countenances have once in a while been investigated. With the progression in age of a human there occurs some changes in the face features. This paper worries with giving a procedure to gauge age gathering utilizing face features. This procedure includes three stages: Location, Feature Extraction and Classification. The geometric components of facial pictures like wrinkle topography, face edge, left eye to right eye separation, eye to nose separation, eye to jaw separation and eye to lip separation are computed. Taking into account the surface and shape data age grouping is done utilizing K-Means bunching calculation. Age reaches are ordered progressively relying upon number of gatherings utilizing K-Means bunching calculation. The acquired results were huge. This paper can be utilized for anticipating future confronts, arranging gender orientation, and expression recognition from facial images.

KEYWORDS: Age group classification, face feature recognition, detection eyeball recognition, face detection, wrinkle features.

INTRODUCTION

Individuals can be identified by studying the different features of their respective faces. The process of studying the features of a face is known as “FACE RECOGNITION SYSTEM”. It is one of the important biometric method used in the present scenario. Biometric methods are highly significant and advantageous as compared to conventional authentication strategies. This is due to the fact that the biometric features are unique for each and ever individual. An issue of individual verification and identification is an effectively developing range of research. The most commonly utilized validation strategies are face, voice, fingerprint, ear, iris and retina. Research in those areas has been conducted over the last two decades. Conventionally, face recognition is used for the purpose of identification in a number of areas. It is used for identifying various reports such as land enrollment, travel papers, driver’s licenses and recognition of human in a security range. Face pictures are being progressively utilized as extra method for verification in applications of high safety zone. As the age of an individual increases there occurs a change in the facial features, so the database needs to be upgraded routinely. In order to update database is a difficult task. So we have to address the problem of facial ageing and try to develop a mechanism that will recognize a man with 100% accuracy. In this paper successful age bunch estimation utilizing face elements like surface and shape from human face picture are proposed. Recognition of face is one of the biometric methods which are used to identify individuals by features of the face. The biometric authentication techniques have a significant advantage over traditional authentication techniques as the biometric characteristics of the individual are unique for every person. A problem of personal verification and identification is an actively growing area of research. Face, voice, fingerprint, iris, ear, retina are the most commonly used authentication methods. Research in those areas has been conducted for more than 30 years.

For better execution, computation of geometric elements of facial picture like wrinkle geology, face point, left to right eye separation, eye to nose separation, eye to jaw separation and eye to lip separation is done. In view of the

composition and shape data, classification of age is done by making use of K- Means clustering algorithm. Age extents are arranged progressively relying on the number of gatherings utilizing K- Means clustering algorithm [1].

Human facial image processing has been a dynamic and intriguing exploration issue for quite a long time. Since human faces give a considerable measure of data, numerous themes have drawn heaps of considerations and therefore have been concentrated seriously. The majority of these is face recognition [3]. Other research subjects incorporate feature faces [4], remaking faces from some recommended features [5], grouping gender orientation, races, and expressions from facial pictures [6], et cetera. On the other hand, not very many studies have been done on age classification. Kwon and Lobo [8] initially dealt with the age classification issue. They alluded to craniofacial research, dramatic cosmetics, plastic surgery, and discernment to figure out the elements that change with increase in age. They ordered gray scale facial pictures into three age groups babies, young adults and senior adults. To start with, they connected deformable formats [9] and snakes [7] to find essential elements, (for instance, eyes, noses, mouth and so on.) from a facial image, and judged in the event that it is a baby by the separations between essential components.

At that point, they utilized snakes to find wrinkles on particular areas of a face to break down the facial image being young or old. Known and Lobo pronounced that their outcome was promising. In any case, their information set incorporates just 47 pictures, and the baby recognizable proof rate is beneath 68%. Moreover, since the routines they utilized for area, for example, deformable layouts and snakes, are computationally extravagant, the framework won't not be suitable for ongoing handling.

RELATED WORK

In order to estimate the age facial global features, Active Appearance Model (AAM) is applied. The AAM is a generative parametric model that contains both the shape and appearance of a human face, which it demonstrates utilizing the principal component analysis (PCA), and has the capacity to create different occurrences utilizing just a little number of parameters. In this way, an AAM has been broadly utilized for displaying face and facial element point extraction. AAM, which is the expansion of Active Shape Model, discovers the component points utilizing the enhanced Least Mean Square method. At that point support vector machine system is made functional to make hyper planes that will go about as the classifiers utilizing the outcome, the individual is named youthful or grown-up. Two separate maturing capacities are produced and used to discover the age as proposed by K. Luu et al. [27] and Choi et al. [32]. The system proposed by K. Ricanek et al. [28] can be considered as the expansion of K. Luu et al. [27], with the special case that Least Angle Regression (LAR) strategy is utilized to build the exactness of discovering the feature points in the image utilizing AAM. In LAR strategy, every one of the coefficients are initially assigned 0. Then from feature point X1, LAR moves persistently towards minimum mean square estimation until it achieves the proficiency. Worldwide elements, for example, separation, point and proportion are additionally considered for order of age gathering. Merve Kilinc et.al. [29] Utilize another system for having covered age gatherings and a classifier that consolidates geometric and textural components. The classifier scoring results are added to deliver the assessed age. Relative investigations demonstrate that the best execution is gotten utilizing the combination of local Gabor Binary patterns and geometric elements. From the geometric elements, the cross-proportion is figured out, which is the proportion of separation between the facial elements like nose closures, head, and mouth. The part of geometric qualities of appearances is considered, as portrayed by an arrangement of historic point focuses on the face, in the view of age. The relative changes used to estimate change in the subjects posture. Sub spaces can be distinguished as points on a Grassmann manifold. The twisting of a normal face to a given face is evaluated as a speed vector that changes the normal to a given picture in unit time.at that point Euclidean space regression strategy is made functional. This paper apprehensions with giving a technique to gauge age gatherings utilizing face features. This system depends on the face triangle which has three direction coordinate points between left eyeball, right eyeball and mouth point. The face edge between left eyeball, mouth point and right eyeball appraises the age of a human. On human trial, it functions admirably for human ages from 18 to 60 as talked about by P. Turaga et al. [30] and R. Jana et al. [31].
Choi et al. [32] examines about the age identification utilizing age feature classification joined as a part of request to enhance the general execution. In feature extraction, they talked about local, global and hierarchical features. In nearby elements, for example, wrinkles, skin, hair and geometrical components are extracted utilizing Sobel filter system. In worldwide components AAM technique, Gabor Wavelet transform methods are utilized. Various leveled is the mixture of both the neighborhood and worldwide elements. In the proposed model they utilized Gabor channel to

extricate the wrinkles and LBP system for skin identification. This enhances the age estimation execution of neighborhood elements.

C.T. Lin et. Al [33], assessed the age by global face elements taking into account the blend of Gabor wavelets and orthogonal locality preserving projections. The Gabor wavelet transformation is utilized to build effectiveness of SVM development. Hu Han et. Al [34] examined about the face pre-preparing, facial part restriction, feature extraction and hierarchical age estimation. They utilize SVM-BDT (Binary Decision Tree) to achieve age group classification. A different SVM age repressor is prepared to anticipate the final age.

IMPLEMENTATION OF PROPOSED TECHNIQUE

In this segment of paper, the implementation of the age group classification will be discussed. The implementation process mainly consists of three stages, namely, location, feature extraction and age classification as outlined in figure 1.
In the location phase, the Viola Jones face detection algorithm is used. In general, Viola Jones face detection algorithm is further divided into three basic steps. The three basic steps include feature extraction, boosting and multi scale detection. For the purpose of classification, geometric and wrinkle features are utilized in the system. In the second phase i.e. feature extraction phase, there occurs calculation of two geometric features. These geometric features are defined as the ration of separations between eyes, noses, and mouths. For evaluating the degrees of facial wrinkles, it is necessary to characterize three distinctive wrinkle features. Classification is done by making use of K-means clustering algorithm.

FLOWCHART PHASE

As per the flow chart shown in figure 1, the input image is supposed to pass through the location phase. In the location phase, we make use of the Viola – Jones algorithm. Viola Jones algorithm is based on the principle that a sub window is scanned which is capable of recognizing faces over a given input image .The standard image processing methodology would be to rescale the input image to distinctive sizes and after that run the fixed size locator through these images. This methodology ends up being somewhat tedious because of the figuring of the diverse size images. In spite of the standard methodology viola jones rescale the indicator rather than the input image and run the finder commonly through the image – every time with an alternative size initially one may suspect both approaches to be equally time consuming, however viola jones have contrived a scale invariant finder that requires the same number of computations whatever the size. This finder is built utilizing a so called integral image and some straightforward rectangular components reminiscent of Haar wavelets. The next section elaborates on this locator.

In general, Viola Jones face detection algorithm is further divided into three basic steps. The three basic steps include feature extraction, boosting and multi scale detection. Let us discuss each one of them in detail.

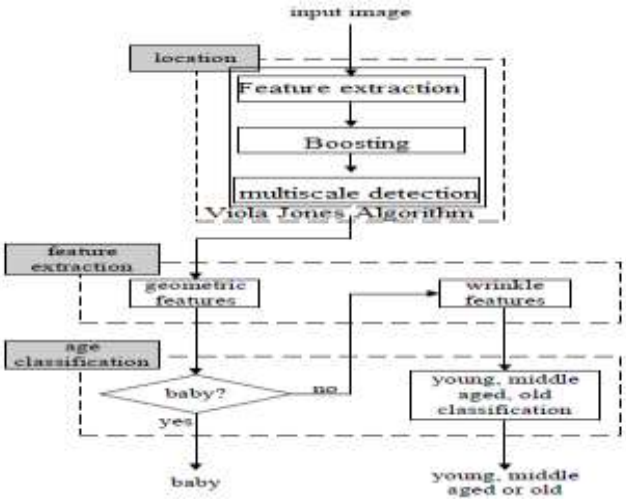

Figure 1. Process of the System

ISSN: 2277-9655
Impact Factor: 4.116

FEATURE EXTRACTION OF IMAGE

It is clear that feature is extremely important to any entity detection algorithm. For the purpose of face detection, a lot of features can be utilized such as eyes, nose, the topology of eye and nose. While detecting face using Viola Face, an extremely basic and direct feature has been utilized.

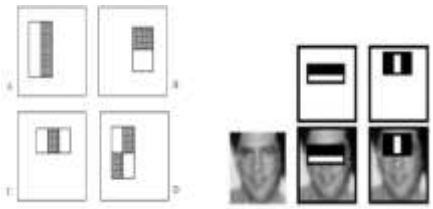

Figure 2. Four basic features in Viola Jones Algorithm

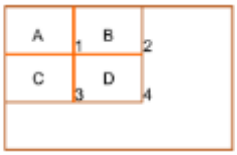

Figure 3. Calculation of Pixel sum within a rectangle

Figure 2 indicates four diverse features calculates using Viola Jones algorithm. Each of these features can be attained by deducing white zone from the black zone. The word 'zone' used here reflects the summation of all the gray valued pixels inside the rectangle. An uncommon demonstration known as integral image has been used for calculating these features. In particular, the sum of the pixel values which are above and to the left side of (x,y) gives rise to integral image of a location (x,y). Figure 3 demonstrates the quick approach to process the pixel sum inside a rectangle. The figure 2 indicates that the value of integral image at location 1 (V1) is the total sum of pixels in rectangle A; while as the value at location 2 (V2) is the total sum of pixels in rectangle A and B. the value at location 3 (V3) is the sum of pixels in rectangle A and C, while as the value at location 4 (V4) is the sum of pixels in rectangle A,B,C and D. On the basis of this information, it is easy to obtain the sum of pixels from V4+V3-V2-V1. After using this principal very efficiently, it is easy to obtain the sum of pixels of any rectangle located at any point.

Viola Jone algorithm

The meaning of boosting in Viola Jones face detection algorithm is the grouping of a numerous powerless classifiers. This boosting thought makes the procedure of learning to be effective and well organized. In particular the boosting works as follow as:

1. From a given dataset, firstly take a solitary and straightforward classifier and after that find out the errors it make.
2. The second step is to reweight the dataset and after that provide the data where it made errors.
3. Take the second straight forward classifier into consideration based on the reweighted dataset.
4. Consolidate the first and the second classifier, reweight the whole data and check where the data make errors.
5. Continue learning unless T classifier is obtained.
6. The last classifier will be the mixture of every one of those T classifiers. Figure 4 shows point of interest of the guideline of boosting.

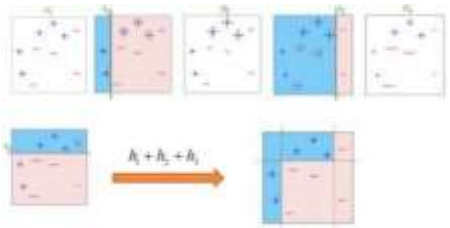

Figure 4. Process of Boosting with 3 simple classifiers

WRINKLE FEATURES

One of the most important property of wrinkle features is that it determines the age of a person. Estimation of feature F5 can be done as follows :
F5= (sum of pixels in forehead region / number of pixels in forehead region) + (sum of pixels in left eyelid region / number of pixels in left eyelid region) + (sum of pixels in right eyelid region / number of pixels in right eyelid region) + (sum of pixels in left eye corner region / number of pixels in left eye corner region) + (sum of pixels in right eye corner region / number of pixels in right eye corner region). F5 can be estimated by making use of the grid features of ace image that is completely dependent on the wrinkle geography in face image

For the estimation of F5 features, a few steps have to be followed as discussed below:
As the age keeps on increasing, wrinkles on face turn out to be clearer. Aged individuals regularly have clear wrinkles on the face in the following areas as mentioned below [12]:

a) The forehead has horizontal furrows.
b) The eye corners have crow's feet.
c) The cheeks have clear cheekbones, sickle molded pouches, and profound lines between the cheeks and the upper lips.

Since there are evident changes in wrinkle intensities and even some form clear lines, thus in this paper we make use of Sobel edge magnitudes, approximating gradient magnitudes in order to judge the level of wrinkles. The Sobel edge magnitude is larger, if the pixel belongs to wrinkles. The reason behind the larger magnitude is that the difference of gray levels is self-evident. From this perspective, a pixel is named as a wrinkle pixel if its sobel edge size is bigger than some limit. Figure 7 (a) and (c) demonstrate a youthful grown up and an old grown up. Figure 7(b) and (d) shows the outcomes after the thresholded Sobel operators. It is clear that the wrinkles are clearer on the old adult than on the young adult

GEOMETRIC FEATURES

As indicated by the investigations of facial representation [9] and emotional cosmetics [12], there occurs a lot of change in the facial features as the age keeps on increasing. In this phase, global features in combination with the grid features are extracted from the face images. The global features include the distance between two eye balls, chin to eye, nose tip to eye and eye to lip. These features are estimated.

By making use of four distance values, there occurs calculation of four features namely F1, F2, F3 and F4 as mentioned below:
F1 = (distance from left to right eye ball) / (distance from eye to nose).
F2 = (distance from left to right eye ball) / (distance from eye to lip).
F3 = (distance from eye to nose) / (distance from eye to chin).
F4 = (distance from eye to nose) / (distance from eye to lip).

From the figure 9, it is clear that new born babies have a number of wrinkles on their faces. The head bone structure in new born ones is not fully grown. Moreover the ration of primary features is highly different from those in other life spans. Hence we can conclude that it is more reliable to use geometric features as compared to wrinkle features when it is to be judged that whether an image is a baby or not.

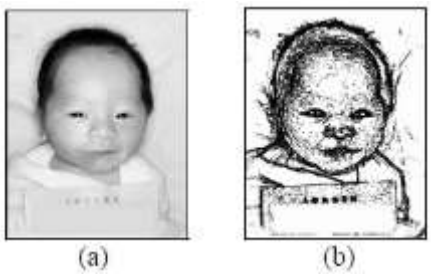

Figure 9. (a)baby(b)result after the sobel operator

In case of infants, the head is near a circle. The distance between two eyes is almost equal to the distance from eyes to mouth. As the head bone grows, the head becomes oval shaped and accordingly there occurs a sudden increase in the distance from the eyes to the mouth. Above and beyond the ratio between baby's eyes and noses is equal to the distance between noses and mouths which in turn are almost equal to one while as in case of adults it is larger than 1, as shown in figure 9(a) and (b).

CLASSIFICATION

Classification is done by making use of K-NN algorithm. The classification of various age ranges is done with dynamism depending on the number of groups. On the basis of six features from F1 to F6, classification of age is done into 2,3 and 4 age range clusters as illustrated as KNN Classification: The k-nearest neighbor algorithm is a classifying method which classifies an object where the majority of the neighbor belongs to. The choice of the number of neighbors is discretionary and up to the choice of the users. If k is 1 then it is classified [10] whichever class of neighbor is nearest. Typically the object is classified based on the labels of its k nearest neighbors by majority vote. If k=1, the object is classified as the class of the object nearest to it. When only two classes are present, it is said that k must be an odd integer. However, there can still be ties when k is an odd integer when performing multiclass classification. After we convert each image to a vector of fixed-length with real numbers, we used the most common distance function for KNN which is Euclidean

CONCLUSION

In this paper, a strategy for age group estimation is altogether defined. So the proposed system gives a powerful strategy that confirms the age gathering of people from an arrangement of distinctive aged face images. Critical components, for example, separations between different parts of face, study of wrinkle topography and count of face edges are analyzed. Every one of these ways are contrasted to locate the most ideal approach to figure age range of the face images in the database. After watching aftereffects of all features discussed above, face images are bunched into 2, 3, and 4 gatherings utilizing K-Means grouping calculation. It has been detected that wrinkle topography feature i.e., F5 gives the best result to gauge human age range in contrast with different components. The above result drives us to the conclusion that wrinkle topography Analysis has been the best strategy to find human age range of a person.

REFERENCES

[1] Jana, Ranjan, Debaleena Datta, and Rituparna Saha. "Age Group Estimation using Face Features." *International Journal of Engineering and Innovative Technology (IJEIT)* 3.2 (2013): 130-134.
[2] Horng, Wen-Bing, Cheng-Ping Lee, and Chun-Wen Chen. "Classification of age groups based on facial features." *Tamkang Journal of Science and Engineering*4.3 (2001): 183-192.
[3] Chellappa, R., Wilson, C. L. and Sirohey, S., "Human and machine recognition of faces: A Survey," *Proc. of the IEEE*, Vol. 83, pp. 705-740 (1995).
[4] Choi, C., "Age change for predicting future faces," *Proc. IEEE Int. Conf. on Fuzzy Systems*, Vol. 3, pp. 1603-1608 (1999)
[5] Shepherd, J. W., "An interactive computer system for retrieving faces," *Aspects of Face Processing*, Ellis, H. D. et al. Eds, Martinus Nijhoff International, Dordrecht, The Netherlands, pp. 398-409 (1986).
[6] Gutta, S. and Wecheler, H., "Gender and ethnic classification of human faces using hybrid classifiers," *Proc. Int. Joint Conference on Neural Networks*, Vol. 6, pp. 4084-4089 (1999).
[7] Kass, M., Witkin, A. and Terzopoulos, D., "Snake: active contour models," *Proc. First Int. Conf. on Computer Vision*, London, England, pp. 259-268 (1987).
[8] Kwon, Y. H. and da Vitoria Lobo, N., "Age classification from facial images,"*Proc. IEEE Conf. on Computer Vision and Pattern Recognition*, Seattle, Washington, U. S. A., pp. 762-767 (1994).
[9] Yuille, A. L., Choen, D. S. and Hallinan,*192 Wen-Bing Horng et al.*P. W., "Feature extraction from faces using deformable templates," Proc.IEEE Conf. on Computer Vision and Pattern Recognition, San Diego,
[10] M. A. Turk and A. P. Pentland, "Eigen faces for recognition", Journal of Cognitive Neuroscience, 3(1): 71–86, 1991.
[11] Sahoolizadeh, Hossein, and Youness Aliyari Ghassabeh. "Face recognition using eigen-faces, fisher-faces and neural networks." *Cybernetic Intelligent Systems, 2008. CIS 2008. 7th IEEE International Conference on*. IEEE, 2008.

[12] B.D., Zarit, B.J., Super, AND F.K.H. Quek, "Comparison of five color models in skin pixel classification", Int. Workshop on Recognition, Analysis, and Tracking of Faces and Gestures in Real-Time Systems, pages 58-63, Corfu, Greece, Sep. 1999.
[13] R.L., Hsu, M., Abdel-Mottaleb, and A.K.Jain, "Face detection in color images", IEEE Trans. on Pattern Analysis and Machine Intelligence, 24(5):696-706, May 2002.
[14] Y.H.Kwno and N.daVitoria Lobo, "Age Classification from Facial Images", Computer Vision and Image Understanding, vol.74, no.1, pp.1-21, 1999.
[15] A.Lanitis and C.J.Taylor, "Towards Automatic Face Identification Robust to Ageing Variation", IEEE Trans. on Pattern Analysis and Machine Intelligence, vol.24, no.24, p.442-455, 2002.
[16] A.Lanitis, C.Draganova, and C.Christodoulou, "Comparing different classifiers for automatic age estimation", IEEE Trans.Syst.Man, Cybern.B, Cybern, vol34, no.1, pp.621-628, Feb.2004.
[17] V. Blanz and T. Vetter, "Face recognition based on fitting a 3D morphable model", IEEE Transactions on Pattern Analysis and Machine Intelligence, 25(9):1063 –1074, September 2003.
[18] R. Kimmel A. M. Bronstein, M. M. Bronstein, "Three-dimensional face recognition", Intl. Journal of Computer Vision, 64(1):5–30, August 2005.
[19] N.Ramanathan and R. Chellappa, "Face verification across age progression", in Proc. IEEE Conf. Computer Vision and Pattern Recognition, San Diego, CA, 2005, vol.2, pp.462-469.
[20] N.Ramanathan and R. Chellappa, "Modeling Age Progression in young faces", in Proc. IEEE Conf. Computer Vision and Pattern Recognition (CVPR), vol.1, pp.387-394, 2006.
[21] X.Geng, Z.H. Zhou, and K. Smith-Miles, "Automatic age estimation based on facial aging patterns", IEEE Trans. on Pattern Analysis and Machine Intelligence, vol.29, pp.2234-2240, 2007.
[22] A. K.Jain, "Age Invariant Face Recognition", IEEE Trans. on Pattern Analysis and Machine Intelligence, 2010
[23] Ramesha K, K B Raja, Venugopal K R, and L M Patnaik, "Feature Extraction based Face Recognition, Gender and Age Classification", International Journal on Computer Science and Engineering (IJCSE), Vol. 02, No.01S, pp. 14-23, 2010.
[24] Chiunhsiun Lin, Kuo-Chin Fan, "Triangle-based approach to the detection of human face", Pattern Recognition Journal Society, vol.34, pp.1271-1284, 2001.