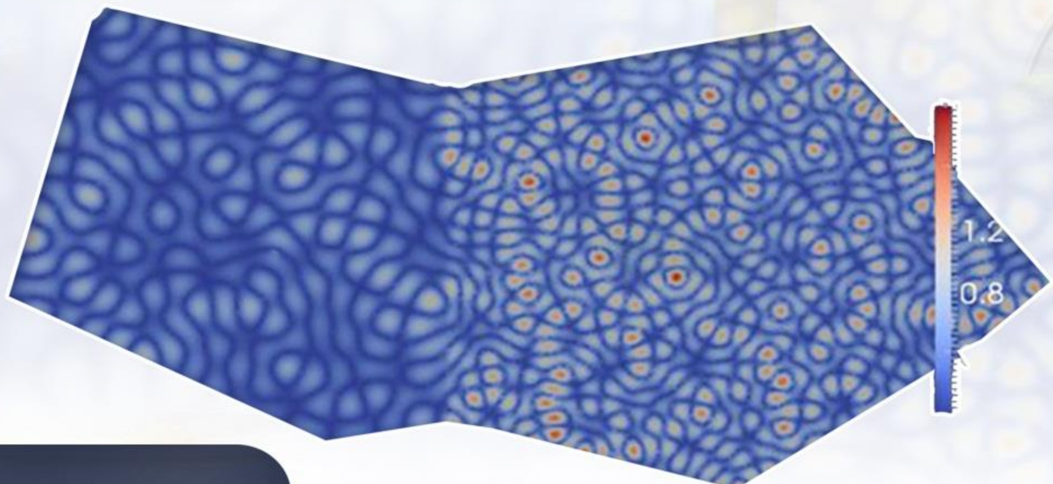
eISSN: 2789-858X

Scientific Journal for the Faculty of Science-Sirte University

DOI: 10.37375/issn.2789-858X - Indexed by Crossref, USA



Volume 2 Issue 1 April 2022

Bi-annual, Peer-Reviewed, Indexed, and Open Accessed e-Journal

SJFSSU

معامل التأثير العربي = 0.32

Legal Deposit Number@National Library (Benghazi): 990/2021

sjsfsu@su.edu.ly
journal.su.edu.ly/index.php/JSFSU

Scientific Journal for the Faculty of Science-Sirte University Vol. 2, No. 1 April (2022) 9-14

Scientific Journal for the Faculty of Science-Sirte University
Journal home page: http://journal.su.edu.ly/index.php/JSFSU/index
DOI: 10.37375/issn.2789-858X

Building a 3D Form to Recognize Facial Images

Yousuf A. Maneetah

Computer sciences Department, Benghazi University, Benghazi, Libya.

DOI: https://doi.org/10.37375/sjfssu.v2i1.130

ARTICLE INFO:

Received 13 September 2021.

Accepted 10 October 2021.

Published 17 April 2022.

Keywords: *Image Recognition, Multilayer Neural Networks, ,3D Image, Pattern Recognition, Correlation, Model.*

.

A B S T R A C T

There are several problems with the ability to recognize facial images, so the image was built in a 3D format, which allows users to evaluate and form the necessary properties of the entire object, while it is impossible to do this in two-dimensional form. Reprinting an object in an image form enables most of the properties of the target image by using layer-based neural networks that learn sequentially with discrete mathematical structures. A two-dimensional image is taken, and then the 3D shape is used in the image to spatially renovate it while different noise levels and different lighting levels are considered. This paper aims to show that the model for reconstructing the three-dimensional image reveals the dilemma of defining the basic characteristics of the image as a whole in all cases of interference, even if the viewpoint of taking the image changes. The processing has several stages. First, input the data processing result obtained in the previous level into the next level input to get the final result. After training, the first level sequences are represented as graphs, and then the input image data is sent to the first layer of the recognition model to calculate h. Consistent activation of learning validity for each subsequent level of the proposed model of reprinting an object in an image completely solves the problem of identifying a person from the front image as a whole under interference and regardless of the change in the perspective image.

1 Introduction

The precise problem of identification, namely the ratio of a particular person (class) to the original image, is not solved unless an enormous number of mechanisms related to the identification of facial images (Hemalatha *et al.,* 2014; Hasan *et al.,* 2012). The identification and recognition problems are inextricably linked. The following is the distinction: Identification is the correlation of the facial image, specifically found in the photograph or video material using recognition, with the facial image, stored in the identification system (Blanz *et al.*, 2003). Recognition of the facial image consists in finding signs in the photograph or video material faces, and identification is the correlation of the facial image, specifically found in the photograph or video material using recognition, with the facial image, stored in the identification system (Alexandre *et al.,* 2020; Albakri *et al.*, 2019).

The main challenge with the facial image identification method is that it must identify the person in the face of various "hindrances," external changes in the face (for example, plastic, cosmetics, etc.), and, most importantly, regardless of the change in viewpoint (Noyes *et al.*, 2018). To resolve this issue, this paper proposes a model for reconstructing an object in an image, which uses methods to restore an object's three-dimensional characteristics from its two-dimensional characteristics. This model can be used to rebuild the entire set of features. It is a series of reproducing levels L0, Ln made up of separate local sign and input data detectors. A multilayer neural network is used to train such a model. The training of a multilayer neural network must be done in a specific order. Related studies on how to recognize faces using techniques are presented in section 2 in this paper.

Corresponding author: E-mail: yousuf.maneetah@uob.edu.ly

A short synopsis of MATLAB in section 4, the majority of the target image's characteristics are specified in sections 5, image recognition and 3D shape of image is used for spatial renewal are described in sections 6 and 7. Layer-based neural networks that learn sequentially were used. A separate mathematical structure was used. The input takes 2D images in section 7. The results obtained and conclusion are shown in section 8 and 9.

2 Related Work

2.1 Emotion Recognition from Facial Images with Arbitrary Views

The emotional state of humans was studied using facial expression recognition. Almost no front view facial images are available in practice. As a result, the desired feature of facial expression recognition would allow the users to move their head in any direction. In order to recognize facial expressions in non-frontal facial images, some techniques for constructing a discriminatory subspace in specific viewpoints have recently been proposed. This method ignores the difference between samples from different classes with the same width label, as well as the proximity of samples within the same class with all width labels. Using discriminative adjacency, this paper proposed a new method for recognizing arbitrary vision facial expressions that preserves the concepts of implication and plurality of viewpoints. It begins by capturing the ability of samples to distinguish between classes. In addition, it explores how close the samples are within the layer with arbitrary widths in a low dimensional subspace. Experimental results on the BU-3DFE and Multi-PIE databases show that paper approach yields promising results for the recognition of facial expressions by arbitrary views.
Posture differences pose a challenge to recognizing facial expressions. Proposed a multi perspective discriminative neighbor method that maintains an embedding approach for recognizing facial expressions in different perspectives. The Proposed method is to exploit the intrinsic structure within the class and the punishment graph between classes to enhance the discriminative power of the inclusion preserving neighbor implication. In addition, offered to include this method in the multi display model, to make in class samples with distinct views that remain close together, MCCA is used to increase the correlation between them. Thus, these plots result in lower dimensional feature spaces that have an independent discriminative ability to display differences performance. The proposed method is tested on facial images with different views in the BU-3DFE and Multi-PIE databases. Experimental results show that the proposed method can achieve promising recognition (Huang *et al.*, 2013).

2.2 Face Model Construction Based on Kinect for Face Recognition

In human situations, these automatic expressions, poses, and intentional expressions are very common. These expressions are typically more durable than automatic expressions. Face movement and facial feature categories are classified using only visual information in expression recognition. Various applications in improving intelligence for the human computer interface, image decompression, and prosthetic face animation. To create an intelligent educational system, automatic face recognition is used. One method of detecting driver drowsiness and preventing a car accident is facial expression recognition. All existing facial expression analysis and recognition systems are currently based on either still photos or dynamic videos. Several technologies, including machine vision technologies, have been developed successfully using 2D still images or video sequences. Although some systems are successful, their performance deteriorates when handled. With different positions, expressions with a large head rotation, gentle skin movement, and/or lighting change. With the advancement of 3D imaging technology, quick and low cost 3D scanners have recently become available on the market. 3D scans, which extract features from faces, are expected to be more robust, resulting in more reliable final expression recognition. The susceptibility of 3D was assessed using 3D images in this study. Expression recognition rates for 3D images are over 90% in both cases. Otherwise, both classifiers are able to recognize about 80% of 2D images. 3D images were created. 2D images have a much lower discrimination rate than 3D images. This result backs up the paper's hypothesis that the 3D facial expression recognition system should outperform its 2D counterpart due to the advantages of 3D images. Without prior knowledge of a subject's neutral facial expression, an attempt was made to identify them. It is always more challenging. Recognizes absolute facial expressions without referring to a specific subject's neutral face. In several scenarios, it is possible to incorporate knowledge of the neutral expression algorithm, which is subject to change in order to improve performance (Hsieh *et al.*, 2015).

2.3 3D Face Recognition by ICP-based Shape Matching

Comparisons between forward facing images from the database and variable width point images Furthermore, compensating for expressions is a challenging task in the 2D approach, because it dramatically changes the facial texture profile. Facial recognition technology is rich in work aimed at solving problems related to this challenge.

The majority of this research uses density images of the face, called 2D model based techniques; for facial recognition.
Research-based on 3D modeling techniques, as well as compositional information, silhouette, and 3D face shape to reduce some differences. For 3D, faces and interests are saved to a library during an offline phase. During the online recognition stage, a 2.5D model captured from the face in the scene corresponds to the models in the library to find the identity and position of a person.
Similarities between layers and differences within a layer: the most recent 3D face recognition technology are presented, with proprietary techniques based on the model, and then on works developed for 2.5D and 3D face recognition saved in a performance database collection by work on recognition algorithms using 2.5D/3D face matching coupled with an area-based scale (Amor et al., 2008).

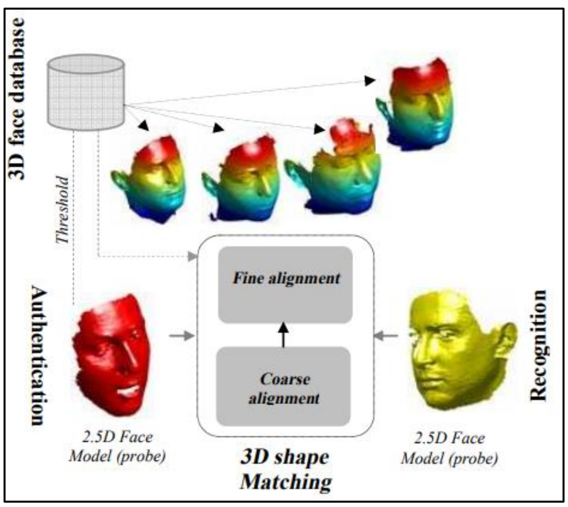


Figure (1). Approaches for face recognition (enrollment) and authentication based on 2.5D/3D face shape matching (Amor et al., 2008).

3 Proposed Methodology

Aims at developing the 3D face recognition method which is robust against illumination effect, changing expressions and varied poses of a face image.
This paper has proposed a new method to recognize the face, using methods to restore the three-dimensional characteristics of an object from its two-dimensional characteristics. Mathematical structure is also used. To train such a model, a multilayer neural network trained sequentially the entry takes two-dimensional images. This model can be used to form a rebuild of all features.

It is a sequence of reproducing levels L0 to Ln, consisting of separate local detectors of signs and input data. The aim of this research is the model for reconstructing the 3D image. The image is processed within MATLAB Biometric authentication.

4 MATLAB

MATLAB is high performance software for practical computing. It combines computation, visualization, and programming in a consumer interface, with problems and solutions written in standard mathematical notation (Tyagi, 2018). Some examples of typical applications are as follows: • Data analysis, exploration, and visualization • Math and computation • Development of algorithms • Modeling (Turk, 2019), simulation, and prototyping • Development of applications, including the creation of graphical user interfaces • Graphics for science and engineering.
MATLAB is a computer program that uses an array as its primary data element and does not require dimensioning. Many technical computing problems, especially those involving matrix and vector formulations, can be solved in moment while takes a long time by writing a program in a scalar of non-interactive language like C or python.
The term “MATLAB" stands for "matrix laboratory." MATLAB was created to make it easy to use the matrix software developed by the LINPACK and EISPACK projects, which together represent the state of the art in software development (Solomon *et al.*, 2011; Kaushik *et al.*, 2018).

5 LD Processing by Neural Networks

The approach is based on a photometric perspective that generates high quality models of faces from several images, but the recovery of regionally consistent shapes is accomplished by the collecting of discrete subsets of images. The route of neural networks is similar to that of the learning sequential based method. It modernized computer vision applications. For regression issues, these techniques work well (Cao *et al.*, 2021; Afzal *et al.*, 2020).
In the input data processing result obtained at the previous level, to the input of a subsequent level to obtain the final result, which wavelength selective switches (WSS) turn appears not only as a function of the activation values Learning Disabilities (LD) but also as a set of object parameters processed LD. Collectively it is called LD. Na input to the input level L0 is necessary to submit the data frame of local sites in sequences of images extracted from the video image.
After training the first level video sequences are represented as graphs (Fig. 2).

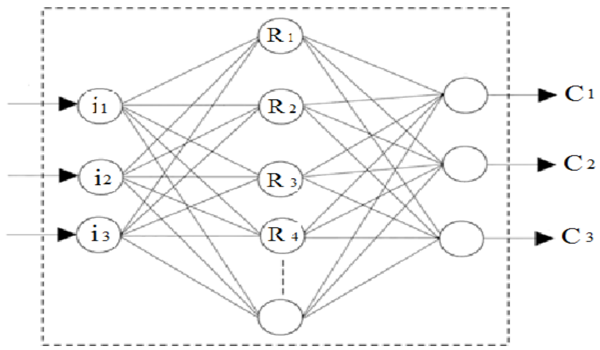


Figure (2). First level sequences are represented as graphs I - input image, R - set of frame by frame sequences, c - output result.

Trained at the first level local detectors are nodes of the graph. Each kth level provides local data grouping. All other levels are trained. A trained model can present an image extracted from a video fragment as a limited number of LDs. Each local detector contains a representation of a complex object. The reprint model of the object in the image should contain:

- The number and local location of Li detectors.
- The number of Nc clusters for each level Lc.
- The number of reprint levels L0 to Ln.
- Internal parameters of the detectors.

For example, images in the image recognition function "m: i → j" are represented as a vector of length n attribute of this function. Many of the j classes used in this function are represented as the value of this function, which in in turn, it is mollified for a specific task. To test the recognition model of an object in the image, function used h: i → j for a subset of the set of pair attributes and values D = {(i-0, j-0),. , (i-n , y-n)}.

6 Image Recognition

For recognition function m in the entire domain of definition. The input image data must be submitted to the first layer of the recognition model to calculate h. Next, the consistent activation of the LD for each next level of the facial image recognition model is necessary. The binary value, represented as activation, is the result of processing the model and determines the ratio of a particular individual image to the corresponding class. This binary value has two states:
At the model output, a probabilistic estimate of the image parameters is calculated. To solve the classification problems, developer can use this model in its original form. The set of class's j consists of two elements. Function m = 1 if the image contains an object belonging to the required class.0 otherwise. The task of identifying an image of an object among many classes consists of 1) the relationship of the sequential verification of the image object to the model instance identification of facial images, i.e. function m = {m1, mj}. m ′ I ′swarm is the collection of classes J ′, for the ith class J ′ = {Jw, z ≠ w jz};) for each particular class, model training takes place. The model diagram, consisting of reprint levels, is shown in Fig. 3.

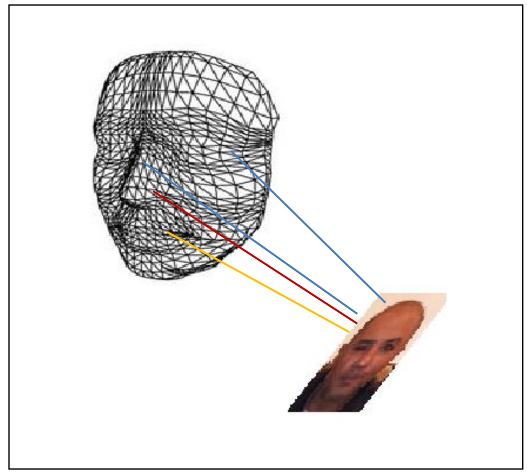


Figure (3). Model diagram, consisting of reprint levels.

7 3D Image Model

The projection of three-dimensional points on the plane can be described as Qs (Q) = CQ, where C is the matrix. Based o*n the definition of a local detector, the result of solving such a matrix will consist of an array of points b with coordinates (i, j). Such a definition LD clearly describes the structure, behavior, and result of the detector in the model of identification of facial images. (V, B) = V transformation operation in three-dimensional space. V is the matrix. The projection of the object is q0 = qs (Q).
Suppose there is some collection of some transformation matrices V1 to Vn and some set of projections q1 to qn, such that qj = Qs (vj, Q). Then the facial image identification model for such collections will use functions LI (qj) = q0; DV (qj) = vj, which in this case is a local detector. LD uses a set of representations of an object in three-dimensional form. For anyone's representation of the object, it is not only to determine the representation of the changed object but also to determine the initial shape of the object. The universality of the definition of LD will be allowed to get rid of the shape of the object when the use of the shape of the object is not necessary. For example, when qi = Tiq, qj = TjQ, qi, qj is the representation of an object. 1. Let Q0 to Qn, a collection of objects. 2. J0 to Jn is a set of classes. 3. J (Q) = J determination of a three-dimensional object belonging to a specific class. Such a definition of the local detector to identify facial models can accurately compare the three-dimensional (3D) object of a particular class.

The local detector must perform:
1) Object recognition,
2) The definition of a specific transformation applicable to the image.
To assess the effectiveness of the LD determines the concept of function error li transformation recovery:

$$J(Dt, q) = \frac{1}{9} \sum_{k=0}^{n} Dt(qi) \qquad (1)$$

The LD receives input in the form of two-dimensional images. Two-dimensional images, and, consequently, the local detector itself, have no data on the vector properties of the object, namely, on the additional coordinate Z. If the coordinate Z were known, then determining the transformation of the object would be a simple task not requiring specialized models using local detectors. For this feature of LD, the following symptoms exist take the required number of Transformed objects of facial images qi, qj corresponding to Ti, Tj. For the case when qi ≈ qj, but Ti ≠ Tj, the LD retroactively restores the changed object from the image. Thus, DT (qi) ≈ DT (qj). When 3D objects Q and Q1, belonging to different classes J1, j2, give similar projections q ≈ q1, the same result is obtained for the LD identification function, i.e., LI(q) ≈ LI(q1). There are such variations of the transformation (T) and the images of the object for which it is impossible to construct. Any possible deviations of 3D shapes of objects of facial images to various projections (facial images) are negatively affected; the variability of the facial image of the object increases the average error within one class. Possibly, there is a negative correlation between the accuracy of restoration of the changed image object, the size of the facial image, and the plurality of facial images. Reprint a complete facial image using only one LD is a complex task that surpasses the task of recognition in complexity. At the first level of the model, LD LI (0) is presented, whose ensembles and values are different personal for each specific object of the facial image that can react to different parts of the object of the facial image at different Perspectives. Data from the first level models of the local detector are necessary for teaching high level LDs that are representative for LD compositions, namely, a 3D feature map - first level LDs on which local detectors are placed by mi equivalent transformations. The belonging of an object to a category is determined by the identification function of the second level LD. Thus, the entire above are included in the MATLAB libraries for facial features, the MATLAB software employs the computer vision toolbox, which is then compared to the database. The system returns the final expected face matching result if the facial features match.

8 Results

The proposed model of reprinting an object in an image completely solves the problem of identifying a person from the front image as a whole under interference and regardless of the change in image perspective. Using layer-based neural networks that learn sequentially, allowable changes in viewpoint, different noise different lighting levels are considered.

Figure (4). Model representing objects training 1 of 5.

Purposes the human body is based on the optimized serial neural network architecture through the behavior recognition algorithm, the network architecture, optimizing implicit neural network extraction of nonlinear features and complex images by building in 3D Form to facilitate the identification of the model image by humans. 5 training models have been worked on, and the results have been found to be reasonable. Ability to extract image feature. The Rectified Linear Unit activation function is used in the nesting layer. The model has both generalization performance and the ability to nonlinear fitting. Compared with the traditional methods, it has achieved good results except response time.

9 Conclusions

In previous studies, several methods were used, such as a novel face recognition method which is based on the Iterative Closest Point matching; others used multi view discriminative neighbor preserving embedding approach for recognizing facial expressions in different views. By looking at the result, a similar system can be used to generate 3D models. The basic idea of this work was to gain knowledge about different problem areas to generate 3D models from 2D images. However, with the current implementation, the output is too weak and slow to get high resolution. How important is the interchange between generation speed and output resolution when creating 3D models from a 2D image, using serial neural networks. The acquired accuracy increases exponentially with each level of detail, while the generation time is not linear. Since speed has a correlation with the amount of mutation needed to move from one level of detail to another, the mutation

required is to have a lower percentage value by each increment of the level of detail. In conclusion, increasing the resolution also increases the effectiveness. However, the total number of mutations was still growing rapidly, high quality is more technically effective, it is still not possible to generate high resolution models, and the total generation time will be too much, however, the proposed method is cheaper than the previous ones, despite their lack of accuracy.

Acknowledgements

The author would like to express his deepest gratitude and special thanks to the staff of the Department of Computer Science at the University of Benghazi for their encouragement in preparing this research.

Conflict of Interest: The author declares that there are no conflicts of interest.

References

Hemalatha, G., & Sumathi, C. P. (2014). A study of techniques for facial detection and expression classification. International Journal of Computer Science and Engineering Survey, 5(2), 27.

Hasan, M. H. M., Jouhar, W. A. A., & Alwan, M. A. (2012). 3-d face recognition using improved 3d mixed transform. International Journal of Biometrics and Bioinformatics (IJBB), 6(1), 278.

Blanz, V., & Vetter, T. (2003). Face recognition based on fitting a 3d morphable model. IEEE Transactions on pattern analysis and machine intelligence, 25(9), 1063-1074.

Alexandre, G. R., Soares, J. M., & Thé, G. A. P. (2020). Systematic review of 3D facial expression recognition methods. Pattern Recognition, 100, 107108.

Albakri, G., & Alghowinem, S. (2019). The effectiveness of depth data in liveness face authentication using 3D sensor cameras. Sensors, 19(8), 1928.

Noyes, E., Hill, M. Q., & O'Toole, A. J. (2018). Face recognition ability does not predict person identification performance: Using individual data in the interpretation of group results. Cognitive research: principles and implications, 3(1), 1-13.

Huang, X., Zhao, G., & Pietikäinen, M. (2013). Emotion recognition from facial images with arbitrary views. In BMVC (pp. 76-1).

Hsieh, C. T., Huang, Y., Chen, T. W., & Chen, L. M. 3D (2015) FACE MODEL CONSTRUCTION BASED ON KINECT FOR FACE RECOGNITION.

Amor, B. B., Ouji, K., Ardabilian, M., & Chen, L. (2008). 3D Face recognition BY ICP-based shape matching,‖ LIRIS Lab. Lyon Research Center for Images and Intelligent Information Systems, UMR, 5205.

Tyagi, V. (2018). Understanding digital image processing. CRC Press.

Turk, I. (2019). Practical MATLAB. Apress.

Solomon, C., & Breckon, T. (2011). Fundamentals of Digital Image Processing: A practical approach with examples in Matlab. John Wiley & Sons.

Kaushik, P., Kaushik, H., & Singh, H. (2018). Building a Face Recognition Technique for Encryption by MATLAB.

Cao, M., Liu, Z., Huang, X., & Shen, Z. (2021, March). Research for Face Image Super-Resolution Reconstruction Based on Wavelet Transform and SRGAN. In 2021 IEEE 5th Advanced Information Technology, Electronic and Automation Control Conference (IAEAC) (Vol. 5, pp. 448-451). IEEE.

Afzal, H. R., Luo, S., Afzal, M. K., Chaudhary, G., Khari, M., & Kumar, S. A. (2020). 3D face reconstruction from single 2D image using distinctive features. IEEE Access, 8, 180681-180689.

Scientific Journal for the Faculty of Science-Sirte University - SJFSSU

sjsfsu@su.edu.ly
journal.su.edu.ly/index.php/JSFSU

تصميم : عبدالله نصرالدين