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ATM WITH AN EYE USING 3D FACE RECOGNITION METHOD

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Abstract - ATM (simply called as 'any time money') is rightly termed in today "hurry-burry' world. But easy access to this 'money storing machine' is applicable to common individuals in the society which is desirable, but also to hackers or thieves which is undesirable. Only a 4 digit pin and a card is not enough to access money which is happening today.A fool proof security system is on the wanted list for the bank community and the society to breathe easy. Now, Face recognition(FR) is the preferred mode of identity recognition by humans. it is a natural ,robust & unintrusive . Automatic FR technology have failed to meet expectations. Variation in pose, illumination of expression limit the performance of 2D FR tech. In recent years, 3D FR has promised to overcome these challenges. With the availability of cheaper acquisition method,3D FR can be the way out of these problem, both as stand alone method or as a supplement to 2D FR Installing this system in every major ATM 's will make money withdrawal a safe procedure and ATM's will no longer be the hang-out for "techno-thieves", but a formidable enemy to hem. Thus, the paper is all about the theory behind the working of the "EYE OT THE ATM".

I. INTRODUCTION

It's an exciting prospect to tap the uses of biometrics even in the use of such a common commodity such as an ATM. Recent developments in computer tech and the call for better security have brought biometrics into focus. A biometric is a physical property; it cannot be forgotten or mislaid like a pass word, and it has the potential to identify a person in very different settings: a criminal entering an airport, an unconscious patient without documents for identification, an authorized person accessing a highly secured system. Be it for purposes of security or human computer interaction, there is a wide application for robust biometrics. Two different scenarios are of primary importance. In verification (authentication) scenario, the person claims to be someone, and this claim is verified by ensuring the provided biometric is sufficiently close to the data stored for that person. In the more difficult recognition scenario, the person is searched in a data base. The data base can be small (e.g., criminals in the wanted list), or large (e.g., photos in registered ID cards). The unobtrusive (without effecting others) search for a number of people is called screening. The signature and sign have been the oldest biometrics, used in the verification of authentication of documents. Face image and finger print also have a long history, and are still kept by police departments all over the world. More recently voice, gait, retina and iris scans, hand print and 3d face info are considered for biometrics. Each of these have different merits and applicability. When deploying a biometrics based system, we consider its accuracy cost ease of use, ease of development, whether it allows integration with other systems, and the ethical consequences of its use. Two other criteria are susceptibility to spoofing (faking an identity) in verification setting.

The purpose of the present study is to discuss the merits and drawbacks of 3D face info as a biometric, and review the state of the art in 3D face recognition. Two things make FR attractive for our consideration. The acquisition of face info is easy and non-intrusive, as opposed to iris and retina scans. This is important if the system is going to be used frequently, and by a large no: of users. The second point is the relatively low privacy of the info; we expose ourselves constantly, and if the stored info is compromised, it does not lend itself to improper use like signatures and finger prints would. The drawbacks of 3D FR include decreased ease of use for laser sensors, lack of sufficiently powerful algorithm. 3D FR represents an improvement over 2D FR in some respects. Recognition of faces from still images is a difficult problem because illumination, pose and expression changes in the images create great statistical difference and identity of the face itself becomes shadowed by this factor. Humans are very capable in this modality, precisely because they learn to deal with this variation. 3D FR has the potential to overcome future localization, pose and illumination problem, and it can be used in conjunction with 2D system. In the next section we review the current research on 3D FR. We focus on different representation of info and the fusion of different sources of info. We conclude by a discussion of the future of 3D FR

II. 3D FACE RECOGNITION

Data acquisition or Face recognition…………
Preprocessing………….
Data base content…………..
Processing…………..
Result……………

Face recognition technique:

There are three state of the art acquisition techniques…………

In the stereo acquisition technique, two or more cameras that are positioned and calibrated are employed to acquire simultaneous snapshots of the subject. The depth information for each point can be computed from geometrical models and by solving a correspondence problem. This method has the lowest cost and highest ease of use.

The structural light technique involves a light pattern projected on the face, where the distortion of the pattern reveals depth information. This setup is relatively fast, cheap, and allows a single standard camera to produce 3D and texture information.

The last technique employs a laser sensor, which is typically more accurate, but also more expensive and slower to use. The acquisition of a single 3D head scan can take more than 30 seconds, a restricting factor for the deployment of laser-based systems.

3D Recognition algorithms

Curvature and surface features………….

In one of the early 3D paper, Gordon proposed a curvature based method for few recognition from 3D data kept in a cylindrical coordinate system. Since the curvature involves a second derivative, they are very sensitive to noise. An adaptive Gaussian smoothing is applied so as not to destroy curvature info.

- Point clouds and meshes………..

When the data are in point cloud representation they are in iterative closest point (ICP), is the most widely used recognition technique. This similarity of 2 point sets that is calculated at each iteration of a ICP algorithm is frequently used in point cloud FR. This method acquires the 3D image of the subject with 2 calibrated cameras and ICP algorithm is used to define alignment.

- Depth map…………..

Depth maps are usually used in conjunction with subspace method although most of the existing 2D techniques are suitable for processing the depth maps. The depth map construction consist of selecting a view point and smoothing the sample the depth values. PCA and ICA were composed on the depth maps. ICA was found to perform better but PCA degraded more gracefully with declining nose: of training samples.

The 3D data are more suitable for alignment to obtain the depth map, and the no: small windows are sampled from around the nose. The statistical features extracted from these windows are used in recognition.

PREPROCESSING

<u>Preprocessing of raw scans involves:</u>

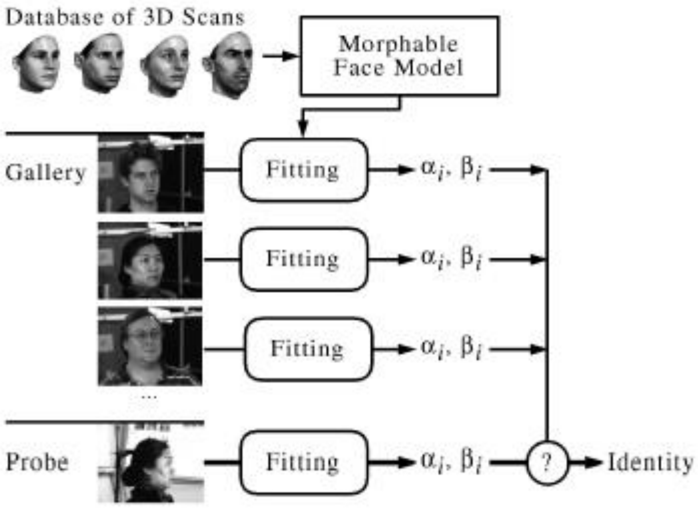
1. Filling holes and removing spikes in the surface with an interactive tool,
2. Automated 3D alignment of the faces with the method of 3D-3D Absolute Orientation,
3. Semiautomatic trimming along the edge of the bathing cap, and

4. A vertical planar cut behind the ears and a horizontal cut at the neck, to remove the back of the head, and the shoulders.

III. DATA BASE CONTENT

PARADIGMS FOR MODEL BASED RECOGNITION:

In FR, three set of images that shows all individuals who are known to the system are often referred to as the gallery. In this paper, one gallery image per person is provided to the system. Recognition is performed on novel probe images. We consider two particular recognition tasks: For identification, the system reports which from the gallery is shown on the probe image. For verification, a person claims to be a particular member of the gallery. The system decides if the probe and the gallery image show the same person.



In many applications,synthetic views to meet standard imaging condition , which may be defined by the properties of the recognition algorithm, by the way the gallery images are taken(mug shots), or by camera setup for probe images. Standard condition can be estimated from an example image by our system.

IV. DATABASE OF 3D LASER SCANS

The morphable model was derived from 3D scans of 100 males and 100 females, aged between 18 and 45 years. one person is asian, all other are Caucasian. Applied to the image database that covered a much larger ethnic model seemed to generalize well beyond ethic boundaries. Still ,a more diverse set of examples would certainly improveperformance.

$$\mathbf{I}(h,\phi) = \left(r(h,\phi), R(h,\phi), G(h,\phi), B(h,\phi)\right)^T,$$
$$h,\phi \in \{0,\ldots,511\}.$$

Recorded with a cyberware TM 3030PS laser scanners, the scans represent face shape in cylindrical coordinate system relative to a vertical axis centered with respect to head .in 512 angular steps _covering360_and 512 vertical steps 'h' at a spacing of 0.615mm,the device measures radius 'r', along with red, green, and blue components of the surface texture R,G,B. we combine radius and texture data :

PROCESSING:

PARADIGM: After fitting the model ,recognition can be based on the model coefficient , which represent intrinsic shape and the texture of faces ,and are independent of the imaging condition. For the identification ,all gallery images are analysed by fitting algorithm, and the shape and texture coefficient are stored .given a probe image, the fitting algorithm computes coefficient which are compared with are then compared which are compared with all gallery data in order to find the nearest neighbour .

V. MORPHABLE MODEL OF 3D FACES

The morphable face model is based on a vector space representation of faces that are constructed such that any convex combination of shape and texture vectors 'Si ' and 'Ti' of a set of examples describes a realistic human face.

$$\mathbf{S} = \sum_{i=1}^{m} a_i \mathbf{S}_i, \quad \mathbf{T} = \sum_{i=1}^{m} b_i \mathbf{T}_i .$$

Continuous changes in the model parameter 'ai' generate a smooth transition such that each point of the initial surface move toward the point on the final surface. Just as in morphing, artifacts in intermediate states of the morph are avoided only if the and final points are corresponding structures in the face, such as the tip of the nose. Therefore, dense point-to-point correspondence is crucial for defining shape and texture vectors. The core step of building a morphable face model is to establish dense point-to-point correspondence between each face and reference face. The representation in cylindrical co-ordinates provides the parameterization of the 2D manifold of the facial surface by parameters 'h' and 'ϕ'. Correspondence is given by a dense vector field $\mathbf{v}(h,\phi) = (\Delta h(h,\phi), \Delta\phi(h,\phi))^T$ such that each point $\mathbf{I}_1(h,\phi)$ on the first scan corresponds to the point $\mathbf{I}_2(h + \Delta h, \phi + \Delta\phi)$ on the second scan. We employ a modified optic flow algorithm to determine this vector field. The following two sections describe the original algorithm and our modifications.

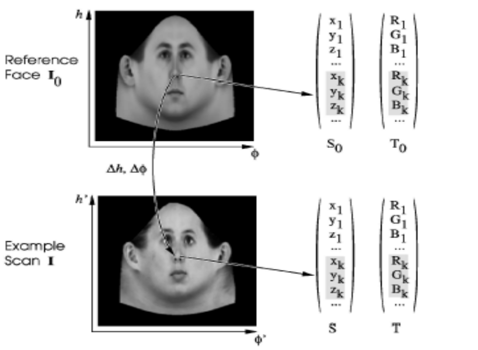


Fig. 3. For 3D laser scans parameterized by cylindrical coordinates (h, ϕ), the flow field that maps each point of the reference face (top) to the corresponding point of the example (bottom) is used to form shape and texture vectors $\mathbf{S}$ and $\mathbf{T}$.

	2D Face	Signature	Voice	Iris	Finger	Retina	Gait	Hand	3D Face
Accuracy				X	X	X			X
Cost	X		X		X				
Privacy	X			X		X	X		X
Integrity	X		X		X				X
Ease of Use	X	X	X		X			X	X
Development	X	X	X		X			X	X
Hiding identity				X		X		X	
Faking identity				X	X	X		X	X

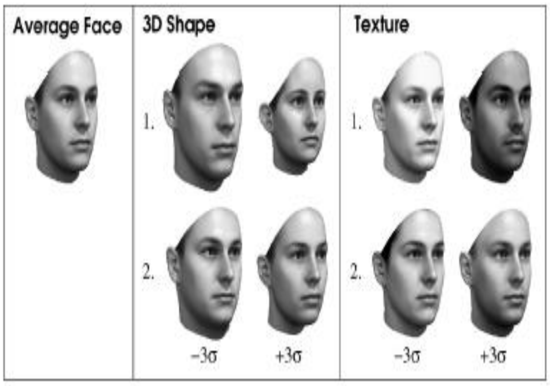
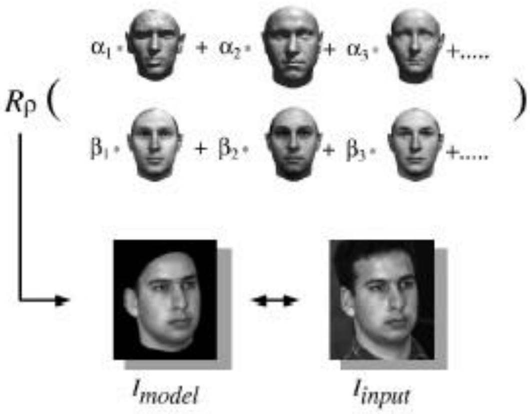


Fig. 4. The average and the first two principal components of a data set of 200 3D face scans, visualized by adding $\pm 3\sigma_{S,i}\mathbf{s}_i$ and $\pm 3\sigma_{T,i}\mathbf{t}_i$ to the average face.

The coordinate of the shape and textures in the matrices must relate in order to have a perfect match.

VI. IMAGE ANALYSIS

The goal of model-based image analysis is to represent a novel face in a image by model coefficients α_i and β_i and provide a reconstruction of the 3D shape .moreover ,it automatically estimate all relevant parameters of the 3D scene ,such as pose, focal length of the camera, light intensity, color, and direction. In an analysis by synthesis loop, the algorithm finds model parameters and scene parameters such that the model, rendered by computer graphics algorithm , produces an image as similar as possible to the input image.



(a)The goal of the fitting process is to find shape and texture coefficients α_i and β_i describing a three-dimensional face model such that rendering R_ρ produces an image I_{model} that is as similar as possible to the input.

VII. CONCLUSIONS

In this paper, we have addressed three issues:

1) Learning class-specific information about human faces from a data set of examples,

2) Estimating 3D shape and texture, along with all relevant 3D scene parameters, from a single image at any pose and illumination, and

3) Representing and comparing faces for recognition tasks. Tested on two data bases of images covering large variations in pose and illumination, our algorithm achieve promising results (95.0 and 95.9% correct identifications respectively). This indicate that the 3D morphable model is a powerful and versatile representation for human faces. In image analysis our explicit modeling of imaging parameters such as head orientation and illumination, may help to achieve an invariant description of the identity of faces. Future works will also concentrate on automated initialization and a faster fitting procedure. In application that require the fully automated system our algorithm may be

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combined with an additional feature detector. For applications where manual interactions is permissible, we have presented a complete image analysis system. It is using this dependable system that the eye of the ATM is installed with statistics as to where 3D FR technique overtakes the other techniques

REFERENCES

[1] J.J. Atick, P.A. Griffin, and A.N. Redlich, ªStatistical Approach to Shape from Shading: Reconstruction of 3D Face Surfaces from Single 2D Images,º Computation in Neurological Systems, vol. 7, no. 1, 1996.

[2] J.R. Bergen and R. Hingorani, ªHierarchical Motion-Based Frame Rate Conversion,º technical report, David Sarnoff Research Center, Princeton N.J., 1990.

[3] D. Beymer and T. Poggio, ªFace Recognition from One Model View,º Proc. Fifth Int'l Conf. Computer Vision, 1995.

[4] D. Beymer and T. Poggio, ªImage Representations for Visual Learning,º Science, vol. 272, pp. 1905-1909, 1996.

[5] C.M. Bishop, Neural Networks for Pattern Recognition. Oxford Univ. Press, 1995.

[6] V. Blanz, ªAutomatische Rekonstruktion der dreidimensionalen Form von Gesichtern aus einem Einzelbild,º PhD thesis, TuÈ bingen,

