Design and development of standard 3D Face and 3D Ear database: A multisensory approach

[1]Sumegh Tharewal, [2]Hanumant Gite, [3]Siddharth Dabhade, [4]K V Kale

[1,2,3]Research Scholar, [4]Professor, Dept of CS & IT, Dr B.A.M University Aurangabad (MH) India.

[1]sumeghtharewal@gmail.com, [2]hanumantgitecsit@gmail.com, [3]dabhade.siddharth@gmail.com, [4]kvkale91@gmail.com

Abstract - In this paper we mainly described the standard of design and development of 3D Face and 3D Ear database of same person using multisensory approach. The important concept is like acquisition, collection, position, distance, illumination, and sensor standard. In available existing database of 3D Face and 3D Ear they use a six position and one sensor and in our database we use 10 positions and 2 sensors. We developed our own database using two different sensors in low cost. We follow ANSI-NIST-ISO Standard. The Database is useful for those who want to do the research in 3D Face and 3D Ear Recognition and as compare to existing database our Database is more in positions as well as sensors, because we enhance the positions of capturing database using two different sensors.

Keywords —3D Face, 3D Ear, Database, Multisensory, 3D SENSE, KINECT XBOX 360.

I. INTRODUCTION

3D Face

Three dimensional (3D) face recognition technologies is now emerging, in part, due to the availability of improved 3D imaging devices and processing algorithms.[1] For such techniques, 3D images of the facial Surface are acquired using 3D acquisition devices and are used for recognition purposes. Three dimensional facial images have some advantages over 2D facial images. Their pose can be easily corrected by rigid rotations in 3D space. [2],[3] The shape of a 3D facial surface depends on its underlying anatomical structure. Hence, images acquired using 3D laser range finders are invariant to illumination conditions during image acquisition. Three dimensional facial images also provide. structural information about the face (e.g., surface curvature and geodesic distances), which cannot be obtained from a single 2D image.[3], The field of 3D faces recognition deals with the development of algorithms for the (a) identification, and (b) authentication of human beings using their 3D facial models.[9],[10]

3D Ear

Human ears offer some distinct advantages over other biometric modalities: they have a wealthy of structural features that are permanent with increasing age from about 8 to 70 years old, and they are not affected by the expression variations Current ear recognition approaches have exploited how to use 2D ear image and 3D ear model for human identification.[4],[5] At present, 3D ear recognition performs well in illumination variation or pose variation

Rich in features, the human ear is a stable structure that does not change much in shape with the age and with facial expressions.[7],[8] Ear can be easily captured from a distance without a fully cooper- active subject although it can sometimes be hidden by hair, muffler, scarf, and earrings. Researchers have developed several biometric techniques using the 2D intensity images of human ears[6]

II. DATABASE DEVELOPMENT

A. Sensor1Specification (3D Sense)

We develop our own database using sense 3d scanner and Xbox 360sensor.the specification of sensor is as follows.

Field of view 57.5 x 45
VGA depth map (640 x 480)
USB 2.0

- Color
- Standard off the shelf components
- OpenNI compliant

SENSE 3D SCANNER PROPERTIES Scan Volume (Width x Height x Depth)

- Min: 0.2m x 0.2m x 0.2m; Max: 3m x 3m x 3m Operating Range: Min: 0.35m; Max: 3m Field of View
- Horizontal: 45o • Vertical: 57.5o
- Diagonal: 69o Depth Image Size: 240(w) x 320(h) pixels Spatial x/y Resolution @ 0.5m: 0.9mm Depth Resolution @ 0.5m: 1mm

B. Final Stage

Fig: 1. Sense 3D Scanner

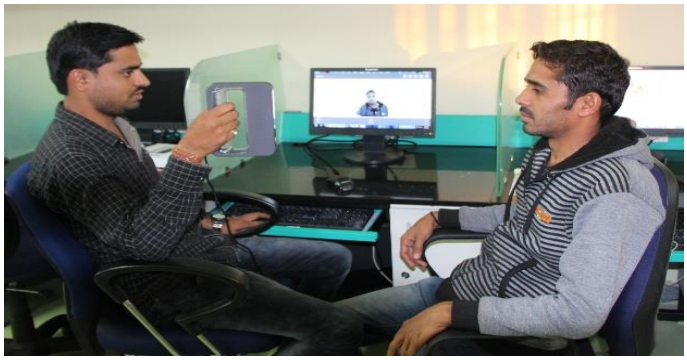

Fig 2. Image acquisition using 3D Sense [11],[12]

Sensor 2 Specification (Xbox 360)

XBOX360	Array Specifications
Viewing angle	43° vertical by 57° horizontal field of view
Vertical tilt range	±27°
Frame rate (depth and color stream)	30 frames per second (FPS)
Audio format	16-kHz, 24-bit mono pulse code modulation (PCM)
Audio input characteristics	A four-microphone array with 24-bit analog-to-digital converter (ADC) and Kinect-resident signal processing including acoustic echo cancellation and noise suppression
Accelerometer characteristics	A 2G/4G/8G accelerometer configured for the 2G range, with a 1° accuracy upper limit.

Fig 3. Xbox 360 sensor

Fig 4. Image acquisition using Xbox 360 sensor

III. COMPARATIVE ANALYSIS AND STANDARD

Database Development for 3D Face

3D Face Standard of FRGC 2.0 Database
1] Sensor: Minolta Vivid 910.
2] Subject: 466
3] Position/Expression: 6(Six)
1] Anger
2] Disgust
3] Happiness
4] Fear
5] Sadness
6] Surprise
4] Distance: 1 meter-1.5 meter
5]Illumination: With light Illumination

3D Face Database Our Standard
1] Sensor: 3D Sense
2]Subjects: 50(500 images)
3]Position/Expression: 10(TEN)
1] Straight towards Camera
2] 30 Degree towards left
3] 30 Degree towards right
4] UP
5] Down
6] Small smile
7] Big smile
8] Close eyes
9] With Glasses
10]Straight towards Camera
4] Distance: 1 meter
5] Illumination: With light Illumination

Database Development for 3D Ear

3D Ear collection F and Collection G Database
1] Sensor: Minolta Vivid 910.
2] Subject: 942
3] Position/Expression:
1] Straight
2] 45 degree left
3] 45 degree right
4] 60 degree left
5] 60 degree right
6] 75 degree left
7] 75 degree right
8] 90 degree left
9] 90 degree right
4] Distance: 1 meter -1.5 meter.
5] Illumination: With light Illumination.

3D Ear Database Our Standard
1] Sensor: 3D Sense
2] Subjects: 50(500 images)
3] Position/Expression: 10(TEN)
1] Straight towards Camera
2] 90 Degree towards left
3] 60 Degree towards left
4] 30 Degree towards left
5] 90 Degree towards right
6] 60 Degree towards right
7] 30 Degree towards right
8] earphone on
9] earphone off
10] Straight.
4] Distance: 1 meter
5] Illumination: With light Illumination.[11],[12]

IV. CONCLUSION

The proposed standard of design and development of 3D Face and 3D Ear database is overcome all the drawback of available database and we can also do a comparative analysis using Two different sensor which is low cost. We follow ANSI-NIST-ISO Standard. The Database is useful for those who want to do the research in 3D Face and 3D Ear Recognition.

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