

A Face Recognition System Through Somatology

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Abstract—Normally facial recognition algorithms identify faces by extracting landmarks or features from an image of the subject's face and then algorithm may analyze the relative size, shape of the eyes, nose, cheekbones, and jaw. These features are then used to search for other image with matching features. The proposed system in also performing the same series of tasks but the specialty of the system is its landmark selection method, which in based on somatology, a division of anthropology it is an oldest, reliable and scientific method for identification of the landmarks on human body.

Keywords-Landmarks, Anthropology, Somatology,Indices.

I. INTRODUCTION:

Our system is a feature based face recognition system; a successful face recognition methodology depends heavily on the particular choice of the features used by the recognition system. In this paper we have proposed features selection method through Somatology which is the division of Anthropology[2].

Somatology is a systematized knowledge of the techniques for measuring and recording observations on the human body. It includes direct surface measurements on different parts of the human body by most reliable means and scientific methods. The measurements on the human body are taken between definite surface points called landmarks[1][2].

The paper is organized as follows .In section II, details of the selected landmarks is being given. In section III, list of distances which is been considered is being listed. In section IV, we have introduced Index and also given formula for its calculation. In section V, we have shown that how can we implement the proposed system on a real subject. In section VI discussion about the problems faced by researchers in this field is being done. Section VII, is covering conclusion.

II. SELECTED LANDMARKS[1]:

The system needs two poses i.e. frontal pose and side pose of each individual subject and then we have considered 25 landmarks upon frontal pose which is shown in figure no.1.1 and 12 landmarks upon side pose which is shown in figure no.1.2, of an individual subject.

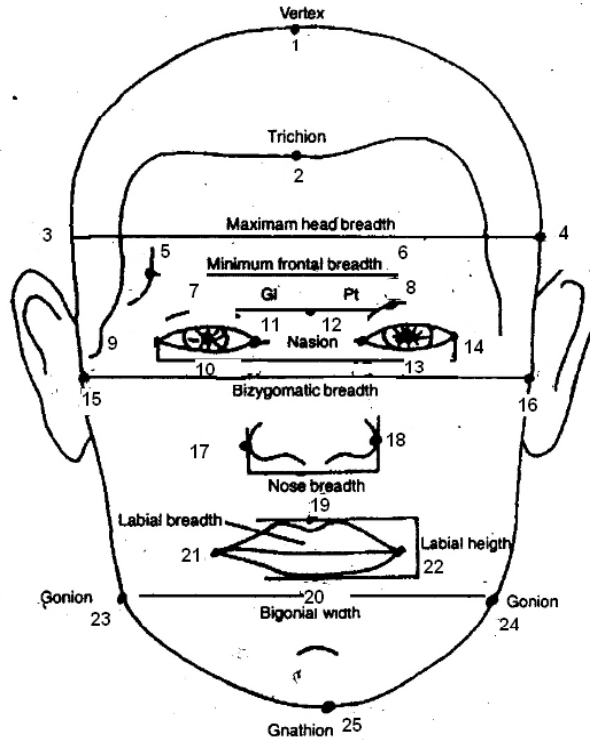


Figure : 1.1 Landmarks on frontal pose

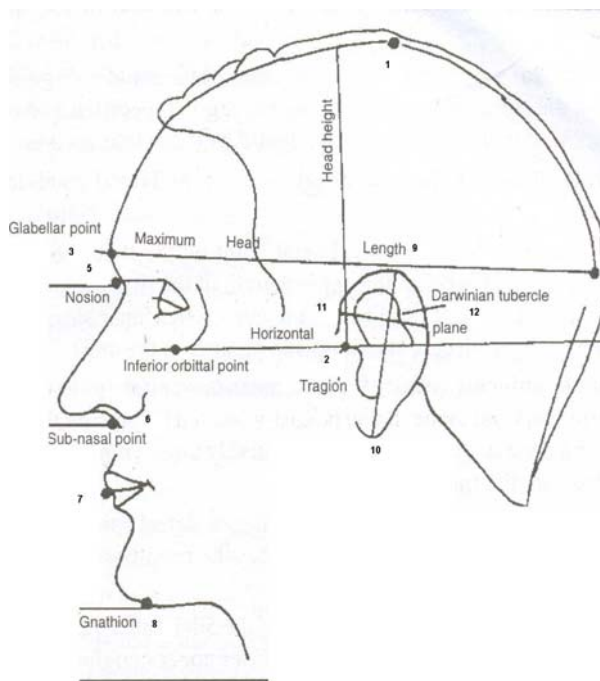


Figure : 1.2 Landmarks on side pose

Using these landmarks the proposed system calculates absolute value for the desired length and breadth of a subject, using Euclidean distances measurement formula, which will provide a ground for indices calculation.

III. CONSIDERED DISTANCES[1][2]:

Using these selected landmarks ,following 12 distances may be calculated from frontal pose

S.No.	Distance
1.	total head height
2.	maximum head breadth
3.	minimum frontal breadth
4.	distance between center points of eyebrows
5.	text. biocular breadth
6.	inter pupillary breadth
7.	inter.biocular breadth
8.	bizygomatic breadth
9.	nose breadth
10.	labial height
11.	labial breadth
12.	bigonial width

Table:1.1 List of distances in frontal view.

S.No.	Distance
13.	head height
14.	maximum head length
15.	nasal height
16.	upper face height
17.	morphological facial height
18.	lower face height
19.	ear length
20.	ear breadth

Table:1.2 List of distances in side pose

IV. INDEX CALCULATION[1][2]:

An index, as used in anthropometry, is the ratio of one measurement to another expressed as a percentage of a larger one. Thus, if it is desired to determine the proportional relation of the breadth of the head to its length, the length is equated to the value of the 100 and the breadth is then expressed as the ratio of hundred. This yields the cephalic index. The relevant formula for such a calculation is as follows:

$$\text{Cephalic Index} = \frac{\text{Maximum Head Breadth}}{\text{Maximum Head Length}} \times 100$$

Thus, an index represents the relationship between two absolute measurements, the lesser measurement usually employed as the numerator and greater as the denominator. The quotient is multiplied by hundred to avoid fractions.

In somatology total 61 important constitutional indices are there but author has considered only those cephalic indices, which are required for face recognition. By using 20 distances which has been already calculated ,we may now calculate following indices through the formula mentioned in the table 1.3.

S. No.	Indices	Formula
1.	cephalic index	(maximum head breadth/maximum head length)*100
2.	length-height index	((head height/maximum head length)*100)
3.	breadth-height index	(head height/maximum head breadth)*100
4.	mean index of height	(head height/half the sum of breadth & length.)*100
5.	cephalic modulus	((head ht.+head length+head brth.)/3)*100
6.	fronto parietal index	(min.frontal brth/max.head brth)*100
7.	morphological facial index	(morph. facial ht./bizygomatic brth.)*100
8.	morph.upper facial index	(morph.upper facial ht./bizygomatic brth.)*100
9.	transverse cephalo facial index	(bizy.brth./max.head brth)*100
10.	fronto-zygo.index	(min.frontal brth/bizygo.brth.)*100
11.	nasal index	(nasal brth/nasal ht.)*100
12.	ear index	(ear brth./ear leth)*100
13.	inter pupillary index	(int.pup.brth./max.bizy.brth)*100
14.	external orbital index	(ext.ocular brth/bizy.brth.)*100
15.	internal orbital index	(int.ocular brth/bizy.brth.)*100
16.	lip index	(labial ht./labial brth.)*100
17.	relative chin ht.index	(ht.of lower face/morph.facial ht.)*100
18.	jugo-frontal index	(min. frontal brth./bizy.brth)*100
19.	jugo-mandibular index	(bigonial brth/bizy.brth)*100

Table 1.3 : Formula for Index calculation

V. IMPLEMENTATION [3]:

We have to convert all the 25 landmarks in the front pose shown in fig.1.1 and 12 landmark in the side pose shown in fig.1.2,into pixel values in horizontal and vertical direction, so that we may calculate the absolute values of the distances of the landmarks.



Figure 1.3 :Selected landmarks on frontal pose



Figure 1.4 : Selected landmarks on side pose

Calculated distances and indices of the subject is shown in the table [3]

S.N.	Mean
1	365.22
2	253.54
3	167.47
4	125.35
5	136.05
6	91.554
7	50.701
8	211.42
9	71.763
10	33.3
11	81.988
12	183.78
13	180.66
14	235.23
15	55.459
16	79.558
17	139.2
18	64.865
19	73.029
20	39.574

S.N.	INDEX
1	107.78
2	76.801
3	71.255
4	49.906
5	223.14
6	66.052
7	65.84
8	37.631
9	83.388
10	79.211
11	129.4
12	54.19
13	43.304
14	64.352
15	23.981
16	40.616
17	46.599
18	79.211
19	86.925

VI. PROBLEMS FACED BY THE RESEARCHERS :

Face recognition is not perfect and struggles to perform under certain conditions. Ralph Gross, a researcher at the Carnegie Mellon Robotics Institute, describes one obstacle related to the viewing angle of the face: "Face recognition has been getting pretty good at full frontal faces and 20 degrees off, but as soon as you go towards profile, there've been problems." [4]

Other conditions where face recognition does not work well include poor lighting, sunglasses, long hair, or other objects partially covering the subject's face, and low resolution images.[5] Another serious disadvantage is that many systems are less effective if facial expressions vary. Even a big smile can render in the system less effective. For instance: Canada now allows only neutral facial expressions in passport photos.[6]

VII. CONCLUSION :

All the researchers working in the field of face recognition are facing many problems and no one could get satisfactory real time solutions of the problem till date. So in this paper we have suggested that, as Anthropology includes direct surface measurements on different parts of the human body by most reliable means and scientific methods, we may develop a method based on the landmarks given by somatology.

We may trend a neural network using the indices which we have calculated in this paper for any number of subjects. We may also increase number of poses, landmarks ,distances and indices for better performance.

VIII. REFERENCES

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