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shafagat\_57@mail.ru**METHODS FOR THE RACIAL AND ETHNIC DETERMINATION OF A PERSON**

*Ethnic belonging of any person is one of his/her groups of traits. Hence, the need for the study may stem from variety of reasons such as face recognition of a person, issuance of ID card, describing the image of an unknown person, or creating photo portrait of a missing person or suspected criminal, based on verbal description, and so on. This article sheds light on the methods for the racial and ethnic determination of a person.*

**Keywords:** image, recognition, racial and ethnic groups, race belonging, identification

**Introduction**

Theoretical and practical studies of the racial and ethnic identification of a person are may be of interest to many professional fields such as anthropology, customs, border control, service, and etc. Solution of this issue can reduce the time spent for the search of millions of photos stored in the database, during the recognition of a person on the basis of images, as well as decrease the scope of the search to a significant degree.

A number of specialists of various affiliations are engaged in solving the problems of racial and ethnic determination of a person. Existing problems in this area are solved with the use of different methods.

The social sciences, such as anthropology, ethnography and race studies (Fig.1), as well as technical sciences, as biometric technologies, pattern recognition, medicine, and etc. deal with the solution of the existing problems.

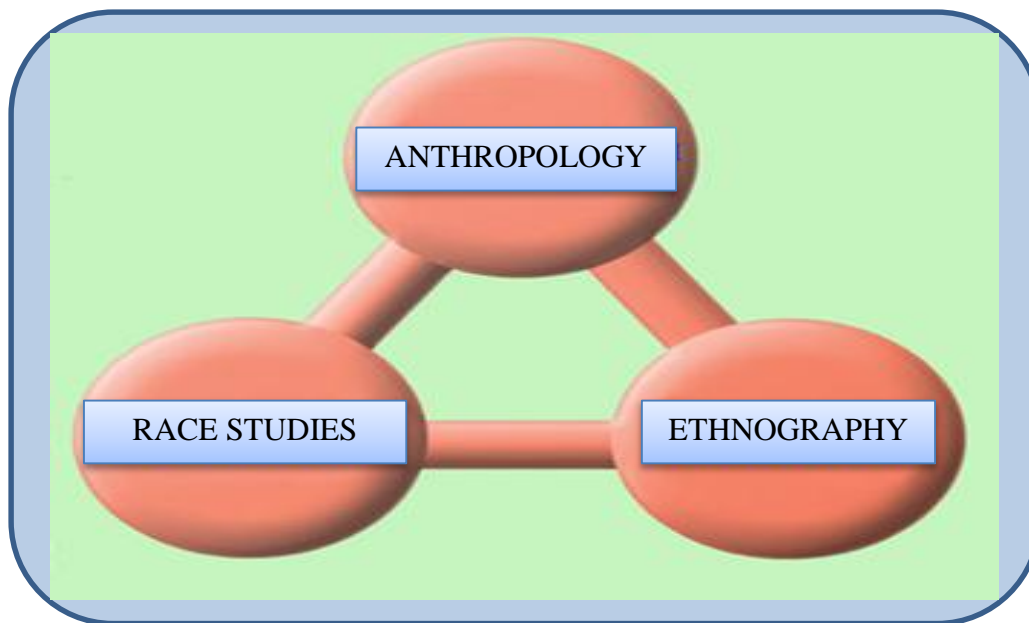


Figure 1. Social sciences engaged in the racial and ethnic determination of a human

Assessment of individual psychological characteristics of a person, based on facial photographs, is realized through the exploration of different racial groups [1].

Ethnography is originated from the combination of the Greek words “ethnos” (people), and “grafis” (to describe). The main objective of ethnography is to study the nations and explore their history.

Some methods in the field of ethnography are:

- The method of the Rokeach Value Survey by Rokeach presumes that the human values are few, and based on them, he sets out the systems of value orientations and proved that everybody has the same values to some degree [2];
- Cognitive-communication method based on exchange of knowledge [3];
- Theoretical foundation of the “Who I am?” method of Kuhn & McPartland is based on social roles and behaviour concepts of a human. Thus, a human is an actor of these roles himself [4];
- The method of stereotypes research, developed by Petrenko B.F, is based on the “multiple identification” methods using characteristic behavior of a person. The concept of ethnic stereotype is applied to characterize the behavior, which is preserved through the generations within the ethnic group and enriched with the life experience [5];
- The method of “Writing additional qualities” by Stefanenko is about the psychological relationships between the ethnic groups and their identification [6];

Some trends in the field of Ethnography include:

- Primordialism. This approach assumes that the ethnic belonging of a person originates from the nature or the society and exists objectively [7];
- Dual theory of ethnic groups is about the relative permanence of common characteristics of the ethnos [8];
- According to the sociobiology of Pierre Den Berghe’s theory, ethnicity is a human genetic trend when selecting the relatives and based on superiority of kinship [9];
- Passionate ethnos theory by Gumilev is about the historical processes as an interaction of growing ethnic groups [10];
- Constructivism studies the ethnicity developed with the help of knowledge of personalities and presented in a constructive way [11];
- Instrumentalism endorses that the existence of any ethnic group serve to the specific interests or target [12].

Anthropology (anthropos – human, logos - science) a science about a human. As a natural science, it studies the formation and development of the humanity, the emergence of human race, and the common changes in the physical structure of human. Anthropology is a field of science, in which the subject of research is a human.

Race studies explore the emergence origins of races, race types, their classification and distribution areas on the Earth, the compliance of the racial types with the changes [13-14].

The concept of the race was first used by French ethnographer and traveler Francois Berne in 1684.

Race is a system of human groups that bond similar genetic and distinct biological characteristics and is formed in a certain geographic region. The characteristic features of the various human races are shaped as a result of adaptation to a certain environment [15].

In another source, the race is defined as large groups of people distinguished by the physical features passed from generation to generation and historically inhabited in a particular area.

A complex of physical traits have emerged as a result of the adaptation to the environment, due to which three main races of the peoples all over the world were distinguished before, which are “white”, “black” and “blond”, respectively europoid, mongoloid and negroid. Lately, it is recommended to distinguish an amerikanoid race from mongoloid race [15].

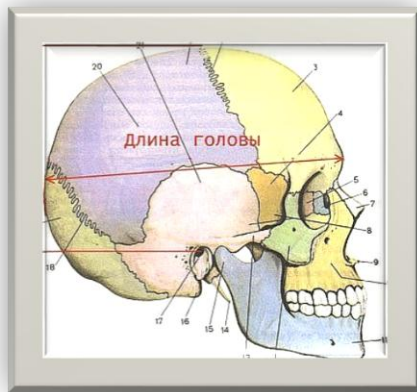
Ethnicity is a historical complex of people having culture and psyche with relatively stable features, as well as of the people differing from others and speaking in own language. Ethnogeny is the origin of any nation [16].

### **Problems of racial or ethnic determination of a person**

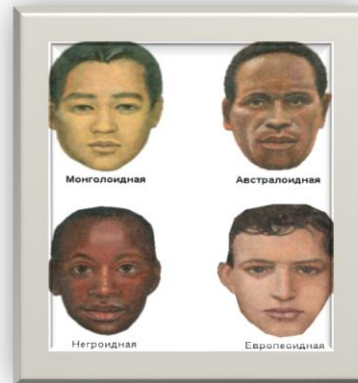
Some methods of racial or ethnic determination of a person are illustrated below:

1. According to skull bones;
2. According to facial images;

3. According to fingerprints and palm patterns;
4. According to eye;
5. According to teeth and etc. (Fig.2).



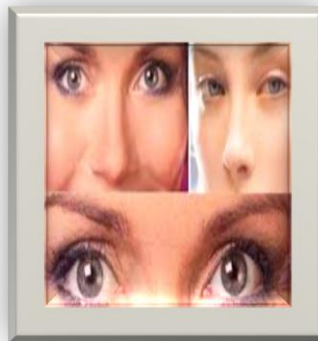
Bones of the skull



Face images



Fingerprint and palm patterns



Eyes



Teeth

Figure 2. Human parameters of various races

Racial or ethnic determination of a person according to the bones of the skull (the bones of the skull is the object of the study) includes the following stages:

- Issue resolution and conducting experiments on the basis of method according to skull bones and algorithms :
- Measuring specified indicators of the skull bones;
- Comparing the indicators with those in the table, which was set out in advance;
- Determination of the race [17].

Some following features of a human face are used for the racial or ethnic determination of the race of a person according to facial images (Fig.3):

- The height of the forehead - the upper part of the nose;
- The distance between the inner and outer corners of the eyes;
- The distance from the tip of the nose to the chin;
- The width of the nose;
- The distance from the top of the nose to the tip of the nose;
- The distance from the tip of the nose to the center of the lips [18].

Among different approaches for 3D face recognition, solutions based on local facial characteristics are very promising [19]. However, a few studies have been devoted to investigation of the regional features applied for 3D facial recognition of a person.

Some articles combined the features of regional approach used for three-dimensional face recognition with selection model. The proposed method was tested by using photoportraits stored in the *Face Recognition Grand Challenge* dataset [20].

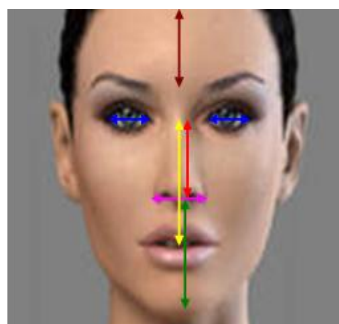


Figure 3. Traits of the human face

Racial or ethnic identification of a person is possible according to the finger and palm patterns. Potentials of Dermatoglyphics and Dactyloscopy are utilized for this.

Dermatoglyphics studies the skin patterns of the palms and paws of a person.

Dactyloscopy is an identification method of a person according to the fingerprints on the skin, and relies on the patterns observed in individual prints (Fig.4). Currently, applications characterizing the papillary patterns of the fingertips are rather popular [21].



Figure 4. Fingerprints and palm patterns of a person of various races

Racial or ethnic identification of a person is possible according to the cellular retina of the eyes. Gustav Fritsch (1839-1891) first showed the racial peculiarities of the cellular retina of the eyes [22]. The cellular retina is a thin nerve membrane of the front side of the back wall of eyeball (Fig.5).

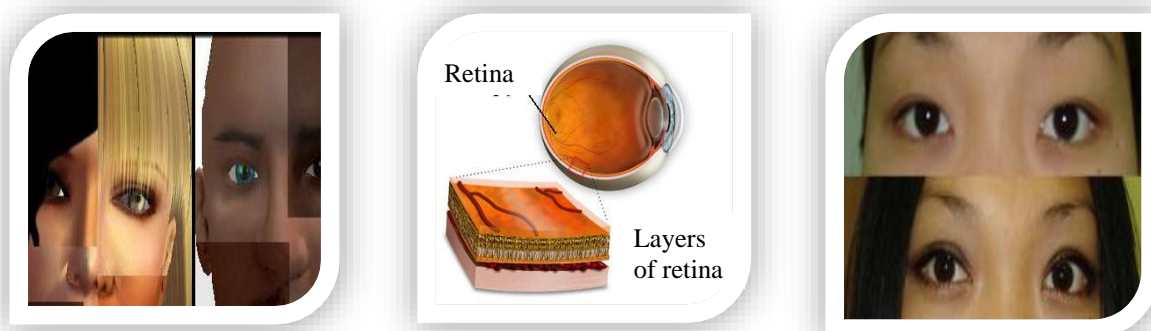


Figure 5. Eyes and cellular retina of a person of various races

Dental identification is used for the racial and ethnic recognition of a person according to his/her teeth (Fig.6).

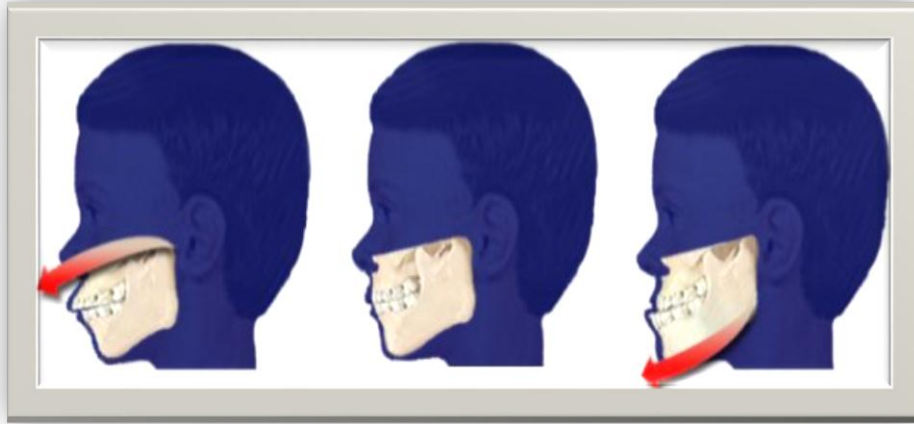


Figure 6. Teeth of a person of various races

The teeth of each individual has the unique characteristics. The mandible, where the teeth are located, is also used in this method [23].

### **Human face determination according to the racial features**

As the human face is the source of most of information signals, it was supposed that in the East, a person's destiny could be predicted according to his face. A person's face is the center of the human behavior and communication. The face has a capacity and as a rule, is described in two projections:

- En face;
- Profile.

According to the human face, information about the age, sex and ethnic origin and race can be obtained [24].

Scientists have used a variety of methods for the racial or ethnic identification of a person according to his/her face. As a result, it has been suggested that the person belongs to one of the three races europoid, mongoloid and negroid according to the geometric signs of the face. In these cases, 30 points of a person's face are used. Diverse methods have been applied for the human face recognition based on these points [25].

Parameters of the human face image were determined in other identification methods. The work sought to identify the race of a person according to the front side (en face) image [23].

The survey revealed that the proportion of the head, the width of the mandible, the shape of the nose and lips, the edge of the eyes and so on are the main parameters.

Relative parameters are recommended to be employed in order to work with these criteria:

- Proportionality of the head - the correlation of the width of the face to its height (3 points)
- The correlation of the width of the forehead to the width of the mandible (2 points)
- The correlation of the width of the nose to the width of the mandible (2 points)
- The correlation of the width of the lips to the width of the mandible (3 points)
- The correlation of the width of the eyes to their height (3 points)

The standard descriptions of the representatives of the races are stored in the database according to the developed methods. The points of the parameters are used for the determination of some races. If the initial parameters are similar to the standards, then the scores are recorded. All parameters are analyzed and the most identical face parameters of any race are defined [26].

Studies in this field are being conducted at the Institute of Information Technology of ANAS.

The standard images are developed according to the certain geometric points of the face and the special algorithm for the calculation of the certain parameters of the images stored in the



database (Fig.7). Then, the initial image is compared to the images of various ethnic groups stored in the database, and thus, the racial and ethnic identification of the person is determined [27]. The research is being continued and further development of methods and algorithms is considered.

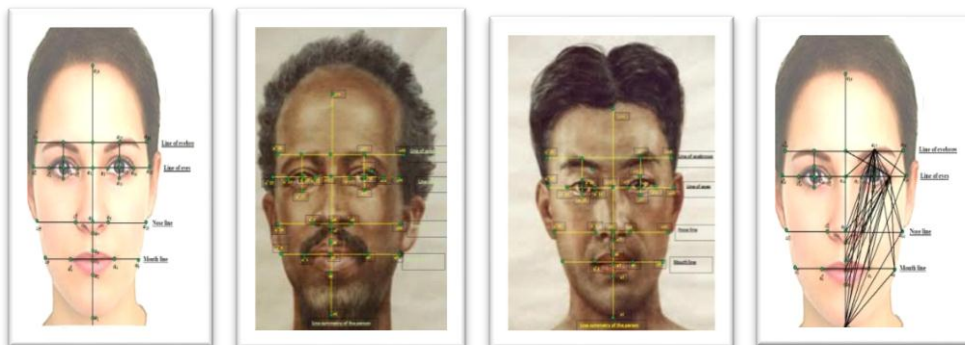


Figure 7. Standard images for racial and ethnic belonging of a person

## Conclusion

The article examines several methods for the racial and ethnic identification of a person available both in social and technical sciences. It provides the information about the use of theoretical and practical studies of many professional fields on determining the racial or ethnic affiliation of a person. The article provides explanations and examples on several methods and algorithms employed for the racial and ethnic identification of a person according to the images.

## REFERENCES

1. Barabanshikov V.A., Ananieva K.I. The perception of photographic images of people's faces of different races // Bulletin of Peoples' Friendship University, 2009, No.1, 7-13 pp.
2. [http://psylab.info/Metodika\\_«Cennostnye\\_orientacii»\\_Rokicha](http://psylab.info/Metodika_«Cennostnye_orientacii»_Rokicha)
3. <http://kayzen.az/blog/psixologiya/8007/%C3%BCnsiyy%C9%99t-haqq%C4%B1nda-anlay%C4%B1%C5%9F.html>
4. [http://psylab.info/Тест\\_Куна\\_-\\_Макпартленда](http://psylab.info/Тест_Куна_-_Макпартленда)
5. <http://psyfactor.org/lib/stereotype9.htm>
6. Stefanenko T.G. Ethnopsychology. M.: Institute of Psychology, Russian Academy of Sciences, "Academic Project", 1999, 320 p.
7. Kolosov V.A. "Primordialism" and the modern national and state building // Polis, 1998, No 3, 95-106 pp.
8. Bromley Y.V. Essays on the theory of ethnos. M.: Publisher LKI, 2008, 440 p.
9. Pierre L.D.Berghe. The ethnic phenomenon, 1981, by Elsevier Science Publishing Co., Inc., 318 p.
10. Gumilyov L.N. Great Russian Encyclopedia, v.8, Moscow, 2007, 155 p.
11. Rogers B. Ethnicity without groups. Cambridge: Harvard University Press, 2004, 283 p.
12. [http://superinf.ru/view\\_helpstud.php?id=2059](http://superinf.ru/view_helpstud.php?id=2059)
13. <http://az.wikipedia.org/wiki/%C4%B0rq>
14. <http://az.wikipedia.org/wiki/Etnoqrafiya>
15. <https://az.wikipedia.org/wiki/%C4%B0rq>
16. <http://az.wikipedia.org/wiki/Etnos>
17. Zvyagin V.N. Determination of race according to the bones of the skull. Forensic Medical Center of MH RF.  
<http://www.expert-kriminalist.ru/info/pasportametodik/medkrimpasport/medkrim1>
18. <http://www.dmitriyo.ru/>

19. Heo J., Savvides M. Gender and Ethnicity Specific Generic Elastic Models from a Single 2D Image for Novel 2D Pose Face Synthesis and Recognition // Pattern analysis and machine intelligence, 2012, vol.34, no.12, pp. 2341–2350.
20. Alberto D.B., Pietro P., Stefano B. Distinguishing Facial Features for Ethnicity-Based 3D Face Recognition // ACM Transactions on Intelligent Systems and Technology (TIST), 2012, vol.3, no.3, pp.1–20.
21. Khit G.L., Dolinova N.A. Racial differentiation of mankind (Dermatoglyphic data) / Institute of Ethnography. NN M.: Nauka, 1990, 206 p.[http://polbu.ru/avdeev\\_rasologiya/ch25\\_all.html](http://polbu.ru/avdeev_rasologiya/ch25_all.html)
22. <http://www.medical-enc.ru/sudmed/identification-trupov-3.shtml>
23. Adilova L.R. Face Recognition // Intelligent Systems, Moscow, 2010, Vol.14, 73-84 pp.
24. Xiaoguang L., Jain A. Ethnicity Identification from Face Images // Proceedings of SPIE - The International Society for Optical Engineering, 2004, pp.114–123.
25. Kazimov T.H., Mahmudova S.C., Tugrul Aktash, System of recognition of an accessory of persons to racial and an ethnic group on the basis of photographs // International Journal of Applied Mathematics, Electronics and Computers, Turkey, 2015, vol.3, no.3, pp.155–160.
26. <http://habrahabr.ru/post/139745/>
27. Kazimov T.H., Mahmudova Sh.J. Increase of indicator values of identification systems quality on the recognition of human face on the basis of photoportraits // Intelligent Control and Automation, 2013, vol.4, no.2, USA, pp.191–198.