International Journal of Science and Research (IJSR)
ISSN: 2319-7064
ResearchGate Impact Factor (2018): 0.28 | SJIF (2018): 7.426

Method and Algorithm for Identifying the Parameters of the Image Face Person

Nurjanov Furqatbek Reyimberganovich[1]

Tashkent university of information technologies named after Muhammad Al-Khorazmiy doctorate, The Faculty of "Information technologies"

Abstract: ***This article describes the face of the person identification process in order to create a robot system brought stages of the construction of a mathematical model. We existing database (DB) to the second person to be compared with the image face that are allocated to the parameters of the pixels. Assessment of the resolution is to compare the process of classification and identification of the values of the correlation coefficient. Face image in the process of creating adequate compensation on the stages of construction of the model.***

Keywords: face image, model, mathematic model and algorithms, correlation

1. Introduction

Face detection is a necessary first-step in face recognition systems, with the purpose of localizing and extracting the face region from the background. It also has several applications in areas such as content-based image retrieval, video coding, video conferencing, crowd surveillance, and intelligent human–computer interfaces. The human face is a dynamic object and has a high degree of variability in its appearance, which makes face detection a difficult problem in computer vision. A wide variety of techniques have been proposed, ranging from simple edge-based algorithms to composite high-level approaches utilizing advanced pattern recognition methods.

This article is the first global issue considered in 3 stages:

1) People face image identification, documentation and analysis of the work performed;
2) Images of the main characters for the identification and isolation of pixels to determine the analysis of algorithms and mathematical approach to identify the images by clicking the image analysis algorithm development with the colors of the structure, processing, and to compare phases of the match. Image recognition "robot system" to create a mathematical model;
3) Images system in technical support measures. If we would address to the literature about these issues on the practice of mystery Markov algorithm. This algorithm is described in the digital image of the face of the person and the resolution on separating the melt [1].

2. Setting the problem

1) At the same time, the image observed some few times, and we are going to save any of the observations $A = A_1, A_2, A_3, \ldots\ldots A_n$;

2) As a result of these observations, all of them will be merged into a single unified sight;

3) The image is compared with the bigger picture (where the algorithm is used);

3.1. Markov algorithm includes confidential and classified cases set out to determine the final image;

$$S = S_1, S_2, S_3 \ldots\ldots S_n \qquad (1)$$

3.2 The last observation of these collections are equal to $V = V_1, V_2, V_3 \ldots\ldots V_n$

3.3 If the pass of the trust of matrix $A = \{0\ldots.\}, Y = P(Q_i = S_j), X = S_i, A = \{0\ldots..\}$ then $A = \{0\ldots.\}$, should be taken.

3.4 Emissary matrix $B = \{b_i(k), b_j(k)\};\ i = 1, n;\ k = 1, m, t = 1, T$ (Markov algorithm). As well as the analysis of the work done. There are other algorithms to identify the image of the metric that uses the size of the GTO (Scan Window Band)'s formula.

$$T_y = \frac{S - L_y}{L_y - M_y + 1} \qquad (2)$$

Here is the $S-$ lower jaw to the upper part of the range of the horizontal size of the head;

L_y - the size of eyebrow and the size of the crown are on the head with the horizontal;

M_y -outside of the eyebrow and the size of the horizontal range that is wrinkled forehead;

In addition, there is another method that is SWR (Scan Window by Rectangle) method based on the image to the right referred to in the form of a square. Images of integrated imaging algorithm in accordance with the matrix out of storage sizes. There is each of the elements: left, right, higher and more intensive compared with the sum of the pixels.

The first phase of the global issue of this resolution in the comparable classes using the following formula to determine the connection between the (CCM) are:

$$R_{x_{j/i}} = \frac{\overline{H_{x_j} \cdot H_{x_i}}}{\sqrt{H_{x_j} \cdot H_{x_i}}} \qquad (3)$$

Here is

$$\overline{H_{x_j} \cdot H_{x_l}} = \sum_{i=1}^{m} x_{ij} \cdot x_{il} - (1/m)(\sum_{i=1}^{m} x_{ij}) \cdot (\sum_{i=1}^{m} x_{il}) \quad (4)$$

$$H_y = \sum y_i^2 - (1/m)(\sum_{i=1}^{m} y_i)^2 \quad (5)$$

$$H_{x_j} = \sum_{i=1}^{m} x_{ij} \cdot y - (1/m)(\sum_{i=1}^{m} x_{ij})^2 \quad (6)$$

The process of comparing the pixels in the image (3) is carried out using a formula, with the result that many comparable It is such a comparison process is carried out. These objects, which objects you want us to search for a correlation coefficient matrix can be made.

$$R_{x_{j/l}} = \begin{vmatrix} R_{x_1 x_1} & R_{x_1 x_2} & \dots & R_{x_1 x_n} \\ R_{x_2 x_1} & R_{x_2 x_2} & \dots & R_{x_2 x_n} \\ \dots & \dots & \dots & \dots \\ R_{x_l x_1} & R_{x_l x_2} & \dots & R_{x_l x_n} \end{vmatrix} \quad (7)$$

Complex processes and compare them from each other Commonalities (correlation dependence) or reliance on the value of a link (7) is found using the formula.

The second phase of the global issue The main objective of the efforts of complex mathematical modeling of the process to identify the connection between the input and output parameters and parameter identification (the color of the link) lies as a result of the following steps from the formula [2].

$$Y = F(x_1, x_2, \dots x_n, c) \quad (8)$$

The vector of choice for C- is unknown to create a mathematical model and the process of identification. The structure of the line, curves, logarithmic, parabolic, and other models is determined by the adequacy of the class. In order to find an invalid parameter - small squares method, a clear image for the object.

$$J(C) = \sum_{i=1}^{n} \left[Y_i - F(x_{1i}, x_{2i}, \dots, x_{ni}, c) \right]^2 \quad (9)$$

(9) The actual formula and model values are determined by calculating the difference in the residual dispersion. As a result, the following formula is formed.

$$\overline{S}_{OCT}^2 = \frac{1}{n-1} \sum_{i=1}^{n} \left[Y_i - F(x_{1i}, x_{2i}, \dots, x_{ni}, c) \right]^2 \quad (10)$$

The possibility of building the F-adequacy ratios will be determined by the correlation method.

$$R^m = \sqrt{1 - \frac{\overline{S}_{OCT}^2}{\overline{S}_y^2}} > R^T(n-1, \alpha) \quad (11)$$

Here is $\overline{S}_y^2$ the complete dispersion. (11) The formula $\overline{S}_y^2$ is called dispersion, and a constant value, as a result the correlation coefficients R^m (9) the value of the $\overline{S}_{OCT}^2$ residual dispersion (8) will change. Coefficient correlation value of its high $R^m = 1$ and $\overline{S}_{OCT}^2 = 0$ equal opportunity.

As a result y^0, the real cost of the y^M process to minimize the difference between the values of the model is equal to the $\overline{S}_{OCT}^2 = 0$ residual dispersion.

Thorough analysis of the above algorithms, the official image of the human face, or other items in the process we are following the creation of a new algorithm to identify the purpose of this algorithm is based on the coefficients correlation method (CCM) lies. (CCU) algorithm created based on the following steps.[3]:

1) Used for check box is selected (called the control box is the number of pixels and the size is divided) and the resolution of the main characters.
2) The inspection window is 1-cell and 2-cage Guard and 2-cell divides into 1st series. This window boxes (pixels) 200 000 options.
3) Comparable pictured above 1.2 will be gradually changed.
4) Simplify the measurement process in the image window (in pixels) of the cage of two images with a resolution of the same size will change.
5) All the founded notes will be given to the classifier.
6) A variety of measurements to check and compare the process to the public. The main image for each image scale compared to the amount of contact between correlations. Commonalities coefficient correlates the level of the maximum value of the preferred. 3rd stage of global affairs robot's eyes to create a technical support model. First of all we should now get interested in the robot we have to learn to fulfill its functions. As a result, the robot's eyes look at the image and through the image it gets to know the person and you need to give this information to a computer [4].

Robotics systems, mainly divided into several types:

Biotechnological:

- Commands to the robot button and lever- management process;
- Copy in a repetitive complex process involving a robot;
- Semi-automatic hereof subordinate commands to the robot.

Automatic:

Program to do the same kind of definite conditions, according to the pre-applications;

- Adaptive robot exemplary work in process based on the specific conditions of the issues;
- Age (automated system versatile foto robot).

Interactive:

- Automated - automatically and run in the biotechnical robot;

- Supervisor subordinate automated system photo image;
- Interviews (dialogue), choosing a strategy to keep the robot itself communicate goals as the robot expert advice.

Various types of mathematical algorithms and software for automatic face image detection, processing and methods of comparison using computer technologies are developed these days. First of all, image detection system is called biometric verification. It means comparing one image with another one and verifying their resemblance. It should be noted, that during the research we investigated set of different software packages and analysed them closely. Face image detection, finding resemblance and verifying the image using software packets is executed in real-time mood.

According to certain resources, one of the analysed software technologies is **Motion Software** packet**.** This package presents 2D model of face image. One of the most popular software packages is **MMER-FEAS,** which is considered to be open source software product and it is mainly used for WEB cameras in the environment of **MMER-FEAS** software package. In general, it transfers face images taken by cameras from one system to another one automatically.

Usability of this software is a capability to compare face image taken from different poses with each image in database. Variance analysis enables to evaluate quantitative and qualitative factors in variance analysis equations. When factors have quantitative features their relation with observable variables is expressed by the regression equation

Correlational analysis: With correlation analysis evaluation of the relation between mean value x (sought for object) and variable value y(compared object) respectively can be detected by following equation [5]:

$$r_{xy} = M[X - \overline{X}]*[Y - \overline{Y}]/\sigma_x\sigma_y \qquad (12)$$

being independent on the selection method for variables:

- Build distribution diagram;
- The distribution diagram should be analyzed to detect the type of the distribution.

If $r_{xy} = 0,$ then there is no connection between variables and as more $r_{xy} = 1$ is as strong it is and it can be concluded that there is functional relation between x and y and mathematical modeling will be as following: $y = b_0 + b_1 x.$

In addition when $r_{xy} = +1$ is positive correlation, namely one value of amount fits to the value of another amount and consequently it can be concluded that when $r_{xy} = -1$ antithetical correlation namely there is strong feedback between the value of one amount to the amount of another value. The analysis of distribution diagram and after getting r_{xy} value make sure that there is correlation connection with static value between variables [6,7,8].

There is a global issue its own terms and the main stage of the algorithm criteria and conditions are as follows:

Step 1. We are given two X, S images to identify with the character X_{ij}, S_{kl}

$i = 1, k = 1$ $n = 0,$ $m = 0,$ $j = 1$ $k = 1$ you want to describe to create a Table or Matrix, a Creator, we call this matrix covaritsion matrix.

Step 2. Coalition matrix on the static analysis where the main box build pixels provides by the window.

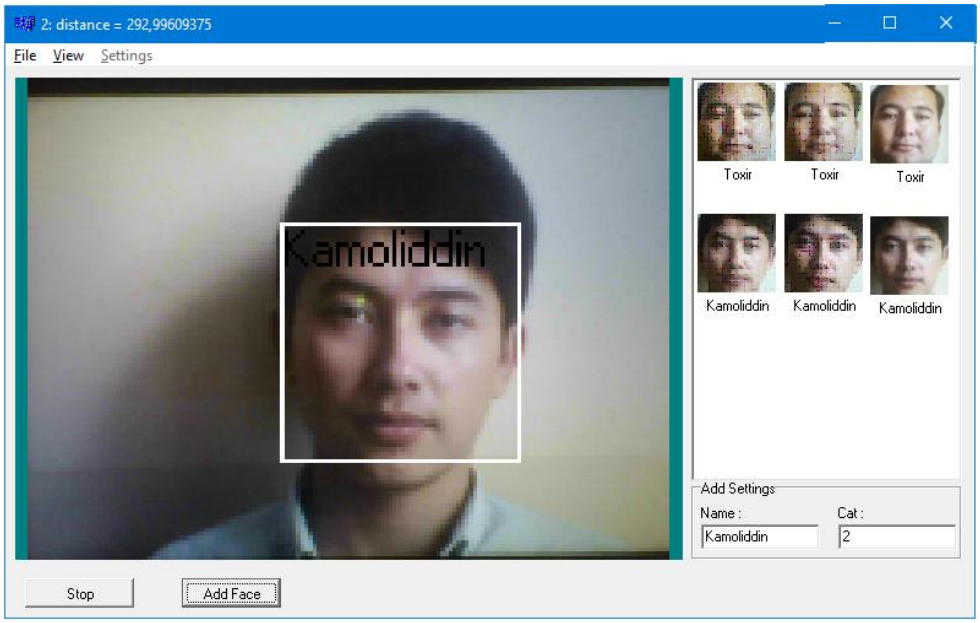
Step 3. The correlation coefficient (9) The decision by the formula.

Step 4. The result of the correlation coefficient (9), $R_{ij} = \{X_{ij}\}, \{S_{ij}\}$ and we can make correlation matrix on the matrix analysis.

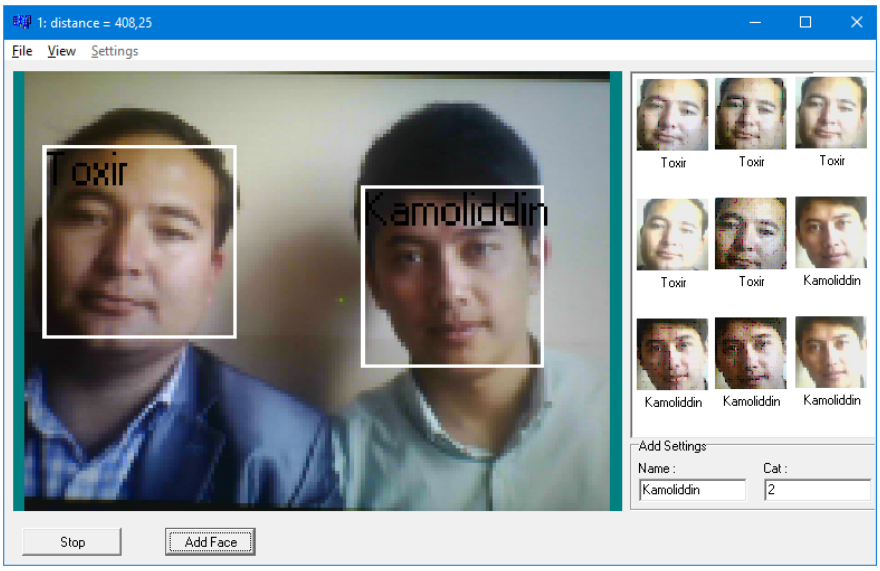
Step 5. The value of the correlation coefficient in the following condition is met they considered the model $R_{ij} > T(\alpha, m), \alpha = 95\%$ given us the first image and the 2 and compared to 95% is considered high and the similarity between the two images like this image, we are looking for image cloning.

The correlation coefficients equal to the value of its high-RM = 1 and $\overline{S}^2_{OCT} = 0$ mathematical models are adequate to achieve the result.

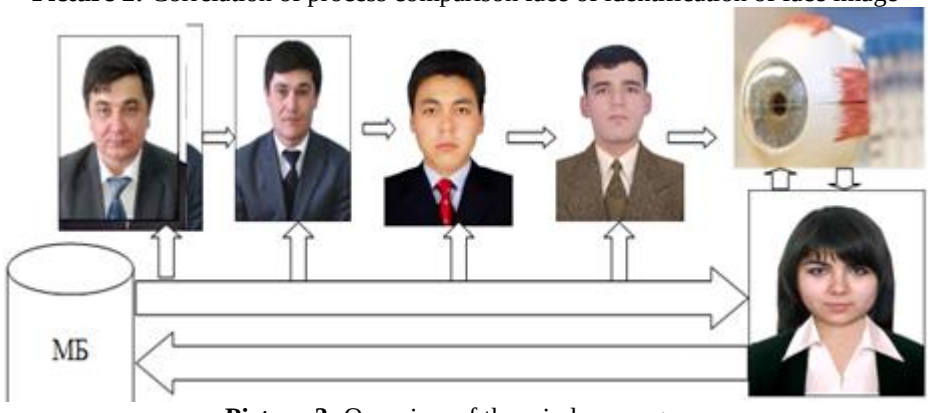
Step 6. $R_{ij} > T(\alpha, m)$ For example, this is not a model of the second picture, the first picture and the next 3 to conclude whether the image is repeated with the 1st stage, and a similar pattern is repeated until the process.



Picture 1: Identification of face image



Picture 2: Correlation of process comparison face of identification of face image



Picture 3: Overview of the window program

The (our) algorithm consists of the following stages (See pict.3):

1) Only facial surface of all colored images (this condition doesn't impact on our algorithm, because comparison and identification of a sought-for image in DB is performed only with human face) is generated at the same resolution of 3x4 shape. (We conduct experiments with images of university entrants of TUIT). Sought-for human face image is brought to A[i,j] matrix shape and all images in DB are brought to B [I,j,k] matrix. k in the given DB is equal to the number of compared images.
2) The process of comparison of sought-for human face image of the given A[i,j] matrix with matrix B[I,j,k]- in BD one-by-one in each column with dispersion and correlation coefficient method .(there are pixels in each cell and column of pixels is equal to the column of

matrix and row of pixels is equal to the rows of our matrix.)

3) The number of columns and rows of the matrix depends on position of human's facial part and pixels of colors. Software complex is developed in the "*C++ BUILDER 6*" environment with all developed algorithm, criteria and methods.

Comparative analisis of existing scientific and practical results on stages above, the object of the article on their basis and also investigating plan of the problem are defined and shown. Let's give sought –for objects and objects in the DB in the following matrix view:

$$Xq_1 = \begin{pmatrix} xq_{11}^1 & xq_{11}^2 & \dots & xq_{11}^N \\ xq_{12}^1 & xq_{12}^2 & \dots & xq_{12}^N \\ \dots & \dots & \dots & \dots \\ xq_{1m_1}^1 & xq_{1m_1}^2 & \dots & xq_{1m_1}^N \end{pmatrix},$$

$$X_1 = \begin{pmatrix} x_{11}^1 & x_{11}^2 & \dots & x_{11}^N \\ x_{12}^1 & x_{12}^2 & \dots & x_{12}^N \\ \dots & \dots & \dots & \dots \\ x_{1m_1}^1 & x_{1m_1}^2 & \dots & x_{1m_1}^N \end{pmatrix},$$

$$X_k = \begin{pmatrix} x_{k1}^1 & x_{k1}^2 & \dots & x_{k1}^N \\ x_{k2}^1 & x_{k2}^2 & \dots & x_{k2}^N \\ \dots & \dots & \dots & \dots \\ x_{km_k}^1 & x_{km_k}^2 & \dots & x_{km_k}^N \end{pmatrix}.$$

Here, $X = \bigcup_{i=1}^{k} X_i,\ X_i \cap X_j = \varnothing,$

($i \neq j,, i, j = \overline{1,k}$), x_{pj}^i and x_{pj}^i - q, p - belongs to the sought -for object and objects in DB. , i-is a sign of j-object; k -is a number of the given DB

objects, m_p - p -is a number of objects in DB. $X = \left\{x^1, x^2, \dots, x^N\right\}$ let's suppose that the space of informative features is given, it is required using it to find similar objects in DB.

Picture 4: Methods of creating images ℓ- - informative characters

In this case we should find such a $F: X \to Y$ reflection, as a result when the condition $\dim X >> \dim Y$ is performed, it tends to $J(Y) = J(F(X)) \to extr$. The recognition of objects via their features is given in [2,3,4,8] and in several other sources. Let's enter unique expression vector $\lambda = (\lambda_1, \lambda_2, \dots, \lambda_N)$ to find out if any features of an sought–for object first the features of objects in DB while comparison.

Vector components here can be eye, nose or mouse, you can choose with the mouse any feature you want. If it is necessary to compare the space of sought-for object informative features with the space of ℓ-informative features in DB, then F reflection can be the following:

$$Y = F(X) \Leftrightarrow y_i = f_i(x_i) = \lambda_i x_i, (i = \overline{1,N}),\ \sum_{i=1}^{N} \lambda_i = \ell \quad (13)$$

$$Y = F(X) \Leftrightarrow y_i = f_i(x_1, x_2, \dots, x_N), (i = \overline{1,\ell}) \quad (14)$$

In this view F reflection can be expressed as following:

First, select the most informative ℓ-features among feature spaces of sought-for object relatively similar to the feature space of objects in DB in the reflection of sought-for object in the (1)view or send back to DB those, which don't have any similarities.

Second is conversion to a new ℓ - dimensional space functionally relevant to feature spaces of sought-for object. In sources the first is called selecting informative features, the second is the degradation of feature space dimension.

The following are the most common methods of creating informative feature complex and their analysis.

Suppose, conversion of sought-for object space into the similar space in DB is performed through the linear varying. As a result we look through one of the linear varying.

$$y_i = \sum_{j=1}^{N} a_{ij} x_j; \quad (15)$$

Here $\|a_{ij}\|$ - is matrix, $a_{ij} = 0 \vee 1$

Such a linear reflection means creating similar feature complex from the features of sought-for object space and sending back dissimilar ones to the DB. I n general, (3) and (1) are equivalents.

Random choice method. In this method ℓ number feature is choosen randomly and evaluated their informatively. Then ℓ - number feature irrelevant to the previous one is chosen again and their informatively is also determined and this process is kept on H times. After that, the feature with the largest informatively is selected from the complex of H number features. It is known that as large H is, as high the probability of selection the largest informative feature complex is and methods of selecting informative features relatively to the distance between sought-for objects and objects in DB are shown in [11]. Distance between x_{pj} and x_{ql} objects are determined by λ -pixels in N-dimensional pixels space as following: Signs in N- measurement pixel space and distance between x_{pj} and x_{ql} objects are defined by λ -pixels as following:

$$d_E\left(x_{pj}, x_{ql}\right)_\lambda = \sqrt{\sum_{i=1}^{N} \lambda_i \left(x_{pj}^i - x_{ql}^i\right)^2} = \left\| x_{pj} - x_{ql} \right\|_\lambda, \quad (16)$$

here $p,q = \overline{1,k}$; $j = \overline{1,m_p}$; $l = \overline{1,m_q}$

Besides, as an effective criteria [11,13] to determine images authors enter proximity unit as following:

$$S_p(\lambda) = \sqrt{\frac{2}{m_p} \frac{1}{m_p - 1} \sum_{j=1}^{m_p} \sum_{l=1}^{m_p} \left\| x_{pj} - x_{pl} \right\|_\lambda^2} \quad (17)$$

$X_p \left(p = \overline{1,k} \right)$ is a proximity measurement describing average quadratic placement of images while comparing $X_p \left(p = \overline{1,k} \right)$ features of sought-for image with features of objects in DB is :

$$R_{p,q}(\lambda) = \sqrt{\frac{1}{m_p} \frac{1}{m_q} \sum_{j=1}^{m_p} \sum_{l=1}^{m_q} \left\| x_{pj} - x_{ql} \right\|_\lambda^2} \quad (18)$$

given X_p and $X_q \left(p,q = \overline{1,k};\ p \neq q \right)$ pair of images characterise average quadratic placement of them in comparitive process of images in DB.

If we have $\bar{x}_p = \frac{1}{m_p} \sum_{i=1}^{m_p} x_{pi}$ concept of averaged images in DB for $X_p \left(p = \overline{1,k} \right)$ sought-for image , then (1.4) and (1.5) can be written as following:

$$S_p(\lambda) = \sqrt{\frac{1}{m_p} \sum_{i=1}^{m_p} \left\| \bar{x}_p - x_{pi} \right\|_\lambda^2}, \quad (19)$$

$$R_{p,q}(\lambda) = \left\| \bar{x}_p - \bar{x}_q \right\|_\lambda \quad (20)$$

Functional in the form of Fisher criteria is used to select the complex of informative features in[8]:

$$\begin{cases} J(\lambda) = \dfrac{\sum_{p,q=1}^{k} \left\| \bar{x}_p - \bar{x}_q \right\|_\lambda^2}{\sum_{p=1}^{k} S_p^2(\lambda)} \to \max\limits_{\lambda} \\ \sum_{i=1}^{N} \lambda_i = \ell. \end{cases} \quad (21)$$

It should be noted, that selection of informative features is rather simple than others in this method and it won't be difficult to create decision rule.

$$L\left(x, X^p\right)_\lambda = \sqrt{\frac{1}{m_p} \sum_{j=1}^{m_p} \left\| x_{pj} - x \right\|_\lambda^2}, \quad (22)$$

Unit is entered as algorithm to determine average quadratic distance between recognizing x image and X^p images in DB in Euclidean space.

Decision rule of this unit works as following, $x \in X^p$, i.e. X^p unknown image is said to belong to sought-for image, if this condition is acceptable:

$$L\left(x, X^p\right)_\lambda = \min_{q=\overline{1,k}} L\left(x, X^q\right)_\lambda. \quad (23)$$

(14), (15) and (17) selection of ℓ- informative features complex on proximity unit can be performed as the following functional form: [10]:

$$\begin{cases} J(\lambda) = J[S_p(\lambda); R_{p,q}(\lambda); L\left(x, X^p\right)_\lambda] \to \operatorname{extr}\limits_{\lambda} \\ \sum_{i=1}^{N} \lambda_i = \ell. \end{cases} \quad (24)$$

As finding and performing of J functional form in practice is complicated, the following appropriate forms are used instead of (7):

$$\begin{cases} J_1(\lambda) = \max\limits_{l=\overline{1,k}} [S_p(\lambda) : R_{p,q}(\lambda) \geq R_{p,q}^0; p,q = \overline{1,k}] \to \min\limits_{\lambda} \\ \sum_{i=1}^{N} \lambda_i = \ell \end{cases}$$

$$\begin{cases} J_2(\lambda) = \min\limits_{p,q=\overline{1,k}} [R_{p,q}(\lambda) : S_p(\lambda) \leq S_p^0; l = \overline{1,k}] \to \max\limits_{\lambda} \\ \sum_{i=1}^{N} \lambda_i = \ell \end{cases} \quad (26)$$

$$\begin{cases} J_3(\lambda) = \min\limits_{p,q=\overline{1,k}} \left[\dfrac{R_{p,q}^2(\lambda)}{S_p(\lambda) \cdot S_q(\lambda)} \right] \to \max\limits_{\lambda} \\ \sum_{i=1}^{N} \lambda_i = \ell. \end{cases} \quad (27)$$

After solving mentioned above problems informative features of sought-for image is selected so as when these features are compared with images in DB there shouldn't be a huge difference between them. As a result, index of efficiency of image recognition will be increased on selected criteria. Because face detection techniques requires a priori information of the face, they can be effectively organized into two broad categories distinguished by their different approach to utilizing face knowledge. The techniques in the

first category make explicit use of face knowledge and follow the classical detection methodology in which low level features are derived prior to knowledge-based analysis. The apparent properties of the face such as skin color and face geometry are exploited at different system levels. Typically, in these techniques face detection tasks are accomplished by manipulating distance, angles, and area measurements of the visual features derived from the scene. Since features are the main ingredients, these techniques are termed the feature-based approach.

3. Conclusion

1) Comparison of the individual pixels on the face image identification and modeling methods used by the process. Developed a new algorithm and the criteria for the application of this method.
2) Conclusion as photo image systems for image recognition algorithms in the image of integrated imaging algorithm and the use of networks of neurons. Method for the processing of the images stored in the database and it gives a very great speed. This process images in two and three-dimensional images in a database management system tasks. The image assignment schedule of neuron networks in the group of images, photos, integrated imaging algorithm, and this small group was looking for matching.
3) Simple pictures, the two tracks-one comparison of the measured methods and they are widely used in this criminalist. In some cases, these methods also failed.
4) The application of the criteria for process modeling method on the development of algorithms and Criteria of research results. We are researching this article on the construction of the linear model. We create the f photo image eye Modeling Other classes may be appropriate. For example, lines, logogriphic.
5) It depends on the sharpness of the picture for (CM). If our models are part of the picture should be clear with more than 10,000 objects in the identification of 100% pro cent surface.
6) The robot recognizes the individual phases and the provision of technical mathematical algorithms and software development.
7) Complex processes to create advanced photo image to use in modern science and technology, and the last. Color portrayal in short to find the use of mathematical methods in comparison with other colors, filled with different colors, these colors are just to identify the connection between correlation take into account the impact of various external media separation (Its a long, rainy and snowy weather, at night) combination of the forces influencing the situation in the position to identify the colors of the ink to show these images take into account the interest conditions with the nuances of the process of mathematical modeling algorithms, scientific, practical and theoretical work. Computer knowledge and skills to rely on being able to find a solution to the issue.
8) Algorithms, the criteria "The photo image" to the creation of the technical delivery performance achieved certain results. Global issues for all stages of the algorithm criteria, creating software in C ++
9) It can be concluded, that the article solves one of the main problems of image recognition, i.e. recognition of unknown image via features among images in DB. Besides software was created with C++ with the help of already created methods and algorithms. Experimental research mechanism is elaborated on the base of proposed methods and algorithms and put into practice

References

[1] Zaynidinov H.N., Nurjanov., F.R. Coorelational method of human face recognition and assessment. “ Visshaya shkola”. Nauchno-prakticheskiy jurnal №-22, 2016 g. 90-92 str.
[2] Mahkamov A.A., Xamrayev A.Sh. Shaxsni quloq chanogi tasviri asosida tanib olishda baholarni hisoblash algoritmlarining qo’llanishi //«Informatika va energetika muammolari», O’zb. jurnali, 2013, № 3-4, 15-17 b.
[3] Turapov U.U., Nurjanov F.R. Tasvirlarni tanib olish modelini qurish va ular orasidagi korrelasion boglanishni baholash usuli.“Radiotehnika, telekommunikasya va axborot va tehnologiyalari muammolari va kelajak rivoji”. Xalqaro ilmiy-texnik konferensiya maqolalar to’plami 1-tom Toshkent 2015-yil 21-22 may 21-23 b.
[4] Turapov U.U.,Nurjanov F.R., Mallaev O.U. Ikki tasvirni va tasvirdagi o’bektlarni identifikasilashda dispersiya va korellasiya usullarini qo’llash. “ Sovremennoe sostoyanie i perespektivi primeneniya informatsionnix tehnologiy v upravlenii”. Dokladi Respublikanskoy nauchno-texnicheskoy konferensii. Tashkent, 7-8 sentabrya 2015 g., Tashkent -2015,s.356-362
[5] Р. Гонсалес, Р. Вудс, С. Эддинс Цифровая обработка изображений в среде MATLAB. М.: Техносфера, 2006,-616 стр
[6] В.Дьяконов, И.Абраменкова. MATLAB. Обработка сигналов и изображений. Специальный справочник. Питер. 2002 г.
[7] Чарльз Генри Эдвардс , Дэвид Э. Пенни. Дифференциальные уравнения и краевые задачи: моделирование и вычисление с помощью Mathematica, Maple и MATLAB. 3-е издание. Киев.: Диалектика-Вильямс, 2007.
[8] С.П. Иглин Теория вероятностей и математическая статистика на базе MATLAB. Харьков: НТУ "ХПИ", 2006,-612 стр.
[9] Adasovskiy B.N. K opredeleniyu informativnosti neparametricheskih priznakov v zadachah raspoznavaniya. // Kibernetika, 1978, №6. S. 131-133
[10] Adılova Z.T., Umarova D.M. Metody postroeniya informativnogo priznakovogo prostranstva dlya upravleniya setyami svyazi v konfliktnyh situatsiyah. // Uzbekskiy jurnal «Problemы informatiki i energetiki», №2, 1992. –S. 3-9
[11] Ayvazyan S.A. i dr. Klassifikatsiya mnogomernyh nablyudeniy. –M.: Statistika, 1974. – S. 240.
[12] Aleksandrov V.V. i dr. Primenenie bazisnyh splaynov v zadachah diskretizatsii mnogomernyh signalov konechnoy protyajennosti. //Metrologiya. –2000. -№1. s.1-
[13] Kamilov M.M., Fazılov SH.X., Nishanov A.X. Metod vybora priznakov s ispolzovaniem kriteriya informativnosti Fisherovskogo tipa. // Uzbek journal

«Problemy informatiki i energetiki», № 2, 1992. – s. 9-12.
[14] Kutin G.I. Metody ranjirovki kompleksov priznakov. Obzor. //Zarubejnaya radioelektronika, 1981, №9. S. 54-70.
[15] Libenson M.N., Xesin A.YA., Yanson B.A. Avtomatizatsiya raspoznavaniya televizionnых izobrajeniy.–M.: Energiya, 1975.- 160 s.
[16] CHeponis K.A., Jvirenayte D.A., Busygin B.S., Miroshenichenko L.V. Metody, kriterii i algoritmы, ispolzuemye pri preobrazovanii, vydelenii i vybore priznakov v analize dannyh.// Sb.statey. – Vilnyus, 1988. – 150 s.