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ХАБАРЛАРЫ

ИЗВЕСТИЯ

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NAS RK is pleased to announce that News of NAS RK. Series physico-mathematical journal has been accepted for indexing in the Emerging Sources Citation Index, a new edition of Web of Science. Content in this index is under consideration by Clarivate Analytics to be accepted in the Science Citation Index Expanded, the Social Sciences Citation Index, and the Arts & Humanities Citation Index. The quality and depth of content Web of Science offers to researchers, authors, publishers, and institutions sets it apart from other research databases. The inclusion of News of NAS RK. Series of chemistry and technologies in the Emerging Sources Citation Index demonstrates our dedication to providing the most relevant and influential content of chemical sciences to our community.

Қазақстан Республикасы Ұлттық ғылым академиясы "ҚР ҰҒА Хабарлары. Физикалық-математикалық сериясы" ғылыми журналының Web of Science-тің жаңаланған нұсқасы Emerging Sources Citation Index-те индекстелуге қабылданғанын хабарлайды. Бұл индекстелу барысында Clarivate Analytics компаниясы журналды одан әрі the Science Citation Index Expanded, the Social Sciences Citation Index және the Arts & Humanities Citation Index-ке қабылдау мәселесін қарастыруда. Webof Science зерттеушілер, авторлар, баспашылар мен мекемелерге контент тереңдігі мен сапасын ұсынады. ҚР ҰҒА Хабарлары. Химия және технология сериясы Emerging Sources Citation Index-ке енуі біздің қоғамдастық үшін ең өзекті және беделді химиялық ғылымдар бойынша контентке адалдығымызды білдіреді.

НАН РК сообщает, что научный журнал «Известия НАН РК. Серия физико-математичес-кая» был принят для индексирования в Emerging Sources Citation Index, обновленной версии Web of Science. Содержание в этом индексировании находится в стадии рассмотрения компанией Clarivate Analytics для дальнейшего принятия журнала в the Science Citation Index Expanded, the Social Sciences Citation Index и the Arts & Humanities Citation Index. Web of Science предлагает качество и глубину контента для исследователей, авторов, издателей и учреждений. Включе-ние Известия НАН РК в Emerging Sources Citation Index демонстрирует нашу приверженность к наиболее актуальному и влиятельному контенту по химическим наукам для нашего сообщества.

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Адрес типографии: ИП «Аруна», г. Алматы, ул. Муратбаева, 75.

T. Zh. Mazakov[1,2], D. N. Narynbekovna[2]

[1]RSE Institute of Information and Computational Technologies MES RK CS, Almaty, Kazakhstan;
[2]Al-Farabi Kazakh National University, Almaty, Kazakhstan.
E-mail: dianamonti24@gmail.com

DEVELOPMENT OF BIOMETRIC METHODS AND INFORMATION SECURITY TOOLS

Abstract. Now a day's security is a big issue, the whole world has been working on the face recognition techniques as face is used for the extraction of facial features. An analysis has been done of the commonly used face recognition techniques. This paper presents a system for the recognition of face for identification and verification purposes by using Principal Component Analysis (PCA) with Back Propagation Neural Networks (BPNN) and the implementation of face recognition system is done by using neural network.

The use of neural network is to produce an output pattern from input pattern. This system for facial recognition is implemented in MATLAB using neural networks toolbox. Back propagation Neural Network is multi-layered network in which weights are fixed but adjustment of weights can be done on the basis of sigmoidal function. This algorithm is a learning algorithm to train input and output data set. It also calculates how the error changes when weights are increased or decreased. This paper consists of background and future perspective of face recognition techniques and how these techniques can be improved.

Keywords: ANN, BPNN, NLP, PCA, Resilient Back propagation, biometric systems.

1. Introduction. Currently, artificial intelligence and machine learning systems are gaining popularity. In addition, almost all facial recognition software is based on machine learning. The quality and nature of this data set have a significant impact on accuracy. The better the source, the better the algorithm can perform the task [1].

The image face recognition system is based on image identification and comparison algorithms. Most modern facial recognition systems are very sensitive to these image characteristics. Therefore, before direct recognition, the source images must be standardized. Face recognition is a biometric software or computer application that automatically identifies or verifies a person based on a digital image or other video sources. This is a method that recognizes individuals that are already stored in the database. It is mainly used for identity verification, security, computer entertainment, passport verification, criminal list verification, border checkpoints, email authentication, etc. [1-2].

2. Methods. In this work, we used the Viola-Jones algorithm and methods such as: PCA, BPNN, ANN, Resilient back propagation, Eigen faces, Feedforward neural network. The basic principles underlying the work of the Viola-Jones method:
- integrated image viewing;
- search for people by city signs;
- cascade classification using gain.

The proposed algorithm includes a facial recognition technique, it can be used with back propagation and PCA for non-linear images of faces.

PCA: This is a statistical method that is used to reduce the dimension while preserving the necessary information, or it is a way to identify patterns in the data and express the data in such a way that you can highlight their similarities and differences.

BPNN: A back-propagation neural network is a multi-layer network in which the weights are fixed, but the weights can be adjusted based on a sigmoid function. It also calculates how the error changes as the weight increases or decreases.

ANN: An artificial neural network is based on a biological neural network that is used to approximate or evaluate functions that depend on a large amount of input data.

RESILIENT BACK PROPAGATION: Resilient back propagation is an algorithm that can be used to train a neural network, similar to back propagation. It has an advantage over back propagation; learning is faster than back propagation.

EIGEN FACES: Eigen faces is the name given to a set of eigenvectors when they are used in a computer vision task for face recognition. Eigen collides with itself from the base set of all images used to construct the covariance matrix.

FEEDFORWARD NEURAL NETWORK: In a forward-coupled neural network, back propagation cannot be performed as feedback in the network.

The Viola-Jones algorithm. The integrated view is used to calculate the brightness of a rectangular area of the image. This representation is used in many other complex algorithms of the computer approach. The integrated view allows you to quickly calculate the total brightness of the free rectangle of a given image, and the calculation time does not depend on the area of the rectangle (figure 1), [3-4].
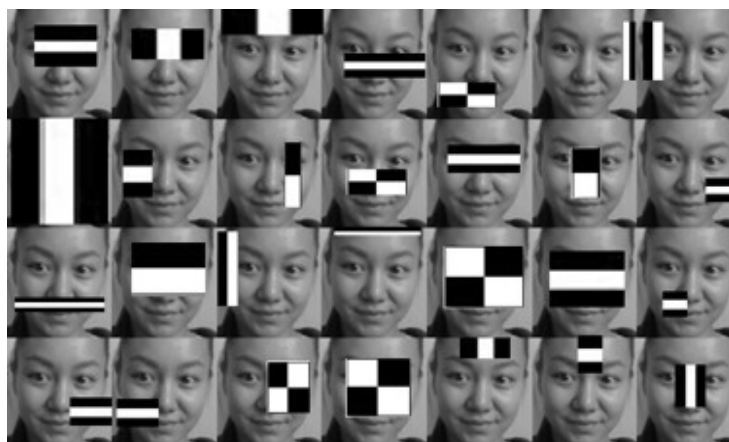

Figure 1 - The process of finding the surface area using the Viola – Jones method

3. Results. Several works have been critically analyzed, namely: PCA is used to reduce the dimension of a face, and BPN is used for recognition purposes. Own faces extract the traits, which are then combined with BPN for image recognition. Each face image is stored in a one-dimensional array. The method proposed in the article was tested on the ORL database of persons. This ensures high accuracy as well as fast calculations. It has a acceptance rate of over 90% and is fast. The implementation of the face recognition system is divided into three parts. The first part is automatic face recognition using BPNN, the second is facial enhancement, and the third is artificial intelligence and BPNN. In this case, face verification and identification is performed using main component analysis and a backpropagation neural network. Dimension reduction is done using PCA and recognition using BPNN [5]. Hence, it is safer and more effective. Its acceptability rate is over 90% and non-linear facial images are also easily recognized. This article presents an approach to recognizing human faces. This face recognition was done by comparing the characteristics of the new face to the old one. In this place of localization of the face, the end point of the mouth and retinas is obtained. In the Extraction section, the distance between the endpoint of the mouth and the retinas was calculated. Recognition is performed using backpropagation networks and radial base function networks [6].

The transformation for various inputs is compared with an unknown person to determine if the person is in the database or not. This method shows high recognition speed and accuracy of human face recognition. In this case, various problems arose due to the movement and orientation of the object. But the problem of subject orientation is overcome by training the neural network. The self-face algorithm works well when the lighting change is small. This article proposes a method for recognizing faces using own faces using an artificial neural network. The structure of the face is converted to eigenvalues, eigenvalues are implemented using eigenvectors, values, and the Jacobi method. When testing the original image, human face recognition is performed, so this method is more effective than other methods. The use

of natural faces is more accurate, as well as its quick calculation, non-linear images can also be recognized very easily. Therefore, this method is said to have a good acceptability ratio in excess of 90% and is fast to calculate and execute [7-9].

Backpropagation is a learning algorithm for training a set of inputs and outputs. When using a backpropagation neural network, the system recognition rate was 99.2%. BPNN is more widely used than other neural network algorithms due to its ability to reduce errors. It extracts features of a human face that have various features such as differential projections and other features. First, a training set is assembled, then the network is trained, and then the display and recognition accuracy are checked. The proposed method is compared with the method of principal components, the method of linear discriminated analysis and the method of Markov random fields (MRF). The ORL face database is used to display the recognition rate of 98% by using only 13 functions (table 1). Thus, accuracy, efficiency, and computational complexity have increased.

Table 1 - Face recognition system as a result

Methods	Benefits	Disadvantages	Recognition rate
PCA	High precision can be obtained.	It is less reliable.	99,2 %
BPNN	1. High precision. 2. It can be used to detect online in real time.	The strength is low.	96,6 %
RESILIENT BPN	Non-linear images are recognized.	Not suitable for small databases.	98,3 %
EIGEN FACES	It gives a higher recognition rate than K-mean and fuzzy c-mean.	Very sensitive misalignments arise from the large size of the orientation of the head.	97 %
FEED FORWARD NN	All entrance sides are reduced by about 30%.	The recognition is poor.	93,7 %

4. Conclusions. As with any method of authentication, biometric technology is not fully protected. Detection methods are the most frequently discussed counteraction measure. We have considered the Viola-Jones algorithm. Face recognition can be used for various purposes, for example, for security purposes, ATM's for card security, for document processing [10]. The face recognition technique can be used with back propagation and PCA for non-linear face images. A review of various methods was conducted to determine and classify which method gives a higher recognition rate. The developed facial recognition system is a product of a completed project. This system is a system for service professionals [11-12].

Т. Ж. Мазаков[1,2], Д. Н. Монтаева[2]

[1]Қазақстан Республикасының Білім және Ғылым Министрлігі
Ақпараттық және есептеуіш технологиялар институты, Алматы, Қазақстан;
[2]әл-Фараби атындағы Қазақ ұлттық университеті, Алматы, Қазақстан,

БИОМЕТРИЯЛЫҚ ӘДІСТЕР МЕН АҚПАРАТТЫҚ ҚАУІПСІЗДІК ҚҰРАЛДАРЫН ЖАСАУ

Аңдатпа. Биометрия - бұл уәкілетті адам мен алдамшы арасындағы сенімді айырмашылықты анықтайтын физиологиялық немесе мінез-құлық сипаттамалары негізінде адамды сәйкестендірудің, тұлғаның жеке басын тексерудің автоматтандырылған әдістері. Биометрика ерекше болғандықтан, оларды ұмытуға немесе жоғалтуға болмайды, және сәйкестендіру нүктесінде түпнұсқалықты растайтын адам физикалық түрде болуы керек, дәстүрлі білім мен жетонға негізделген әдістерге қарағанда биометрика табиғатынан әлдеқайда сенімді және тиімдірек. Адамдарды анықтау үшін биометрияны қолданудың бірнеше ерекше артықшылықтары бар. Биометрия көмегімен сіз өзіңіздің қандай екеніңізді анықтай аласыз. Биометрия әр түрлі қосымшалар үшін қолдануға оңай, тез, дәл, сенімді және арзан аутентификацияны уәде етеді. Бетті танудың ең жиі қолданылатын әдістеріне талдау жүргізілді. Бұл мақалада жүйені кері жүйелеу (BPNN) бар компоненттердің негізгі талдауын (PCA) қолдану арқылы сәйкестендіру және растау мақсатында тұлғаны тану жүйесі ұсынылған, ал бетті тану жүйесін енгізу нейрондық желіні қолдану арқылы жүзеге асырылады.

 Кіріс нәтижесін шығару үшін нейрондық желіні пайдалану. Бұл тұлғаны тану жүйесі MATLAB жүйесінде нейрондық желі құралдарын қолдана отырып енгізілген. Нейропропагиялық жүйке желісі - бұл салмақтары бекітілген көп қабатты желі, бірақ салмақтарды сигмодальдық функция негізінде реттеуге болады. Бұл алгоритм -

кіріс және шығыс жиынтығын оқытуға арналған алгоритмі болып табылады. Сондай-ақ, салмақтың өсуі немесе төмендеуі қатенің қалай өзгеретінін есептейді. Бұл мақалада тұлғаны тану әдістерінің болашағы және осы әдістерді қалай жақсартуға болатындығы туралы айтылады. Әр түрлі биометриялық әдістерге шолу кейбір артықшылықтары және кемшіліктері берілген. Содан кейін біз қай техниканың қауіпсіз және сенімді екенін анықтауға тырысамыз.

Түйін сөздер: ANN, BPNN, NLP, PCA, тұрақты кері тарату, биометриялық жүйелер.

Т. Ж. Мазаков[1,2], Д. Н. Монтаева[2]

[1]Институт информационных и вычислительных технологий КН МОН РК, Алматы, Казахстан;
[2]Казахский национальный университет имени аль-Фараби, Алматы, Казахстан,

РАЗРАБОТКА БИОМЕТРИЧЕСКИХ МЕТОДОВ И СРЕДСТВ ЗАЩИТЫ ИНФОРМАЦИИ

Аннотация. Биометрия – это автоматизированные методы идентификации человека или проверки личности человека на основе физиологических или поведенческих характеристик, которые позволяют надежно различать уполномоченное лицо и самозванца. Был проведен анализ наиболее часто используемых методов распознавания лиц. В этой статье представлена система распознавания лиц для целей идентификации и проверки с использованием анализа главных компонентов (PCA) с нейронными сетями обратного распространения (BPNN), а реализация системы распознавания лиц выполняется с использованием нейронной сети. Поскольку биометрические характеристики являются отличительными, их нельзя забыть или потерять, а лицо, подлежащее аутентификации, должно физически присутствовать в точке идентификации, биометрия по своей сути более надежна и более эффективна, чем традиционные методы, основанные на знаниях и токенах. Использование биометрии для идентификации людей дает некоторые уникальные преимущества. Биометрия может использоваться для идентификации вас как вы. Биометрия обещает быструю, простую в использовании, точную, надежную и менее дорогую аутентификацию для множества приложений.

Использование нейронной сети для создания выходного из входного данных. Эта система распознавания лиц реализована в MATLAB с использованием инструментами нейронных сетей. Нейронная сеть обратного распространения – это многослойная сеть, в которой веса фиксированы, но корректировка весов может выполняться на основе сигмодальной функции. Этот алгоритм представляет собой алгоритм обучения для обучения набора входных и выходных данных. Он также вычисляет, как изменяется ошибка при увеличении или уменьшении веса. В этой статье рассказывается о перспективах методов распознавания лиц, а также о том, как эти методы можно улучшить. Представлен обзор различных биометрических методов с некоторыми преимуществами и недостатками. Затем мы постараемся выяснить, какая техника надежнее и безопаснее.

Ключевые слова: ANN, BPNN, NLP, PCA, устойчивое обратное распространение, биометрические системы.

Information about authors:

Mazakov Talgat Zhakupovich, doctor of Physical and Mathematical Sciences, Professor, Chief Researcher, Institute of Information and Computing Technologies, KN MES RK. E-mail: tmazakov@mail.ru, https://orcid.org/0000-0001-9345-5167;

Montayeva Diana Narynbekovna, 2nd year master's degree in "Computer engineering", Al-Farabi Kazakh National University, Almaty, Kazakhstan. E-mail: dianamonti24@gmail.com, https://orcid.org/0000-0002-7159-9191

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