

### SOFTWARE OF NEURAL NETWORK METHODS OF IMAGE RECOGNITION

**Andriy Terletsy**

*University Bielko-Biala, Poland, Master's Degree student*

#### I. Formulation of the problem

Neural network methods offer a different approach to solve the problem of image recognition. Architecture and functionality of neural network have biological prototypes [1]. Weights in Neural Networks (NN) cannot be calculated by solving analytical equations, and its build by different local methods at training. During NN training automatically extract key features, determine their significance and construction between them. Trained neural network can successfully use the experience gained in the learning process for unknown images due to the good generalizing ability. Therefore, the use of NN for user identification and authorization for web-resource is promising direction and highly important.

#### II. The purpose of the work

The purpose of the work is to develop software for neural network system of image recognition.

#### III. Neural network methods of user authorization in web-resource

To carry out any action with data used integral representation of images in Viola-Jones method [3].

Integral representation allows to quickly calculate the total brightness of random rectangle at this image, and calculation time not depends on variety of rectangle. Integral representation of image – a matrix that matches by size with output image. In each item are stored the intensity sum of all pixels, which stored left and above current item.

In standard Viola-Jones method used rectangular feature (Fig. 1), which called Haar wavelet:

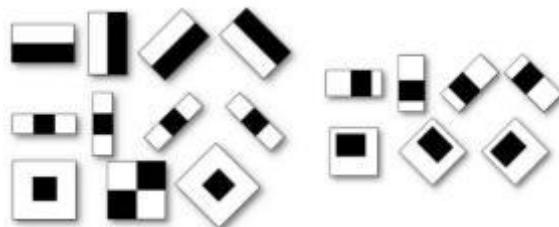


Figure 1- Rectangular Haar features

Calculated value of such feature is  $F = X - Y$ , where  $X$  - the sum of brightness points, that closed by bright feature part and  $Y$  – sum of brightness points, that closed by dark feature part. Haar features gives point value in brightness difference on the  $X$  and  $Y$  axis. Feature scan algorithm looks like: researched image, chosen scan window, selected used features. Then scan window begins consistently move on image by step in 1 window cell (window size is 24x24 cells). Scanning is performed successively for different scales, scales not the image, but the scan window (window cell is changed). All found features fall into the classifier, which "makes the verdict". In the search process to calculate all features on low power desktop PC is simply unrealistic. So, classifier should respond only to a specific needed subset of features. Quite logically, that its necessary to train a classifier to find people from specific subset. This can be done by automatic trainee.

It's necessary to construct an algorithm that able to classify arbitrary object from original set. To solve this problem of complex trainee, there is a technology of boosting complex methods, that improve the accuracy of analytical models.

Cascade model of strong classifiers – is the same as decision tree, where each node is constructed to detect all images, what is necessary and refuse areas, that aren't images. In addition, if nodes are closer to the root, the less consist of primitives and requires less time for decision making. This type of cascade model is well suited for image processing, which have small count of detected general images. If the input detection is

supplied by color image, then it is possible to increase the algorithm work speed, processing previous image by color encoding. The color encoding helps to reduce the number of errors. Nowadays, Viola-Jones algorithm is the most popular because of its high speed and high precision response [3].

### **Conclusion**

As a result of research performed web-application, which implement system of user registration and authorization on web-browser. For proper work strongly recommended use Mozilla Firefox browser. Development of the database was performed among phpmysqladmin.

### **References**

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## **SOFTWARE IMPLEMENTATION OF METHODS FOR IMAGE QUALITY IMPROVEMENT**

**Dmytro Koval**

*Ternopil National Economic University, Master's Degree student*

### **I. Formulation of the problem**

Most one-dimensional signal processing methods (such as median filter) applicable to two-dimensional signals, which are images. Some of these one-dimensional methods becomes more complicated when transit to two-dimensional signals. Imaging introduces several new concepts, such as connectivity and rotational invariance that make sense not only for two-dimensional signals. Therefore, the development methodology software processing color images with optical sensors is extremely urgent problem.

### **II. The purpose of the work**

The purpose of research is the software implementation of methods for reading a color image to improve its quality.

### **III. Image quality improvement methods**

Basic methods of improving image quality [1]:

- by histogram equalization;
- by gamma correction;
- noise Reduction using wavelet transformation;
- by increasing image sharpness.

To improve image quality by histogram equalization in Image Processing Toolbox package for this feature is provided `histeq`. The function `J = histeq(I, hgram)` converts the image histogram by modeled histogram given by vector `hgram`. The number of elements sets the number of its columns and element values range from 0 to 1-height columns. The function automatically scales for the condition  $\sum(hdram) = \text{prod}(\text{size}(I))$ . The function `J = histeq(I, [n])` allows you to set the number of columns histogram with uniform their distribution. The number of columns have to be much smaller than the number of gradations of brightness of the source image [2].

Another way to improve the image by adjusting the brightness and contrast based on the change of brightness palette. For this in Image Processing Toolbox package provides the function `imadjust(I, [low_in high_in, low_out, high_out], gamma)`. The transfer characteristic of the pixel brightness value must be linear. When poor quality picture caused by poor quality photographic equipment, this relationship is nonlinear. Normalization is carried out manually, with a step correction. For line change brightness and contrast of a step change is 0.1 (brightness gradation range is increased by 10%). Setting the gamma curve