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СИСТЕМА РАСПОЗНАВАНИЯ ЛИЦА ЧЕЛОВЕКА НА ФОТО И ВИДЕОИЗОБРАЖЕНИЯХ МЕТОДОМ ВИОЛЫ-ДЖОНСА (АНГЛ.)

Аннотация. В данной статье приводится описание программы распознавания лица человека на фото и видеоизображениях методом Виолы-Джонса. Программный продукт распознавания лиц на изображениях, предназначается для распознавания лиц с фото и видеоизображений отснятых с камеры видеонаблюдения для автоматического определения лица на фото или видеоматериале с целью дальнейшего анализа. Применяется в сфере компьютерного зрения и анализа характерных черт лица человека. Разработан на основе алгоритма нахождения и сопоставления простых геометрических фигур чертам лица человека.

Ключевые слова: изображение, система распознавания, метод Виолы-Джонса, окно сканирования.

FACE RECOGNITION SYSTEM IN THE PHOTO AND VIDEO USING VIOLA JONES ALGORITHM

Abstract. This article is a description of a person's face recognition software to photo and video images by Viola-Jones. Recognition software product entities on images intended for facial recognition with photos and videos captured with the video camera to automatically detect faces in the photo or video material for further analysis. It is used in the field of computer vision and analysis of the characteristic facial features. It developed on the basis of an algorithm for finding and comparing the features of simple geometric shapes of the human face.

Keywords: image recognition system, method, Viola - Jones the scanning window

Due to the rapid growth and development of information technology, most of the areas of technique, science and industry using system in which the information is in the nature of the field (image, video). Starting to process such information raises many complex scientific, technical and technological problems. Processing and pattern recognition in the image (video image) - to determine the number of these problems, one of the most difficult can be identified. Research in the field of pattern recognition, analysis of video and voice are a priority in science and technology, reflecting the importance of this issue [1].

The processes of recognition and pattern recognition have always been interesting and substantial, especially with regard to increasing protection needs: security systems, verification and plastic credit cards and expertise in the field of forensics, biometric identification systems, and teleconferencing etc. Look that the person is well face recognition people many software developers are trying to "teach the computer to" carry out this procedure by developing an increasing number of different systems of face recognition on photo and video. This article focuses on the application of the method of Viola-Jones (Viola-Jones) for the development of human face recognition program photos and videos.

Description of Viola-Jones method

There are many different methods to solve the face recognition task. One of them is Viola-Jones method, which was used as the basis for writing the human face recognition software to photo and video images in real time.

The method was proposed by Paul Viola and Michael Jones in 2001 [2], [3], and has become a real breakthrough in the field of face recognition. Due to its high accuracy and theoretical basis, this method began to gain great popularity among programmers. However, the complex calculations used in this method is still in need of a powerful hardware platform. This method generally uses scanning window. That is, the frame, which is significantly smaller than the image displayed in the camera moves with a certain predetermined pitch in the image, and using a cascade of weak classifiers looking facial features and marks them.

Advantages of this method:

- the possibility to use this method in the video stream in real time;
- the ability to detect more than one face, both static and on dynamic image.

Generalized scheme of recognition by Viola-Jones algorithm can be seen in Figure 1.

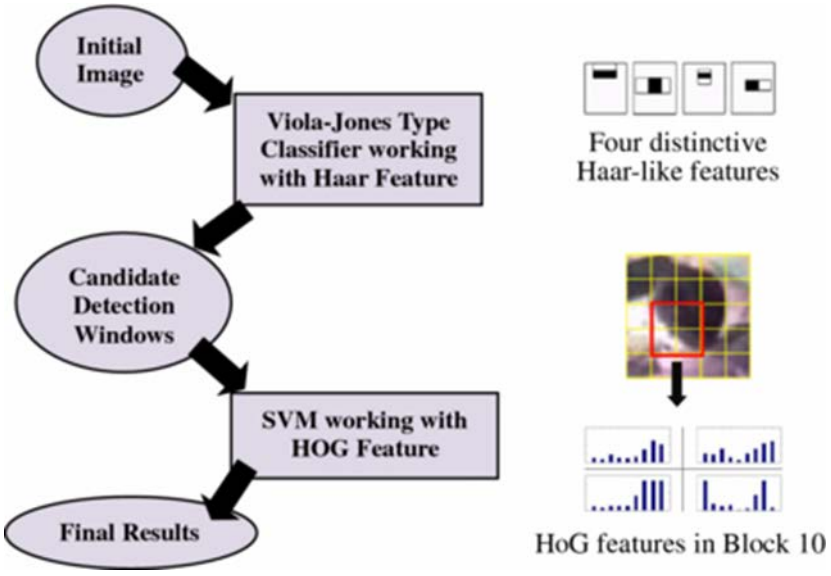

Figure 1. A generalized diagram of Viola-Jones.

Method is based on the following principles:

- images is used in the integral representation-it allows you to quickly calculate the required objects and details;
- to search for the desired object (in this case the person and its features) used Haar like features;
- to select the most suitable characteristics for the desired object in this part of the image, using boosting (from the English boost - the improvement, strengthening.);
- all the signs are input to the classifier, he, in turn, gives the result "true" or "false";
- used cascades features for quick drop windows where a person has been found.

Viola-Jones is one of the best indicators of the efficiency ratio recognition / speed. Education classifiers is slow, but the faces of the search results very quickly,

which is why this method of face recognition in an image has been selected. Another advantage of this detector is that it has a very low probability of false detection face. The algorithm works well and recognize facial features, even at a slight angle, about 30 degrees.

It requires detailed analysis of the principles on which is based the algorithm Viola-Jones. This method is generally looking for face and facial features on the general principle of the scanning window.

The principle of scanning windows

In general terms, the task of facial detection and facial features in the digital image looks that way:

- there is an image in which there is the unknown objects. It is represented by a two-dimensional matrix of pixels, w * h, in which each pixel has the value:

- 0 to 255, where the black and white image;

- From 0 to 2553, where the color image (components R, G, B).

- as a result of their work, the algorithm should define the entities and their features and label them - the search is in the active image area rectangular signs with which and describes found his face and his

rectangle i = {x,y,w,h,a}

where x, y - coordinates of the i-th center rectangle, w - width, h - height, a - angle of inclination to the vertical rectangle image axis.

In other words, with reference to the drawings and photos using an approach based on the scanning window (scanning window): scanned image search box, it is called "scanning window", and then applies a classifier for each position. Training and selection system is the most significant features automated and does not require human intervention, so this approach works quickly.

The task of searching and finding people in the image with the help of this principle is often the next step on the way to the recognition of the characteristics of, for example, human verification by a recognized face or facial expression recognition.

Analysis of these features and advantages of the method of Viola-Jones, and has led to the development of the program to recognize a person's face in the photo and video images, let us to find desired image. The developed program can recognize the faces of people in real time.

Structure and algorithms of the program

Recognition software product entities on images intended for facial recognition with photos and videos captured with the video camera to automatically detect faces in the photo or video material for further analysis. It is used in the field of computer vision and analysis of the characteristic facial features. It developed on the basis of an algorithm for finding and comparing the features of simple geometric shapes of the human face.

The program starts when you click on a file DetectorLica.exe. When you start the program the main window appears, which provides information about the residence time of the person in the image and recognition of the model used. The program uses an open computer vision library OpenCV to work and video analysis.

To recognize the need to run start recognition program by clicking Start, the following window appears (Figure 2.)

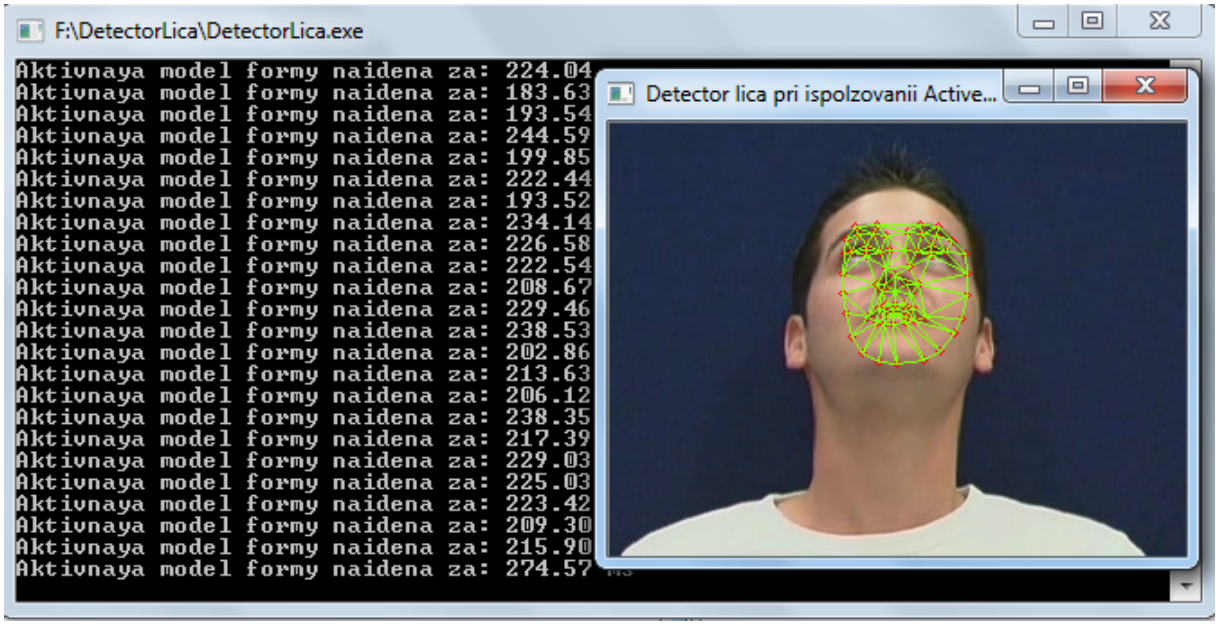

Figure 2. Recognition of a person on the video.

Program can analyze data about a person being in the video frames. It processes each frame separately and displays statistics on the detected face frame and

the time of his recognition. If the person in the video is found, the program is building around the green frame - a grid that defines the contours and features of the face.

The draft program consists of the following files and libraries source code:

1. The main code file - DETECTORLICA.CPP
2. Header matching function library ASM file masks ASMFITTING.H ASMLIBRARY.DLL
3. Recognition library
4. recognition file method Viola Jones - VJFACEDETECT.CPP

Uses open OPENCV recognition library 2.4.9, which helps to solve the complex problem of face recognition. This library can be easily integrated with the development environment MS Visual Studio software, which is written in the main program of face recognition.

How the program works is the following:

- The program downloads the input data input image or streaming video is divided into frames;
- the frame is removed from the color component;
- the image scanning for Haar features scan the windows;
- It creates an active shape model (ASM) for each image;
- displays the result in the window.

Features of the proposed software product is that automates face recognition on photos and video footage, freeing the operator from viewing hours of footage with a view to its analysis in video surveillance systems.

For example, to describe the operation access control system. At the entrance is a photo camera / video, which controls access to a further input. If you try to enter, is the human face photographs, then there is the recognition of that person. If the person fit the profile stored in the database, then read further information: name, age, position, etc. On the basis of the read data or system accesses or closes shows the algorithm of the system.

Work program algorithm can be represented as follows:

1. Running;
2. Generation face template;
3. Analysis of video frames;
4. The conclusion of the analysis;
5. Displays a border around the detected face.

Conclusions

Preliminary studies have shown that this software has a practical significance and can be used both in industry and in every sphere of human activity, which requires a system of machine vision to detect a person's face.

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