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PARAMETERS OF HUMAN IDENTIFICATION IN REAL TIME

Abstract

This article considers a software package that identifies human in real-time video streaming with the help of some classification parameters. In this research, three classification parameters: gender, age and race, are used as classification parameters.

Keywords: human identification, classification parameter, video streaming, program package, software.

Introduction

Identification of humans is one of the main goals of computer vision. Human can be identified based on different parameters like gait, face, fingerprint and iris. In following research paper, authors used face recognition, because the aim of the research project is to develop a system, that identifies human with the help of predefined some classification parameters. The reason of taking these three parameters is that people can be classified into age, gender and race groups based on their facial features [1]. Some examples of this classification are shown in Figure 1. Besides this, other modalities can be used for classification; especially, human body can be used for gender classification.

The main focus of this research paper is face-based age estimation, gender and race classification. In addition to this, we try to help parents to control their children and teach them how to use Internet, and other possible threats that can break minds of young generation [2]. Today, in this modern time in Kazakhstan, when there is a high rate of crimes against children, there is a problem with the control of children. Moreover, people need software that will control access to the Internet sites with content oriented for audience over 18 years old, which will block children from the access. Furthermore, there is need for software in vending machines that will not lend the children items like cigarettes, alcohol, etc. It is the social problem of all people not only in Kazakhstan, but also worldwide and the software with age estimation, gender and race classification features can solve it. Besides that, this type of software can also be used for obtaining statistical data. For example, extracted demographic information of the customers could provide statistical data for marketing departments of any company, especially for companies specialized on sales for collecting data about their customers [3]. Currently most security agencies utilize software with functionality to search person in video streaming according to predefined classification parameters like age, gender and race. This type of software is used in access control points of airports, financial institutions and banks. For example, it might be used for verification of every person in blacklist database and for detecting person, who fits the search criteria.

Materials and methods of research

There are many algorithms for face recognition presented until today. For detailed information, you may check. Nevertheless, all of them are sensitive to large variations in lightning and facial expressions. Taking into consideration these lacks, authors of developed a face recognition algorithm, which is insensitive for those type of variations. This algorithm is based on two methods, Fisherfaces and Eigenfaces. The Fisherfaces method is a derivative of Fisher's Linear Discriminant that maximizes the ratio of between-class scatter to that of within-class scatter. The Eigenfaces method is also based on linearly projecting the image space to a

low dimensional feature space and. In this research paper, after taking into considerations all these contributions, authors developed some different approach. The first step of this work is to classify any person into gender and age groups by using known face recognition algorithms; for doing this, Fisherfaces method was chosen. The Eigenfaces method is based on the Principal Component Analysis, which is an unsupervised statistical model and not suitable for this task (Figure 1). The Fisherfaces instead yields a class-specific linear projection, so it is much better suited for the age and gender classification task. According to experiment in done by P. Wagner, it is possible to see that the Fisherfaces method achieves a 98% recognition rate in a subject-independent cross-validation.

Images	Estimated age	Estimated gender	Estimated race
	27-32	M	White
	25-30	F	Mongolian
	20-25	M	Black/African race

Figure 1. Example of age, gender, race classification

A subject independent cross-validation means that images of the person under test are never used for learning the model. Fisherfaces method is already developed in OpenCV framework. OpenCV is an open source computer vision and machine learning software library. For the age and gender classification we need to train classifiers, which can be loaded into Fisherfaces recognizer in OpenCV library. To train age and gender classifiers we need a set of images of different people faces. Before starting to train classifier, authors had a choice to create own dataset or to start with one of the available face databases. We have chosen the available dataset in order to save time. There are many available face databases like AT&T Facedatabase, Yale Facedatabase A, Extended Yale Facedatabase B, etc. We have chosen The Images of Groups Dataset created by A. Galagher and T. Chen due to the fact that this dataset was oriented for age and gender classification task, which is clearly described in. They built a collection of people images from Flickr images. They divided photos into 3 categories: Family photos, Group photos and Wedding photos. Each person's face in photos was labeled by gender and age category. They used seven age categories: 0-2, 3-7, 8-12, 13-19, 20-36, 37-65 and 66+, roughly corresponding to different life stages [3, 4]. For gender labeling, they used 1 and 2 for female and male. In all, 5,080 images containing 28,231 faces are labeled with age and gender; it is the largest dataset so far. This dataset contains a great deal of variety. There are many types of images, in which people are sitting, laying, or standing on elevated surfaces. People often have dark glasses, face occlusions, or unusual facial expressions. They distribute their dataset for non-commercial research purposes use only. Using these images, age and gender classifiers were

trained. All images from dataset were collected to one folder. As there are only group photos, all faces were cropped into separate images with the size of 70x70 pixels [5]. Seven age categories as in original dataset were used, but for labeling male and female – binary format consisting 0 and 1 was used. For training classifiers, one specific application was developed using OpenCV framework. This application takes a while to train one classifier on a custom PC. For the experiment, 1500 cropped images to train age and gender classifier were taken. At the end, we get one xml file for each classifier.

Results and discussion

Software is developed by using OpenCV and QT frameworks. QT is a cross-platform application and UI framework. OpenCV is used for logic construction, whereas QT is used for developing UI. Software is implemented as a desktop application (Figure 2). Desktop application has the sequence of five operations (Fig. 3). Video stream input comes from file or locally connected camera. Application has the usable search engine. It can search people from video by three parameters: age category, gender and human race. There are seven age categories: 0-2, 3-7, 8-12, 13-19, 20-36, 37-65 and 66+; two gender categories: male and female; three main human races: Mongolian race, White/ Caucasian race and Black/Negro race. By default, application searches for people who first matches, i.e. if there are many people in video, then it will show only one human, who was found first. It can be configured to search all people in video. Search will be finished when human is found. It can be configured to search people only in current moment of video. Search is performed by Age OR Gender OR Race combination, i.e. search will be ended if any of these search parameters matches with a person in video, which means that human was found. User can configure the search by himself, which means any combination can be configured. As the result of search, application shows new window with screenshot of video with rectangle around the detected face in case of finding a human, otherwise, there will be window with no results.
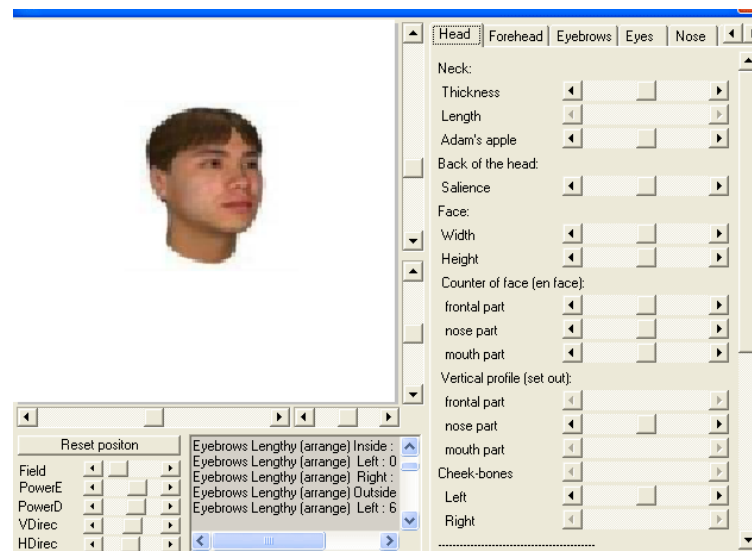

Figure 2. Main window of desktop application

Conclusion

The main attention is paid to desktop application that can search people in video streaming, according to predefined search parameters. This application is the main part of one big security system software. All work done as a demonstration of new features, which suitable for all security systems software. In general, application works well, but has low recognition rate, because only 1500 face images were used for training classifiers. In next coming releases, this problem will be resolved and new features will be added.

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ПАРАМЕТРЫ ИДЕНТИФИКАЦИИ ЧЕЛОВЕКА В РЕАЛЬНОМ ВРЕМЕНИ

Аннотация

В статье рассматривается программный пакет, который идентифицирует человека в режиме реального времени по заданным параметрам. В работе были применены следующие параметры: пол, возраст и расовая группа, которые в свою очередь играют важную роль в индивидуальности каждого человека.

Ключевые слова: идентификация человека, параметры классификации, видео-поток, программный пакет, программное обеспечение.

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ҚАЗІРГІ НАҚТЫ УАҚЫТТАҒЫ АДАМНЫҢ ПАРАМЕТРЛЕРІН АНЫҚТАУ

Андатпа

Мақалада нақты уақыттағы берілген параметрлер бойынша адам параметрлерін анықтайтын бағдарламалық пакет қаралған. Жұмыста қолданылған өз кезегінде әр адамның жеке өмірінде маңызды рөл атқаратын, параметрлер: жынысы, жасы және гендерлік тобы.

Кілт сөздер: адам сәйкестендірілуі, жіктеу параметрлері, бейне – ағыны, бағдарламалық пакет, операциялық жүйе.