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Preface

The volume contains the proceedings of the international conference on Digital Image & Signal Processing (DISP'19). The international conference on Digital Image & Signal Processing represents an ideal opportunity for the students and the researchers from both industrial and academic domains having as main objective to present their latest ideas and research results in any one of the DISP'19 topics. **The International Conference on Digital Image & Signal Processing (DISP'19)** aims to investigate innovative applications and last researches in the areas of applied signal processing and digital image.

The DISP'19 conference is a scientific event which gathered leading researchers and practitioners who presented their ideas to more than 100 attendees. Attendees have provided high quality contributions reviewed by a program committee featuring renowned international experts on a broad range of knowledge management topics. More than 261 papers were submitted to the DISP'19 conference from authors of many countries and continents. Two or three reviewers were assigned to each paper and according to these reviews, 130 papers were accepted which makes acceptance rate of 48%.

We are grateful to the St Hugh's College, Oxford University, United kingdom, for hosting this conference. Also, we would like to express our gratitude to the Chairs, Program Committee, External Reviewers, Organizing Committee and the keynote speakers for their wonderful work and efforts. Finally, we would like to thank all the participants and sponsors hoping to meet them soon for other collaboration in scientific events.

Sincerely yours,

Faouzi Hidoussi

DISP'19 Chair

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Recognition of gestures with the help of images

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ABSTRACT

This article discusses the emergence of natural and computer-human interfaces for distinctive applications. The dishonesty is based on the fundamental human factor. Falsifiers are driven by a complementary approach to computers, as they are perceived in the natural sense of the communion. The basic part of the system is that it can be used for identification of specific human bodies and for providing real-time information for disclosure. The basic part of the system is that it can be used for identification of specific contacts and use of personal information, management devices.

Keywords

Human-computer interaction, gesture recognition, transmission of information, intelligent interfaces.

1. INTRODUCTION

It requires the use of the natural user interface to improve the various tasks in our time at any point. Availability of computers and the ability to interact with the people's computer in the community will surely produce positive results. The purpose of this article is to describe the real-time gesture recognition system based on HSV adaptive color model. Depending on the color-treated skin color, the effect of the light, the environment and the camera can dramatically decrease, and the reliability of manual gesture recognition improves considerably. "Recognition of gestures with the help of images" is based on video conception. This method allows people to naturally and intuitively monitor these products. Most gesture recognition methods typically have three basic steps. The first stage is the identification of the object. At this stage, you can define objects in digital images. Overall picture problems include unstable brightness, noise, poor resolution, and contrast. However, it is difficult to control the gesture recognition system when working in the real world. The second stage is recognition of the object. Defines the gestures of detected access objects. An effective choice of differentiated functions and classifiers at this stage is a major issue in many studies. Third stage - analysis of consistent actions to determine the behavior of the instruction or user.

Alongside with the description of a number of important technologies and algorithms for recognizing gestures, this article presents an algorithm for recognizing gestures and studying the possibility of using gesture recognition in human interaction. The article also describes an algorithm for recognizing gestures using image processing and its application in systems based on security.

2. REPRESENTATION OF IMAGE-BASED GESTURE

The movement of the human body is abstract as a model of curves. These scenes are embedded in the three-dimensional model as gestures model. Two major categories of gestures based on the three-dimensional model are based on the appearance of the gesture recognition method. Various gesturing techniques are used to model three-dimensional gestures. They are three dimensional kinematic or three dimensional model, three dimensional geometric model and three-dimensional skeletal model. The model includes a model based on the gesture color based on the appearance of the model, color geometry and the deformable model based on motion. The three-dimensional image of model-based gestures determines three-dimensional spatial characteristics of the hand when the temporal aspect is subjected to automated processing. This automates the temporary characteristics of the gestures by three phases [1]: preparatory or pre-strike phase, nuclear phase, or abandonment or subsequent text. One or more passage of the three-dimensional model of humanity corresponds to each phase. One or more cameras are targeted to specific targets and calculate spatial settings to suit the specific purpose, followed by 3D motion detection.

Thus, the three-dimensional model has the advantage that it can upgrade the model settings during transient checks, according to the time pattern, which will give a clearer gesture and understanding of the gestures. However, such models are computing and require special equipment. Three-dimensional modeling of the projection by its own orientation combines several methods of color reproduction. Typically, three models are used: a three dimensional kinematic or three-dimensional model that provides accurate information about the skeleton of the human body and skin information. Three-dimensional kinematic or three-dimensional models have more important information on skeleton than three-dimensional geometric models, more accurate than three-dimensional geometric models, depending on the information derived from the skin.

Gestures, based on the method of visualization, are widely divided into two main subcategories: methods based on 2-D static models and methods based on motion. Each category has different variants. Usually used 2D models include color models that use body tags to track body or body movement. Booley [2] has introduced the method of manual thickness recognition, which uses different color functions, hierarchical specimens and particle filtering. The model is based on geometry of the model, such as perimeter, convex surface, or geometric properties such as ellipse, extension, rectangle, centroid, and orientation. The geometric properties of the hands are used to recognize the tone of the hands. Models based on deformable criteria are usually based on deformable active circuits.

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The three-dimensional gesture model identifies a three-dimensional spatial description for temporarily manipulating human hand. This automation divides the temporal characteristics of the gestures into three phases [3], in particular, in the preparation or prevention, phase or stroke of the phase and the release stage. Each stage corresponds to one or more transitional spatial conditions of a human 3D model. In a three-dimensional model, one or more cameras focus on the specific purpose that tracks the target movement in the process of calculating and recognizing the corresponding parameters in space. Thus, the 3D model has the advantage because it updates the template settings when checking for the time model compliance. This function results in an accurate recognition and display of gestures with the help of computer technology.

3. IMAGE-BASED GESTURE RECOGNITION

The main challenge and task of recognizing image-based gestures is a wide range of acting movements. Gesture recognition involves a greater degree of freedom, a major transformation, depending on the camera's vision, other interpretations (for example, spatial resolution) and many solutions for the time dimension (such as gesture rate variability). The distinction between accuracy, productivity and profitability also requires balancing according to the type of action, the cost of the solution and some other criteria such as productivity, reliability, scalability and independence. In real-time, the system can analyze images based on the frame rate of the incoming video before it can immediately respond to any user about gesture recognition. Reliability affects different lighting conditions and the effective recognition of movements on different background. The system must be reliable on the plane and on the outside of the plane. Zooming allows you to manage the lexicon of the gesture that can include multiple gestures. Thus, this function allows you to control the composition of various movable commands. The user creates environmentally friendly, not just one user, but different users who can recognize human gestures in different sizes and colors. All of these technologies have the advantages and disadvantages of recognizing gestures. The physical connection required by communication devices may be inconvenient for users, but these devices have high accuracy and are much more difficult to implement. Visible devices are very convenient, but they are confronted with configuration.

3.1 Module Description of the Recommended System

The convolution error of the handwriting is first calculated using the OpenCV inbuilt function. Once we've got a bucket, we'll take steps to figure out the number of fingers and fingers.

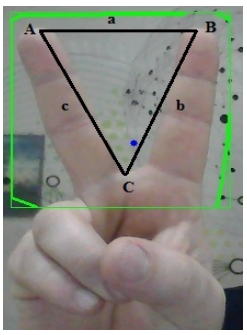

Figure 1. Find cnversion defects

The resulting deviation defects are the four-point, starting point, end point, the most remote point and the approximate distance to the nearest point, three of which are used. Figure 1 represents one of the start, legs and distant points. The starting point is the starting point B, the end point, and A is the distant point. The angle made with two fingers should accurately determine if your finger holds the finger. This is done by a triangle A, B, and C. The length of each string is determined by the distance formula

$$a = \sqrt{(start[0] - end[0])^2 + (start[1] - end[1])^2}$$
$$b = \sqrt{(start[0] - far[0])^2 + (start[1] - far[1])^2}$$
$$c = \sqrt{(end[0] - far[0])^2 + (end[1] - far[1])^2}$$

After the length of each of them has been determined, using the Cosine rule,

$$a^2 = b^2 + c^2 - 2bc\ cos\,A$$

he angle A is used

$$\mathrm{A} = \cos^{-1}(b^2 + c^2 - a^2\backslash 2 * \mathrm{b} * \mathrm{c})$$

If the angle A is less than 70 °, two fingers will be held. This method applies to all defects to determine the number of fingerprints. If the number of fingers is greater than two, you can only use the number of fingers.

4. IMAGE BASED GESTURE RECOGNITION ALGORITHM

The algorithm of recognizing and explaining the gestures is divided into stages. Hand gestures are based on an American signal language, which is represented by a 150-character frame. This is a very popular sign language all over the world [4].

The webcam's video input processes up to 10 frames per second. Then changes the color that appears in the segmentation of each picture, which is later explained in this section. As a rule, when converting colors, the RGB values of each pixel are converted to the YCbCr color space, where Y is the intensity value, Cr is the red color of Chrominance; Cb is a blue component of Chrominance [5].

When experimenting with 5 images, it was found that the Cr value of each pixel was to uniquely represent the pixels belonging to the hand, in contrast to those that belong to the background. The equation for converting color to Cr (4).

$$Cr = 0.5 * R - 0.418688 * G - 0.081312 * B$$

One of the main advantages of the conversion to Cr is to use 4 bytes to store the RGB values of the color pixels, only after a 1 byte of memory color changes. This reduces the use of memory for the implementation of the equipment and increases the speed of execution of the algorithm.

To recognize the hand gestures, you must remove your hand from the background. This process is called image segmentation. We have introduced segmentation using the threshold. It should be noted that the Cr threshold can be varied

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depending on the light and the environment. However, because the installation is used during a fixed installation, this does not prevent the algorithm from running.

The first step in recognizing gestures is to determine the control point of the hand. This control point is marked as ρ. To determine the state of all the fingers of the hands, you need to find the hand that serves as an auxiliary system. In other words, even if the access is horizontally moved, ρ also moves appropriately. Thus, regardless of the position of the arm, ρ remains relative to the hands. This makes it easier for your fingertips to be tracked.

The first step in calculating ρ is the actual state of the hand. To do this, the handwritten binary image taken at the top is scanned across the width from the right lower corner to the right. This scan method is based on the assumption that the hand is at the bottom of the image. As we have already said, the background is black, and white, the first transition from black to white indicates the starting point of the hand. This article provides an algorithm for image-captured videos.

5. CONCLUSION

The article presents a gesture-based image recognition algorithm. The algorithm receives information about the depth of the zone through a webcam. This algorithm is designed for being used in approved installations, so it can be used anywhere. In the article we have considered the main technologies that offer recognition methods. Many technologies are based on the expanded use of systems of recognition of gestures. Due to the large number of movements, many gestures need to be developed at a certain level, so it is important to make algorithms more complex using 2D images that can be recognized. As a result, we can conclude that the proposed algorithm is competitive with the best modern control algorithms.

6. REFERENCES

[1] Just A (2006) Two-handed gestures for human–computer interaction. Research report IDIAP 06 73, EPFL

[2] Boulay B (2007) Human posture recognition for behavior understanding. PhD thesis, Universite de Nice-Sophia Antipolis

[3] Hasan H, Abdul Kareem S (2012) Fingerprint image enhancement and recognition algorithms: a survey. Neural Comput Appl. doi:10.1007/s00521-012-1113-0

[4] Kerimbayev, N. (2016). Virtual learning: Possibilities and realization. *Education and Information Technologies*, *21*(6), 1521-1533.doi.org/10.1007/s10639-015-9397-1

[5] McNeill D (1992) Hand and mind: what gestures reveal about thought. University of Chicago Press. ISBN 9780226561325

[6] Bretzner L, Laptev I, Lindeberg T (2002) Hand gesture recognition using multi-scale colour features, hierarchical models and particle filtering. In: Fifth IEEE international conference on automatic face and gesture recognition, pp 405–410. doi:10.1109/ AFGR.2002.1004190

[7] Kerimbayev, N., Akramova, A., & Suleimenova, J. (2016). E-learning for ungraded schools of Kazakhstan: Experience, implementation, and innovation. *Education and Information Technologies*, *21*(2), 443-451. doi.org/10.1007/s10639-014-9331-y

[8] Saravanan, C.: Color Image to Grayscale Image Conversion. In: Second International Conference Computer Engineering and Applications (ICCEA), pp. 196–199 (2010)

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