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AUGMENTED REALITY USING CONTOUR ANALYSIS IN e-LEARNING

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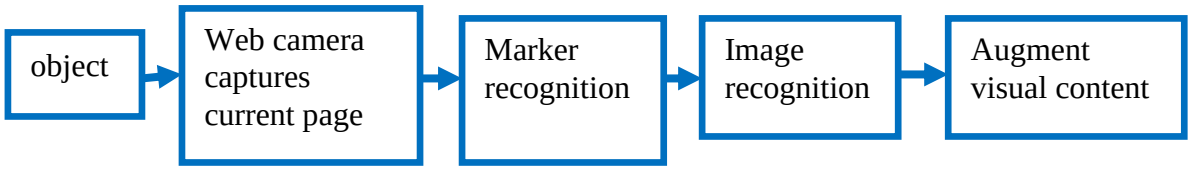
Abstract: Augmented reality (AR) has been increasingly applied in various fields. It is a new technique of the computer vision application used to facilitate interaction in the digital arts. We propose an augmented reality learning system that enables user to recognize alphabets or any character (pattern recognition). We are using contour analysis for processing an image. As Contour Analysis allows to describe, store, compare and find the object presented in the form of exterior outlines, solve the main problems of a pattern recognition - transposition, turn and a rescaling of the image of object. CA methods are invariant to these transformations. It provides more realistic interaction. It is an advance method and could be a promising technology for motivating users to engage in learning systems.

Keywords: Augmented reality, Pattern recognition ,Contour analysis.

I. INTRODUCTION

This learning system makes use of two modern technologies. They are augmented reality and pattern recognition and web as the communication path between computer software and learner.



Phases of e learning system

II. AUGMENTED REALITY

An Augmented reality as use in reference [1] ,to a system in which the physical surroundings of a person are mixed with real-time computer generated information creating an enhanced perception of surrounding environment. As augmented reality is partly virtual and real, its requirements are extreme for practical applications use.It also has very much potential in numerous different application areas. These issues make augmented reality both an interesting and challenging subject from scientific and business perspectives. Pattern recognition is the assignment of some sort of output value (or *label*) to a given input value (or *instance*), according to some specific algorithm. The proposed system exploits pattern recognition techniques for object-based interactive learning. The goal is to design a mentoring system for self-study, which lets the students learn the text-visual content interactively.

The proposed system augments the content as the students interact with the objects in the textbook. For text, the interactive e learning system enables interaction and augmentation of the content based on pattern recognition. When the images and objects on the text pages are recognized, the related content is augmented on the display. The content is also displayed according to the pattern marker which is a kind of computer mouse. Implementation of the recognition algorithms of images and objects is made possible by the use of contour analysis. Thus, the proposed e learning system provides a combination of education and various information technologies. It should be noted that the proposed e learning system is exploited for the usual and public educational courses.

III. OBJECT/IMAGE RECOGNITION

Image recognition is designed for identification of current text page or objects. When the text page or objects are identified, the related contents are automatically displayed on the PC. Since we can obtain the pose information of objects in the captured image, we augment the visual 3-D contents according to the poses of objects. Contour analysis is used to point out the particular image or object from the textbook.

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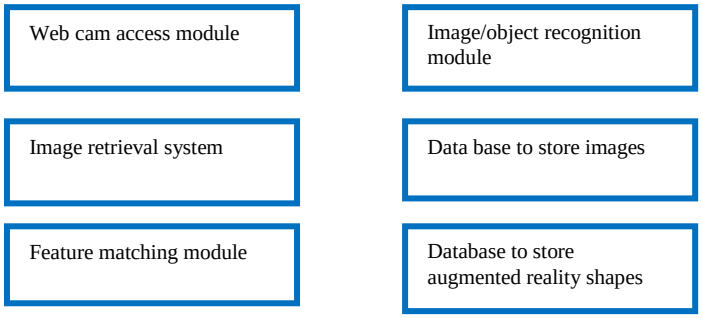
IV. E-LEARNING SYSTEM

It consists of several modules and databases and an image retrieval system. Explanations for important modules are as given below.



A. WEB CAM ACCESS MODULE

It consists of program to access web cam in order to take input from the web cam so as soon as the software starts this program or this module of the software starts executing. Output of this shows an "Allow web cam access" option, by clicking "ok" or "yes" learner can allow the web cam to take input.

B. IMAGE RETRIEVAL SYSTEM

It helps in take images one by one from the image database which helps in comparing image from PC with the image recognize from text book. Here it simply retrieves image from database of images each time and after comparison next image is retrieved from database.

C. FEATURE MATCHING MODULE

It contains set of codes matching features of the recognized object/image which is pointed out by the learner and image in the database.

D. IMAGE/OBJECT RECOGNITION MODULE

It contains code for Image/Object recognition. Image/Object recognition is done by the following procedure. When we have all pairs of matched features, we can recognize the images or objects. The simplest method is to count the number of matched features. Without loss of generality, the image pairs that have the largest number of matched features are the same. If the similar image patches or repetitive patterns exist in the images. As described before, we use the homography to reduce matching errors. Since the homography reflects the geometric relations of features, it removes such mismatched features that satisfy the matching criterion.

E. DATABASE TO STORE IMAGES

There is the software contains database to store images. And images are retrieved one by one for query purpose.

F. DATABASE TO STORE AUGMENTED REALITY SHAPES

In this database all augmented reality shapes which has to be augmented out when certain condition is matched ,for example when images are matched is stored. This is also updated whenever a new pattern is encounter. These augmented reality patterns are changes from Images to images / Objects to Objects matches.
As soon as the learner start software after installing it, "allow webcam" option will come on the interface as soon as learner clicks on allow option the web cam program executes and asks for input through web cam in his PC. The learner has to open the text book the scanned copy of which learner uploaded in the database. Web camera connected to the computer focuses on the textbook. The students study by watching augmented reality pattern. To augment the text-shape contents related to the images in the textbook, the contour analysis is used.

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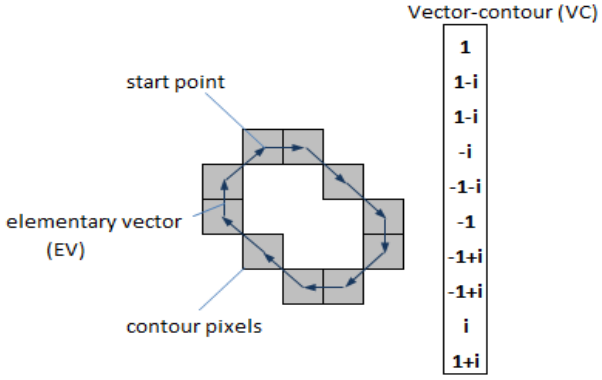
V. CONTOUR ANALYSIS

A. *THE MAIN CONCEPT*

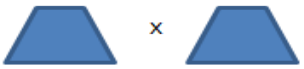
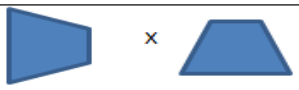
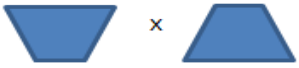
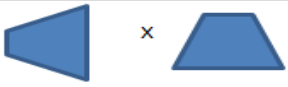
The contour is the boundary of object.It is the population of points or pixels,separating object from a background. In a CA the contour is encoded by the sequence consisting of complex numbers. On a contour, the starting point is fixed. Then, the contour is scanned and each vector of offset is noted by a complex number a+ib. Where a - point offset on x axis, and b - offset on y axis. Offset is noted concerning the previous point.



Owing to the physical nature of three-dimensional objects, their contours are always closed and cannot have self-intersection. Hence we can define unambiguously a way of bypass of a contour. The last vector of a contour always leads to the starting point. Each vector of a contour name *elementary vector* (EV). And sequence of complex-valued numbers - *vector-contour* (VC).Normalised scalar product (NSP) of a contour can be defined as

$$\eta = \frac{(\Gamma, N)}{|\Gamma||N|}$$

Properties of the normalized scalar product of contours

	NSP	Re(NSP)=cos(a)	|NSP|
	1	1	1
	i	0	1
	-1	-1	1
	-i	0	1

The norm of the normalized scalar product of contours gives unity only in the event that these two contours are equal to within turn and a scale. Otherwise, the norm of NSP it will be less unity. Actually, the norm a NSP is an invariant on transposition, rotation and scaling of contours. If there are two identical contours their NSP always gives a unity, is not dependent on where contours are, what their angle of rotation and a scale. Similarly, if contours are various, their NSP will be strict less 1, and also independent of a place, rotation and a scale.

If contours are identical, but the EV reference begins with other starting point the norm the NSP of such contours will not be equal to a unity.

B. *PRACTICAL APPLICATION OF THE CONTOUR ANALYSIS*

Contour analysis is used for pattern recognition task on the image. Let us take the image a size n*n pixels. Then breed its uniform grid with a step s. The total length of all grid lines is: $L = 2n^2/s$ As the image in the form of contours already has natural segmentation - is divided into contours it is possible to carry out a filtration of parts of the image to simple indications.

Among them - contour square, perimeter, the ratio of quadrate of perimeter to squares. Thus, there is enough simple and effective mechanism of a preliminary filtration of parts of the image. The CA allows to process the image in a

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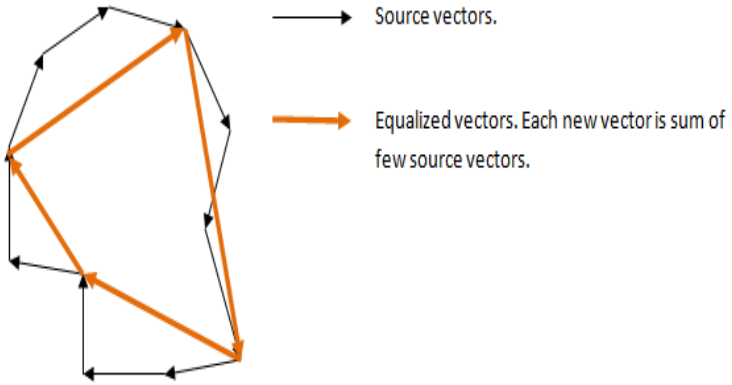
progressive mode. It means that we can sort contours on any to an indication (for example, by square or on a gradient of boundaries, or on brightness, etc.). And then to treat the first contour, and to produce outcome. Remaining contours to process in a background mode. It means that the first outcome (and in many application-oriented tasks it and it is necessary) can be received for O(n) that is an excellent estimation for algorithms of pattern recognition. As contours are independent from each other algorithms of a recognition it is easy to parallelize. Besides, algorithms are very simple and can be executed on graphic processors.

For fast searching of templates, it is necessary to introduce the certain descriptor characterizing the shape of a contour. Thus, close among themselves contours should have the close descriptors. It would save us the procedure of an evaluation an ICF of a contour with each template. Would be to compare only descriptors and if they are close - only in that case enough - to calculate an ICF. Comparing of descriptors should be fast. Ideally, one number should be a descriptor. An ACF invariantly to transposition, rotation, scaling and a starting point choice. And besides, the ACF is a function of one contour, instead of two, as an ICF.Hence the ACF can be selected as the descriptor of shape of a contour. The close contours will always have the close values an ACF.

C. *EQUALIZATION OF CONTOURS*

In the real image contours have arbitrary length. Therefore, for searching and comparing of contours, all of them should be led to uniform length. This process is called *equalization*.At first, we fix length of a VC which we will use in our system of a recognition. We designate it k.Then, for each initial contour A we create vector-contour N in length k. Further probably two variants - or the initial contour has greater number of an EV than k, or smaller number than k. The picture shows the meaning of equalization:



VI. **ADVANTAGES OF E-LEARNING SYSTEM**

a) It helps students to understand and the concepts clearly,
b) The chance of false imagination while learning is reduced,
c) Less time to learn,
d) Recall of concepts is enhanced,
e) Self learning is possible or it is easy for lecturers to teach,
f) It can be used in understanding geometrical puzzles, Structure of electron, atom...etc, g)
g) It leads to innovative thinking
h) It improves the standard of education.
i)

VII.**CONCLUSION**

CA methods are attractive for the simplicity and high-speed performance. In the presence of accurately expressed object on a contrasting background and lack of parasites of a CA well copes with a recognition . Thus, the CA treated 249 images of a various size (from 400x400 to 1280x960) for 30 seconds. Besides recognition of freeze frame images, high-speed performance of a CA allows to process video.

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