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Smart Visualization for Online Aids Image Retrieval

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Abstract

Visual aids can be considered as a motivational tool in enhancing students' attention and create positive perceptions. The use of new technologies has opened new possibilities to integrate online visual aids in the teaching process, which produce positive learning effects. In this paper, a novel technique employed to retrieve specific images based on the kind of query classification. The semantic dictionary built based on the specific classification correlate with the query intention. Singular Value Decomposition SVD training technique have been used to select the effective key templates in order to link the query with the web annotation directly. The present method can be considered as a strategic tool in the E-learning technique, which can provide variety of clustered images to help the students in creative and critical thinking skills and prevent the indoctrination method in learning the students. The qualitative results achieved high True Positive (TP) retrieved images that respect to the effectiveness of the E-learning task. Also, it provides a good 92% of learning reaction and superior learning behavior level.

Introduction

Currently, new methods and techniques are entered in the field of education to aid teachers and make learning more effective. Visual aids are instructional aids, used inspire students. They make the classroom experience more interesting, motivate the students and assist the teachers task to explain difficult concept (Cuban, 2001). Research Cuban, (2001) indicates that 83% of what is learned is from the sense of sight. Bamford, (2003) states that visual literacy is the key to gain information, construct knowledge and achieve successful educational outcomes. According Mannan, (2005) points out that visual aids help the teacher to clarify, establish, correlate and coordinate concepts, interpretations and appreciations, and enable teachers make learning concrete, real, interesting, inspirational, meaningful and vivid. Research from Joklová (2009) Shows how images can be used to help the learner remember. As an example: using pictures to optimize the process of teaching vocabulary. Yunus et al., (2013) demonstrates how the use of visual aids help teachers engage students in studying literary texts despite the students having different English proficiency level. As a result, teachers had a positive attitude towards the use of visual aids. Shabiralyani et al. (2015) Concluded that using visuals aids stimulates thinking and enhance the learning environment in a classroom. Based on the present point of views, the researcher employs a novel technique in enhancing the teaching and learning process using a direct query from web pages and connecting the query with the class of request to be able to retrieve a class of image object instead of the traditional method of representing one offline picture in each query case.

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Methods

The process of image retrieval as visual aids is going to be described along this section. The chosen method presented by Abdul Baqi et al. (2017) as stat-of-art method which able to solve many Sketch Based Image Retrieval (SBIR) problems such as scaling, transport, imperfect of image retrieval and working on the web repertory directly Abdulbaqi et al. (2014) the sequence of image retrieval processes from web will describe in the steps below:

Results and Discussion

Input representation is a technique used to represent and convert an input query in drawing form into string form for achieving effective recognition. There are various approaches that could be used to represent input, but this method enables the teacher to deal with the query by direct drawing on web as shown in Figure 1.

Figure 1. the input representation board

The main feature in the present board is the in-time registration of the letter element details. This technique depends mainly on the mouse click based on the specified pixels position. It will determines the pints (P1, P2, …Pn) shown in figure 2.

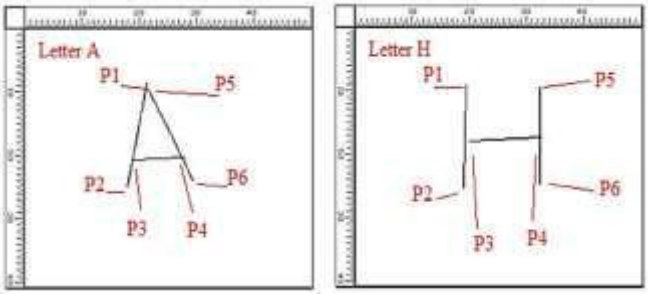

Figure 2. the input representation board

These points will stored in term of (x, y) coordinates values. From the registered points, the angle magnitude will be determined based on the formula:

$$\tan(\Theta) = y2 - y1 / x2 - x1 \qquad (1)$$

of each element of letter. Then correlate all the letter elements features to produce on specific string. The mining technique can be described as an analytical tool, which specifies the input representation features in order to cluster the shape as base on their pixel mining. The correlation between the pixels will specify the unique shape of drawn shape as shown in figure 3.

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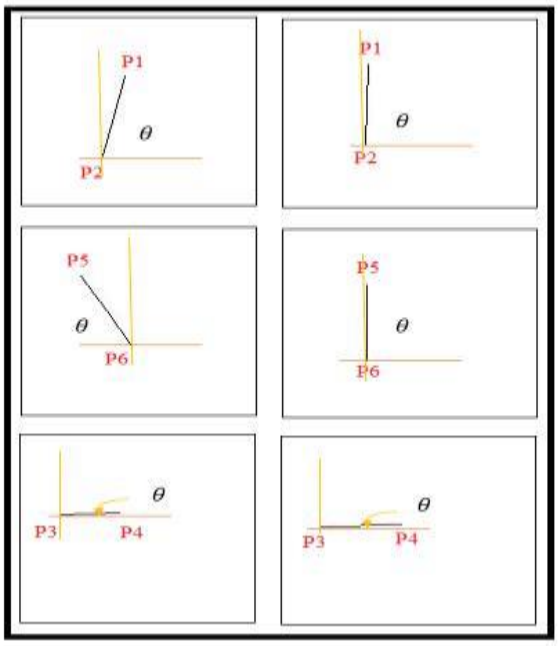

Figure 3. The mining base of the letter elements

From the shape of the letter, it is clear that for each element there are two points in the edges and a specific angle. Also, for all letter elements there is a specific correlation between the edge points. For instance in figure 2, the letters (A, H) both of them have three elements. The differences of the two letters are the angles of the straight lines and the distance between the edge points. It is clear that the distance between (P1 and P5) always symmetrical. In case of letter (H), there is a larger distance than letter (A). Also, the line angles always not symmetrical even with different writing behaviors as shown in figure 4 below:

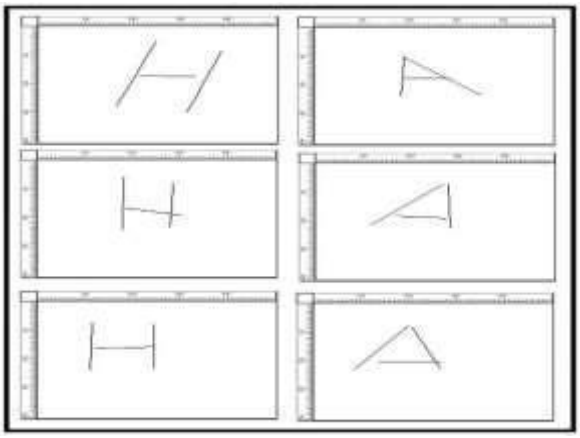

Figure 4. Different writing behaviors on the board

The determination of the letter query shape can be described in the Algorithm 1 below:

Algorithm 1 Determination of letter elements features

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```
Input: (x1,y1), (xn,yn), (xm,ym)
Output: string(lines and theta angle)
Variables x1, y1,xn, yn, xm,ym : integer
begin
Read the x1 ,y1 ,xn, yn
xc= (xn- x1)
yc= (yn- y1)
theta = inv.tan ( xc / yc)
Threshold = 2
D = √((xc − xm)² + (yc − ym)²)        // calculate the distance
If (D < threshold)  then
        element← straight line keyshape
else
element← keyshape
end if
string( H-lines ,V-lines ,D , theta angle)
    END
```

String:

Shape	P1	P2	P3	P4	P5	P6
Angle	Theta 1	Theta 2	Theta 3	Theta 4	Theta 5	Theta 6
Distance	D1	D2	D3	D4	D5	D6

The present string represent the ID of the letter shape, this ID will be stored in the dictionary template to use in semantic matching in testing stage. The next step will be the training step in the system, which will give the string a specific meaning.

Recognizer training and testing

To make the system cognitive the input representation drawing, the system developed by training. Training process is a process of create a specific template for each drawing case. The training was accomplished by inviting a group of people to capture various styles of drawing the selected letter. Singular Value Decomposition SVD is used as an optimal matrix decomposition technique which presents the highest signal energy in case of too few coefficients. The SVs (Singular Values) have stability, i.e. the strength of the variance (spread) on a specific axis does not vary rapidly and sorted in decreasing order. That means the strength of each state of string can be observed. The effects of this technique are to eliminate the unwanted data. Using SVD based on string results can observe the effective means by measuring the behavior, attitudes, and preferences of relatively large numbers of subjects. This technique allows to deal with the problem of large variety of answers. The results of this technique are the eigenvectors of the optimal answer, which represent the pattern of certain questionnaire (Kostelich & Kuhl, 2008). The results of this technique are the eigenvectors correlated semantically, which represent the template of the letter drawn in the board.

The template contains the string which specified by the input representation tool correlate with the class of shape intention. The class will be selected by the teacher, for instance the shape (A) can be specified in animals class. That means the training will specify all the animals start with the letter (A). The template content of this operation is shown in figure 5.

String:

Shape	P1	P2	P3	P4	P5	P6
Angle	Theta 1	Theta 2	Theta 3	Theta 4	Theta 5	Theta 6
Distance	D1	D2	D3	D4	D5	D6
Class:	**animals**					
Type:	**Ant**	Ant Eater				

The class and type patterns were deployed into the training and have been demonstrated to be effective for on-line processing. The Specified ID in the dictionary correlated with each class

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and types used to match and find the similarity between the queries came from the input representation using Cosine technique. Cosine technique will provide us the nearest pattern to the query based on the query vector content, which investigates the difference in stream of the strings. The ID will identify the class and type of the selected template and send them to the web annotation. Matching knowledge space of this proposed system is constructed through composed of natural language concepts semantically with the annotation that relevant with each image stored in repository of web images.

System Performance Results

The results tested by using the first page appeared on the search, which contains 12 images of each letter drawn sketch on the online board. The results observe the identification of the query results with high (TP) images retrieval that achieved 98% precision of query, the intention of the teacher testing letter. The retrieved images are the same of class and type of template content. It contains an animal starting with letter (H and A) class types as shown in figure 6 and 7.

Figure 6. Letter (H) query results

Figure 7. letter (A) query results

Study Evaluation And Discussion

In this study, we have used Kirkpatrick's Training Evaluation Model as a basic tool for performing evaluation. Kirkpatrick identified four levels of evaluation of educational program (Vít Dočekala et al., (2015; Megan et al., 2016). Every level is based on the previous one and follows from the information gained in the previous level. This model offers the potential of a feedback exploitable for modifying the educational activity on several levels (Liviu, 2016; Aluko & Shonubi, 2013). The collected data gathered based on two groups. The questions focused on student perceptions. The outcomes of the implementation using the Kirkpatrick evaluation are:

Reaction of student which measure the reaction and how the delegates felt about the training or learning experience, what they thought and felt about the training. The happy sheets are used

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for that. Reaction In the feedback process students were asked to provide their views. They were asked about their willingness to participate again, 92% provided a response of absolute willingness.

Learning which measure the increase in knowledge before and after the resulting increase in knowledge or capability. The used method for that is tests before and after the training. Learning Content of the group suggested that many students had developed an understanding of diverse images based on one letter.

Behavior which measure the extent of applied learning back. The used method to measure the behavior change is the direct observation. The student responses indicated a limited range of social contact was occurring outside classes due to change in knowledge. It is seem that knowledge development separate students in groups based on their knowledge levels.

Results which measure the effect on the environment of trainee. The effects on environment resulting from the trainee's performance in recognizing the environment. Developing trainee's performance across cultural boundaries. Also, the present learning method provides a significant rationale for curriculum innovation that encourages intra-cohort engagement.

Conclusion

This paper presents a novel method for visual aids E-learning to retrieve specific images based on the kind of query classification. The present method used simple sketch of letter as an input representation to detect a specific class of image retrieval based on specific type of images classes. The online direct query provides relevant identified images with the base of the specified class and type of the query latter, which improve the online retrieval in retrieve specific two kinds of animals. This novel retrieval process enables the learner to present a variety of images for one case query, which can improve the student's visual learning and improve their flexibility thinking. In this vein, our current work focused on defining a more efficient metric for teaching and learning. In addition, the proposal method achieved high precision 98% in online image retrieval technique. Also it provides a good reaction of 92% in addition to good learning level and behavior. This strategy could be applied for other applications requiring classes that are more specific.

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