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Primary School English Smart Classroom Construction with Immersive Information Collection Platform

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***Abstract*—**In this paper, we study the immersive information collection platform to assist the primary school English smart classroom construction from camera network to image clustering algorithms. Although the feature representation based on image content fully explores the relative relationship of image local features in the feature domain, these content information ignores their contextual information in the global domain, which makes the image representation obtained by the final algorithm missing, which may lead to Image clustering effect is not ideal. Hence, in this paper, the novel camera network to the image clustering algorithms are well defined together to make the comprehensive modelling of the study. Based on the concept of attribute reduction, the weight of each attribute is calculated, and the weight is used to determine the different points in the region and every decision is based on class equivalence. In further, the information collection platform to assist primary school English smart classroom construction is designed and verified. Through the verification, the performance is proven to be effective.

Keywords*—Image clustering; camera network; data transmission; information collection; smart classroom*

I. INTRODUCTION

As a new technology, QR code has a wide range of the applications in people's lives, such as bill recognition, online shopping, mobile payment, book lending, identity recognition, etc. The ability to quickly and reliably locate and identify two-dimensional codes in different application scenarios is also a hotspot of current research [1, 2, 3, 4].

However, the traditional two-dimensional code recognition technology is limited to identifying two-dimensional codes in static scenes, limited to a certain area or a specific location does not have the characteristics of real-time and dynamic. [5, 6]The core system has almost unlimited seamless expansion capability. All devices are divided by IP addresses.

Adding devices only means increasing IP addresses, which can form a very complex video capture system. The video data output by the server has been converted from analog to digital. Compression, using TCP/IP protocol for transmission on the network, supporting remote video information transmission across gateways and routers. The software on the camera side runs in the embedded environment of ARM+Linux, so it is necessary to implement an RTSP streaming media service based on Web Socket protocol stack transmission in C/C++ language [7, 8, 9]. The media service also needs to continue to support the transmission of the RTSP protocol based on bare TCP connection, so that ordinary RTSP media players can continue to play. Within the field of view of the camera, the monitoring ability of the target is the same regardless of the distance; in a given monitoring area, each part has the same monitoring requirements. However, this is not the case in the practical applications. The distance between the target and the camera will affect the clarity of the imaging [10, 11, 12]. There are also positions in the monitoring area that need to be focused on. In the figure 1, we denote the camera network system.

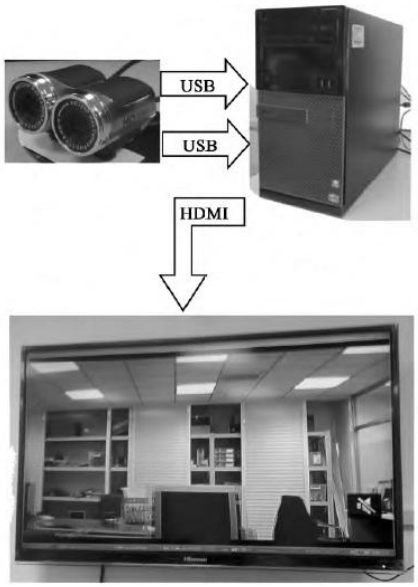

Fig. 1. The Camera Network System

For the system, the image processing model is then essential. Even for human observers, it is very difficult to correctly recognize a single image area without corresponding background information Human beings prefer to regard the image as the whole [13, 14]. Other regions in the same image can provide corresponding auxiliary information for recognition, so as to improve the reliability of recognition. In our algorithm, all image regions are used to participate in the similarity discrimination between image objects. Firstly, according to the correlation between annotations and visual features, the visual discrimination ability of the labeled words in the image is scored. The labeled words with good visual discrimination ability are extracted as the semantic category of the image.

In order to avoid the clustering results relying too much on the labeled words, the visual similarity and the correlation between the labeled words are used to then further adjust the clustering results. In the final clustering, the number of the occurrences is selected [15, 16]. Annotated words equivalent to the number of images in the cluster are used as the semantic description of the category. With this general idea, in the listed section, the proposed model will be discussed in detail.

II. LITERATURE REVIEW

The image processing is summarized and reviewed in this section. Image segmentation is to extract the target from the background and lay the foundation for the higher-level image processing and understanding. Clustering method is often used to segment the image with fuzzy boundary. Using this method to segment the image can be regarded as an extension of the concept of threshold segmentation [17, 18, 19]. The single-view image clustering algorithm divides the input image into different clusters according to the characteristics of the single-

view image, so that the image data in the same cluster is similar, and the image data in different clusters is dissimilar.

Currently, there are many different types of single-view image clustering algorithms, such as the non-negative matrix factorization, information bottleneck algorithms, some spectral clustering algorithms, and so on [20, 21].

According to the different feature information used, these algorithms can be divided into two categories: content-based single-view clustering algorithms and context-based single-view clustering algorithms. First, according to the correlation between annotation and visual features, the visual discriminant ability of image annotation words was scored. The annotated words with good visual discrimination ability were extracted as semantic categories of images [22, 23]. Then, the image is classified according to the extracted semantic categories by using the annotation information. In order to avoid the over-dependence of clustering results on labeled words, the visual similarity and correlation between labeled words were used to further adjust the clustering results. In the final clustering, the annotation words with the same frequency of occurrence as the number of images in the clustering were selected as the general semantic description of the category.

III. THE PROPOSED METHODOLOGY

A. The Camera Network Modelling

Image acquisition is a process in which the camera constantly converts optical signals into electrical signals, and finally stores them through complex processing such as the analog-to-digital conversion and interpolation. This process is easily affected by many uncontrollable factors, such as general illumination, ambient noise, shooting angle, etc., which may make the image uneven in color and low resolution. Web Socket technology is a part of the HTML5 specification, which then also provides a long-connect full-duplex network communication mechanism between the browser and the server. If the camera as a streaming media server supports the Web Socket protocol, the player on the browser side can establish a WebSocket connection with it, and communicate with RTSP streaming media data through this connection, and obtain RTSP streaming media audio and video data on the browser side. NAND FLASH adopts K9F2G08, the memory chip has a large capacity, up to 256MB, the rewriting speed is very fast, easy to use, has reliable durability, and is suitable for a large amount of data storage [24, 25, 26]. The FLASH uses 512B as a block for read and write operations. Transfer address and command, transfer special data interface to connect with CPU, data bus is 16b, write operation must be carried out in blank area, so when rewriting data, it must be erased first, and then written. The figure 2 shows the structures.

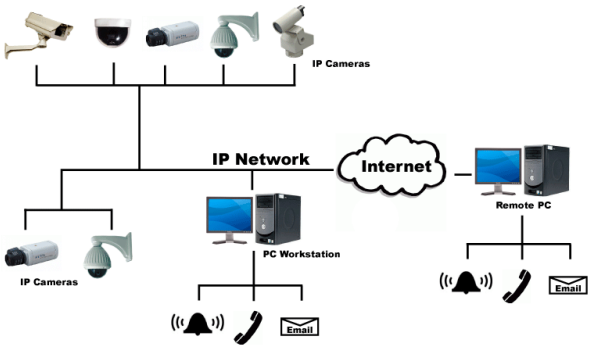

Fig. 2. The Camera Network Structure

Different sizes and different positions will have different eigenvalues. For example, the nose area adopts a core linear template. Different template sizes will generate the different eigenvalues, and the calculation area of the large template often already includes the area of the small template, which will lead to a large number of the repeated calculation is not conducive to the real-time detection, so this paper proposes the concept of integral graph [17]. The construction of the camera network is to use the spray method to randomly distribute the cameras to the designated area. It is assumed that each camera can know its own position and direction, and cannot move its position after falling, but can rotate within 360° to adjust its monitoring direction that is defined as the lemma 1.

$$\arg\max \sum_{\theta \in S} w_i * e_i \tag{1}$$

The virtual force approach is no longer applicable. At the same time, the author believes that the relationship between the equilibrium state of the core moment and the coverage optimization is not very direct. Many circular primitives that can be moved at will, the goal of expanding coverage can be achieved through force balance, and it is easy to fall into local optimum. The figure 3 shows the details.

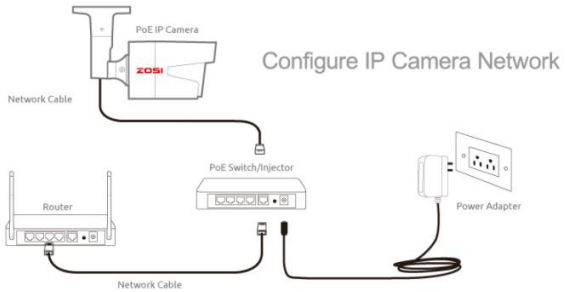

Fig. 3. The Optimized Network Framework Details

B. The Image Clustering Algorithm

The local data of missing point cloud is lost, which will change its general core local normal characteristics, boundary characteristics and overlap to a certain extent. These changes will affect the convergence speed, registration accuracy and applicability of most algorithms to varying degrees. Extended Gaussian image clustering can effectively extract sub point clouds with similar normal features and large overlap, and is not sensitive to the loss of local point clouds. From the perspective of fusion, there are currently three different levels of multi-view learning algorithms: feature-level [9], semantic-level and also kernel-level fusion, according to how various information sources are used. These three kinds of fusion are to operate the data of each information source respectively, and then fuse each information source at three levels.

The disadvantage of doing so is to ignore the guidance and possible penetration between information sources. In the listed lemma 2, the comparison algorithm is defined.

$$\Pi = \{\hat{\lambda}_1, \hat{\lambda}_2\} = \left\{ \frac{p(x)}{p(\bar{t})}, \frac{p(t)}{p(\bar{t})} \right\} \tag{2}$$

Where the p()is the function for referring. Based on the traditional clustering algorithm, the algorithm assumes that different features of the image have different important levels for the expression of content, and dynamically determines the weight of each feature.

Especially in the image semantic representation, image features which play an important role in content expression occupy a large weight, so it will play an important role in similarity calculation. This method is then called weighted similarity measurement criterion shown as below.

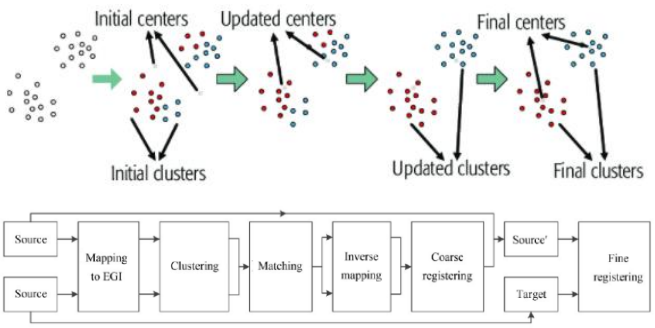

Fig. 4. The Model Algorithm Framework Model

When adding labels, users may use polysemy, that is, a label may correspond to multiple synsets in WordNet, but users actually only use one of them to describe the image. If we use all synsets corresponding to the label to measure its similarity with other labels, the accuracy is bound to decline, We found that users tend to use the most common meaning of words to describe images. We can obtain a weighted similarity matrix M given the entire image dataset, where each element Mij in M represents the weighted similarity between the ith image and the jth image.

Obviously, the matrix M is symmetric and all elements on the diagonal are 1s. Finally, expand the symmetric non-negative matrix factorization of this matrix to obtain the clustering results. In figure 5, the framework is then defined.

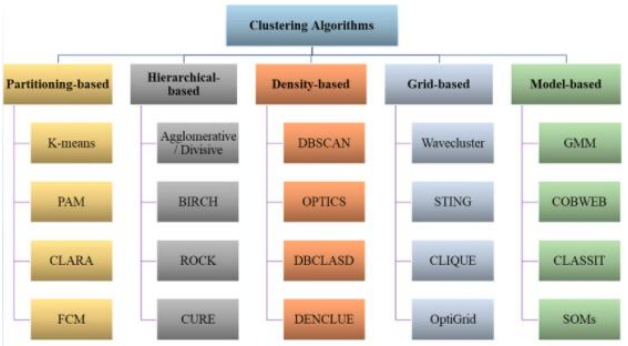

Fig. 5. Image Clustering Algorithm Pattern

C. The Immersive Information Collection Platform to Assist Primary School English Smart Classroom Construction

Smart education is a high-end form of some education informatization, and it has received widespread attention today. From the perspective of the national system, it is likely to promote the birth of the education system in the intelligent age. Compared with the educational model in the industrial age, the future educational form is bound to be then more advanced, innovative and intelligent. Hence, we consider listed issues.

(1) Under the flipped classroom teaching method, teachers should have an overall control over the course design, not only need to consider the content received by students in the classroom, but also need to consider the autonomous learning situation before class. The receptive ability and also thinking process of students as autonomous learners are issues that teachers should think about.

(2) Under the flipped classroom teaching method, the role of teachers has changed quietly, from knowledge imparting to learning guidance. Learning is not simply a process of the transferring knowledge from the teachers to students, but a process of general constructing knowledge system by students themselves.

(3) Use the reminder function of the blue ink cloud class to notify students who have not completed the pre-class learning tasks; use the pre-class self-study test function to understand students' understanding and mastery of knowledge, and determine the difficulties and also doubts in classroom teaching; use the function of then answering questions and discussions , to summarize the difficult problems encountered by students in self-study before class, to prepare for classroom group discussion or answering questions.

Primary English teachers should consider how to increase the fun in the primary English classrooms. Only by making students feel interesting and gain something from the fun, they will feel more happy and become more in learning. Actively, in a state of interaction and ease, grasp the knowledge more firmly. Therefore, when primary school English teachers design teaching, they should effectively exert the functions of new media and new technologies, especially to set up more interactive teaching links. Allow students to use English to communicate with other students in the English classroom learning process. At the same time, they can also use some software and learning resources of the new media and new technologies to complete some autonomous learning activities.

The scientific, systematic and effective application of the multimedia technology in primary school English teaching can further optimize and improve the primary school English teaching mechanism, especially for the construction of a teaching mechanism that combines "online" and "offline". The attention time is relatively short. By using the multimedia technology to create teaching scenarios, it can make primary school English teaching more attractive, so that students can quickly enter the learning state. To further improve the quality of English teaching in primary schools.

IV. THE EXPERIMENTAL ANALYSIS

In this section, the system performance is simulated. To compute CE from the clustering result, we need a mapping function to establish a correspondence between the clusters in the clustering result and the clusters in the truth value. For CCA, according to the order of the canonical correlation coefficient, we select the top d pairs of canonical scores as feature vectors, and perform clustering. As d increases, the clustering effect of CCA features gradually becomes better. In the figure 6, the simulation result is demonstrated.

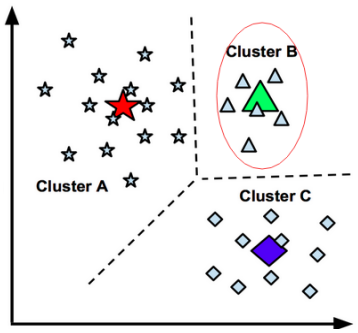

Fig. 6. The Clustering Performance Simulation Result

CONCLUSION AND SUMMARY

In this paper, we then study the immersive information collection platform to assist the primary school English smart classroom construction from camera network to the image clustering algorithms. Whether the algorithm can converge depends on the characteristics of samples and the number of different regions. As a new mathematical tool to deal with fuzzy and uncertain knowledge, rough set has been widely used in the fields of pattern recognition, artificial intelligence,

image processing and data analysis. Hence, in this paper, the camera and image analysis models are combined to construct the efficient immersive information collection platform to assist the primary school English smart classroom construction. The system is validated through the testing. In the future study, we will consider some more scenarios for estimation.

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