A Study on the Application of Metadata in Online Sports Video Clips Systems

Yuebo Lai*

Institute of Physical Education, Gannan Normal University
Ganzhou 341000, Jiangxi, China
e-mail: Yuebo1611567002@qq.com

***Abstract* — In this paper we focus on the design of metadata formats for sports video and consider: i) result aggregation storage and management of metadata for full-text search, ii) online sports video clip metadata editing systems, iii) research on aspects of the video player to show metadata, iv) assessing sports video metadata standards and format design for retrieval and result aggregation, and v) editing to a set of client display solutions. To increase the wide spread use of sports video metadata, research covering all aspects of sports video metadata may be involved in the business process. This will provide a coherent solution for the application of the metadata, where each part can be separated from the application to other similar systems to deal with. The results show the study to have some innovation and practical values.**

Keywords - Video metadata; sports video; online video clips; clips system

I. INTRODUCTION

Video metadata development up to now, we need to pay attention to is not only the content attribute and describe the two types of metadata, metadata and hot time class metadata can provide more details of the video information. In attention to the user experience now, metadata editing system status in the video is not a word and the Ming Microsoft in RCE application, a set of metadata solution, although part of the code in the RCE project video editor is open source, but the specific solutions to the metadata has not announced. Therefore, this paper presents application of system metadata in sports video clips online, aims to combine existing on sports video metadata research, according to the online video editing system and puts forward a set of their own metadata solution. Research on video metadata format paper has the depth of theory, metadata editing in online video clips of the realization of the system has application value for the sports events, the contents of the video has some innovations in the metadata processing [1-6].

Video metadata from the level of detail up classification can be divided into the following 4 categories: content attributes, content description, time of metadata, metadata. The existing hot metadata format focusing on design asked the metadata and hot element number format to capture, rarely consider the characteristics of sports video, for structural design of metadata storage and management of metadata [7-10]. Considering the metadata storage, take the database storage or storage format of XML file, and thinking is stored in a disaster degree problem of metadata and video file information management, mapping relationship needs to study the metadata information and video information. Retrieval and result processing according to the metadata, metadata storage, retrieval methods of thinking and effective efficient, take some mature technologies and tools, the metadata retrieval system design and implementation. In order to get more effective results, the need for preliminary search results obtained were gathered [11-13].

Sports video metadata text retrieval system, mainly introduces a set of sports video metadata based on Solr full text search program, unified metadata format, on the various types of metadata aggregation processing, search through the experimental analysis of the single source of information search and various kinds of information source of effectiveness and performance. The design and Realization of the system online sports video clips, mainly introduces the operation of the system, development environment, system framework design, system operation process and the steps of use, technology to achieve the key points and other aspects, especially introduces the embodiment of application of video metadata in the system. The main work of this paper is the study of sports video metadata editing application system and a series of solution in the online sports video format design solutions involving sports video metadata, storage and search, edit and modify, all aspects of client presentation.

II. RELATED METHOD AND THEORY

A. The research status of metadata video format

The metadata MPEG series has been developed by MPEG, the new MPEG standard 21 supports the following functions: content creation, content production, consumption and use of content distribution, content, content grouping, intellectual property management and protection, content identification and description, user permissions, extraction of terminal and network resources, content representation and event report. The standard is

from commercial content and services related to content perspective to begin the work, will be combined with the appropriate and has some other MPEG series standard, thus the processing of video and audio is more convenient and effective, and ultimately in the global scope, providing electronic trading and the use environment transparently and effectively for multimedia information user in the future. We can foresee, multimedia and other related fields, MPEG 21 will play an important role.

Although the PC platform based video editing system has been used more easily than professional editing workstation, with the rapid development of Web technology, B/S structure of the online video editing system mushroomed, into our line of sight, provides a more convenient option for many users even enterprise.

B. The existed difficulty

To achieve this were facing great difficulties, first of all, in the network transmission, due to network transmission bandwidth and speed limit, the problem of the network reliability and consistency. Data flow control, time delay, flow control, error rate, mobility and the ratio of performance to price and other reasons, it is difficult to unity. Secondly, in terms of quality of service, to consider the reliability of service, price, information integration, ease of use, the dynamic response of the needs of the user, can access issues such as on demand and service. In the service and equipment, but also relates to the intelligent, equipment compatibility and interactive platform to ask, the distributed intelligent problem between devices. In addition, since such as consumer trust, release, use designated exhibition and consumer privacy protection problems must be solved, these are MPEG-21 in the future should focus on study and solve problems.

III. SPORTS VIDEO METADATA MODEL

A. The stantard of sportsML

SportsML is developed by the IPTC for data exchange standard of sports news, was released in 2008 in the IPTCGZ family as a member of the.GZ family with advanced equipment, combined with the metadata and XML, the most advanced technology use, compatible and semantic network.

SportsML is a global sports only open XML data exchange standards, are designed to be easily understood and executed as soon as possible, including sports scores, schedules, statistical information table and the list of all kinds of sports communication.

In the sportsML standard core package includes the description of elements of various sports competitions the core attribute general set, the elements of the structural relationship between as shown in Figure 1, because it contains SportsML core package item more, only the three-layer structure is shown in the figure in the content.

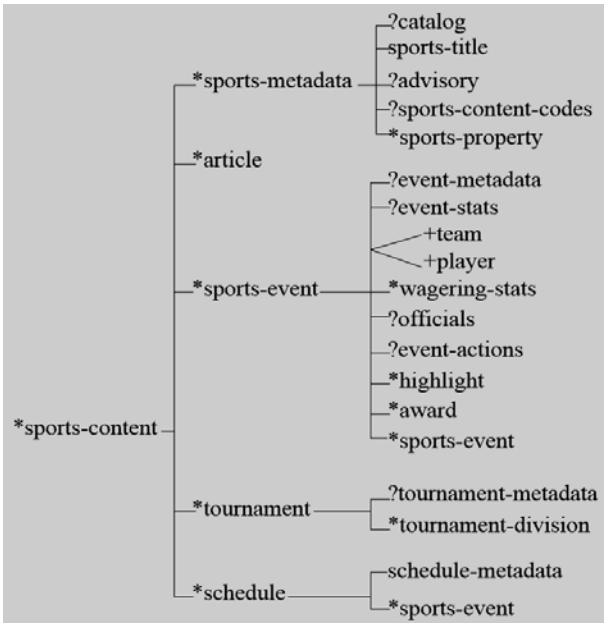

Figure 1. The elements of the structural relationship

B. Design method of sport data preprocessing

If there are n nodes in the network, the adjacency matrix of A, then you can construct a n*n matrix. In this network if a link between the node i and node j, then the diagonal elements in the adjacency matrix is zero represents no ring edge node. So the one containing the n A node in the network can be represented by an n order symmetric matrix.

$$A = \begin{Bmatrix} 0 & 0 & 1 & 1 & 1 \\ 1 & 0 & 1 & 0 & 1 \\ 1 & 0 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & 1 \\ 1 & 1 & 0 & 1 & 0 \end{Bmatrix} \quad (1)$$

The distance matrix was used to denote the distance matrix of order n between nodes in the network diagram, where n denotes the number of nodes in network diagram. The distance matrix can be expressed as a A= aij. It can be concluded that the distance matrix is a symmetric matrix.

$$A = \begin{Bmatrix} - & 2 & 1 & 1 & 1 \\ 1 & - & 1 & 2 & 1 \\ 2 & 2 & - & 2 & 0 \\ 2 & 2 & 2 & - & 1 \\ 1 & 1 & 0 & 1 & - \end{Bmatrix} \quad (2)$$

Metadata is of sports video file attributes and content description, before further discussion on Application of sport video metadata; we must first study the metadata description model. According to the existing metadata standards, used in the design of online sports video clips of sports video metadata module in the system. After the

metadata when sports video is very good management and maintenance, may search of sports video clips using metadata, and even the final presentation.

C. Random access technology

They are: (1) This is also called the throughput through put S, which is equal to the frame transmission time T0, the average number of frames successfully transmitted. Obviously 1,≤ S≤, 0 and S = 1 is the limiting case. In the S = 1, the frame sent out one by one, there are no gaps between the frames. However, the S can be closer to 1 to measure the extent of utilization of the channel is sufficient. When the network system reaches a steady state, at time T0, the average number of frames reach the network should be equal to the throughput S.

$$P[t]=\frac{(2G)^k}{k!}e^{-2G}, k=0,1,2... \tag{3}$$

In the above formula, 2G in 2T0 mean arrival time frames. Then

$$S = G \cdot P[t] = G \cdot P[2T0] \tag{4}$$

$$= G\frac{(2G)^0}{0!}e^{-2G} \tag{5}$$

When G = 0.5 when 0.184.≈1–S = 0.5e. It is possible to achieve the maximum throughput of the value of S. This point from Figure 2 throughput curves can be clearly seen. The pure ALOHA throughput and network load curve was shown in Figure 2.

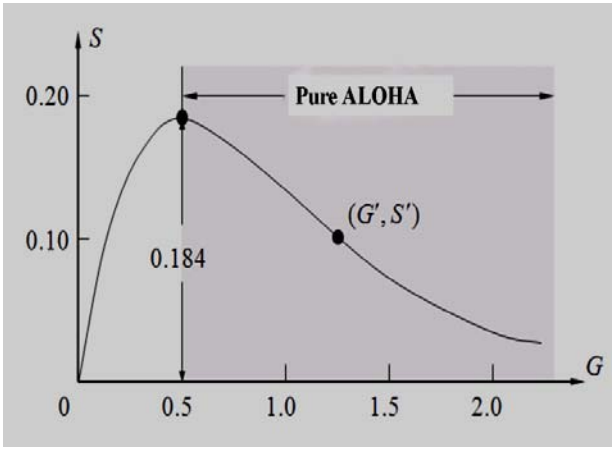

Figure 2. Pure ALOHA throughput and network load curve

To achieve the purpose of the traditional K-Means algorithm is the n sample points, classified into one class. So that each sample with the class mean and minimum error square, also is the criterion function. A clustered data set for the X, X = {xi, |Xi ∈R, i =1, 2, 3, ... , n }. The clustering center for free, and with A cluster category, said the Euclidean distance between two data objects are as follows:

$$d(x_i, x_j) = \sqrt{(x_i - x_j)^2} \tag{6}$$

Each data object of the arithmetic mean for:

$$z_j = \frac{1}{n}\sum_{x\in\omega_i} x \tag{7}$$

The criterion function can be expressed as:

$$J = \sum_{i=1}^{k}\sum_{j=1}^{n} d(x_j, z_i) \tag{8}$$

Suppose now that for some reason the network load G increases a little. The curve according to Fig throughput should be decreased. This indicates the number of frames successfully transmitted frames collide reduction increased. This situation causes more retransmissions, thereby further increasing the network load G. This vicious cycle, so that the operating point along the curve declined rapidly until the throughput drops to zero. At this time, the network load reaches a great value. Continuously transmit data frames, collision, retransmission, but there is no useful output. Seen in pure ALOHA system, the network load G must not exceed 0.5.

$$D /T0 = 1.5 + R + NR [R + 0.5 + (K + 1)/2]] \tag{9}$$

Video generation principle lead to video information and text information have great differences in retrieval: a word text information in an easily identifiable, and words usually has the concept of people can understand (semantic information), so text information can easily for full-text retrieval; feature of video information is difficult to directly search because the video frame image, a color distribution features and user search information may be irrelevant, video information in the semantic information hidden deeper, more complex, to let the machine to search the user information into the video feature query is very difficult. As each station sends frames are independent:

$$S_j = G_j\prod_{\substack{i=1\\ i\neq j}}^{N}(1-G_i) \tag{10}$$

This is a limited number of stations ALOHA system throughput formula. Using the formula:

$$S = \lim_{N\to\infty} G(1-G/N)^{N-1} = Ge^{-G} \tag{11}$$

Right (5) type S obtained when G = 1 time, S up to maximum value:

$$Smax = (1 - 1/N)*N - 1 \tag{12}$$

IV. EXPERIMENTAL RESULTS

A. *The design of system process*

From the user's perspective, easy and convenient for interactive process habits is very important, in the system design process, and strive to achieve the complete function, reasonable process flow, convenient operation. The flow chart of the system shown in Figure 3, more clearly illustrates the use of steps and data flow system.

Project configuration module to invoke the service layer of project management services, project support for new, open, save and delete functions. Content management, resource loading module to invoke the service layer indexing service is responsible for obtaining to be edited from the content management for the video file and its metadata. The output service output module to invoke the service layer is responsible for the video clip, generating results. The video clip module as the main module and user interaction contains four sub modules: media library module, content viewer sub module, the preview module and time axioms module in these modules, users can easily be video editing work and metadata editing.

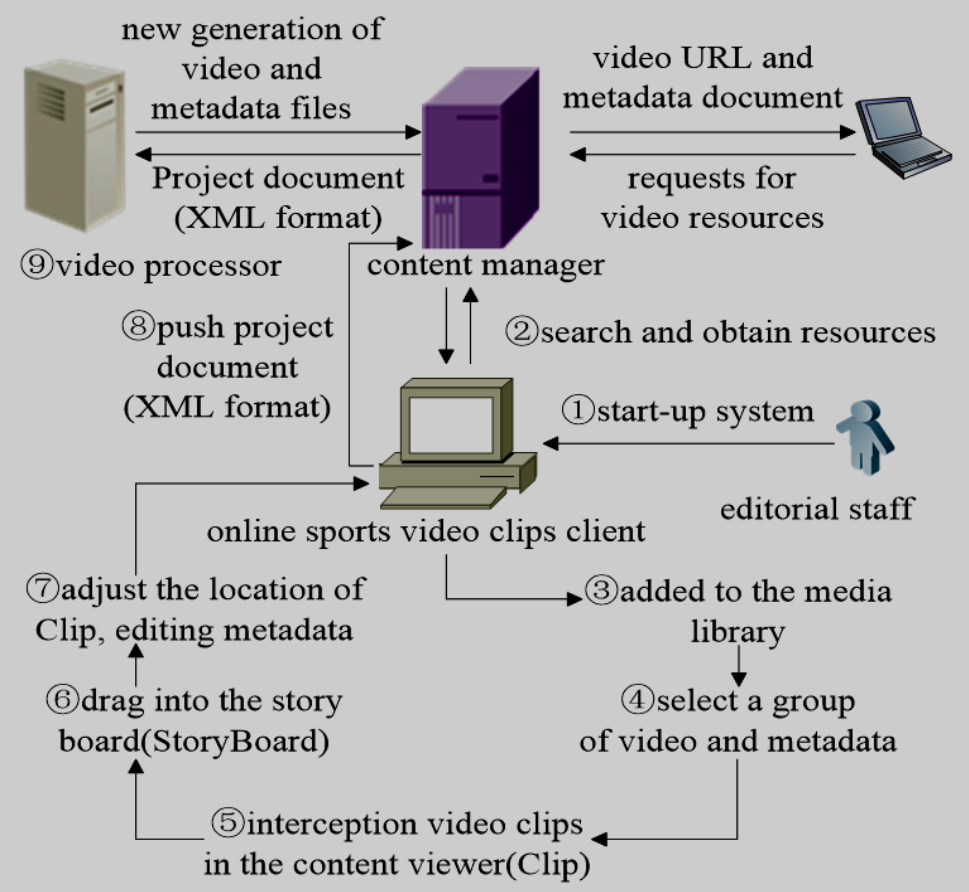

Figure 3. The flow chart of the system

According to the existing video processing technology, it is difficult to achieve direct from the machine understanding video features for retrieval. Therefore, if you want to make effective use of video retrieval, video metadata information can find an easier and effective implementation of the program, this kind of search is often called the video content based retrieval.

B. *Sports video metadata model*

The global metadata is used to describe the global of a sports video file, once the video files are edited, for example by merging a fragment of a video segment in this file and another in the video file after the formation of a new video files, so the original video file metadata is not going to be the new whole. Video file inheritance; and time metadata itself with the paragraph feature, is often as video clips of basis, should be retained in the new video files generated. In the reference and integration of various existing video metadata standards, the formation of sports video metadata model and structure of this thesis.

C. *Experiment and analysis*

For the evaluation of the effectiveness of the two indicators: the hit rate and correct rate. Among them, the hit rate of two search results

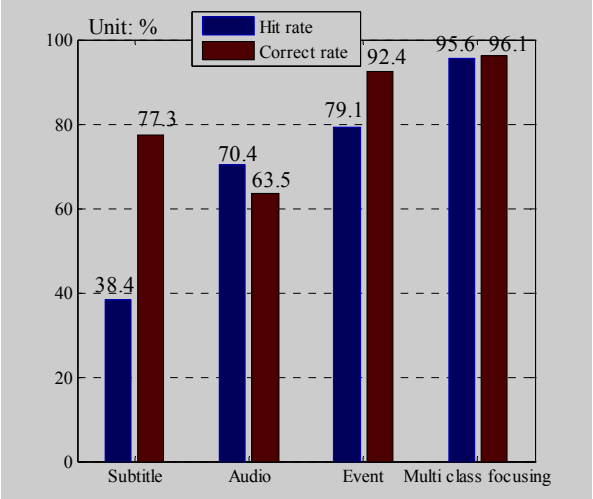

Figure 4. Hit rate and correct rate of experimental.

The number of correct items / fruit in the expected number of search results; the correct rate = search results correct quantity / total number of search results. Figure 4 experimental results show: in three the single data source information search, event information source has a higher hit rate and accuracy; caption information search accuracy is high, but its accuracy is low; the audio information search accuracy rate and hit rate. Many types of aggregation of the search results is better than a single the data source of the search results.

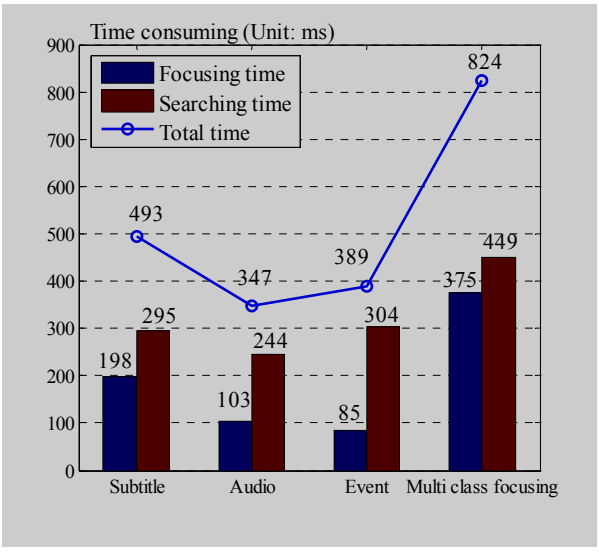

Figure 5. The Experimental Results

Figure 5 for four cases respectively, the average time (unit: ms), including the total time, gathering processing time and search time, the total time is about gathering processing time and search time and value, closed in aggregation process, the total size of three kinds of information source data file are: subtitle data file 634KB, the audio data file 502KB, event data file 838KB.

The results have certain difference preview in the preview window and content manager window preview tab: preview content manager is directed to a video clip selected a video file selected in media library or story board is concerned, here the Preview allows the user to select the correct video file, you can also help users to video clips intercept point for fine-tuning; and results in the preview window preview will be in accordance with the composition of video fragments storyboards, simulation of new generation video playback, it is in fact play the video list in order, help user generated visual impression of the video file will be generated. If the preview after the user feels satisfactory, you can enter the output settings section.

V. CONCLUSION

Attention to the user experience now, metadata in video clip system plays a more and more important position, it helps enterprise application implementation more professional requirements, but also give more advanced experience for interactive. This paper will pay attention to sports video metadata in online sports video clips in application system, starting from the has system and research results, introduces in detail the design of video metadata format, storage methods and the realization method of metadata framework, full-text search, online sports video editing system metadata editing, and client rendering extension content.

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