Implementation Measures to Expand Metadata Application Services

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Abstract

With the aim of developing metadata application services, NTT is making efforts to spread new service concepts and proposing new business areas through joint experiments with advanced users using the latest technologies.

1. Introduction

Metadata is expected to be the key to managing digital content [1] and expanding content distribution services. This article introduces the following metadata application services to expedite digital content business processes: i) the production of metadata about content, ii) distribution of metadata for searching for or navigating through suitable content for each consumer, and iii) mediation with other content/services through the use of metadata relationships.

2. Metadata production support services

Creating metadata production markets for generating content metadata and promoting everyday metadata production are important in establishing services and businesses that use metadata. A metadata production support system provides metadata generation support functions that are deemed essential to the content/metadata production workflow conducted by various entities involved in content/metadata distribution (Fig. 1).

2.1 Main functions for metadata production

Providing support functions for producers such as content holders can reduce the cost of producing content metadata. These functions include high-performance video-indexing technology [2] and interfaces that simplify video handling as well as a function for defining metadata extensions by content holder and

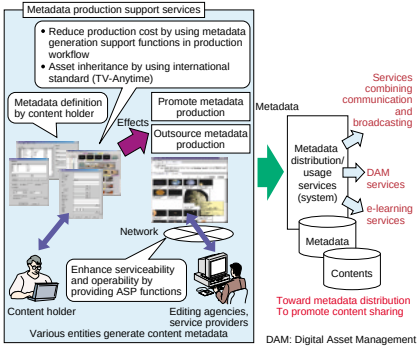

Fig. 1. Overview of metadata production support services.

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support functions in the production workflow (such as importing existing metadata). In addition, functions supporting metadata editing over the network (ASP (Application Service Provider) functions) will facilitate the establishment of location-free metadata production work and the outsourcing of metadata-provision businesses (such as editing agencies).

3. Services combining communications and broadcasting

One industry that is rapidly incorporating metadata is broadcasting. For example, Broadcast Satellite (BS) digital broadcasts in Japan are already transmitting metadata indicating program characteristics such as genre and cast list along with program content for use in electronic program guides (EPGs).

At present, standardization activities to extend metadata specifications of broadcast media and to define new metadata using XML [3] are taking place and technical proposals to convert existing metadata to XML are being made. This kind of metadata will make it possible to present viewer-based EPGs and commercial messages, to extract favorite scenes, and to play back a program digest or program highlights, for example.

3.1 The role of communications

As the use of metadata for broadcast programs expands and transmission capacity increases, it will become increasingly important to provide an efficient way of delivering metadata to viewers, to integrate broadcast-type viewing services and individual viewing services like video on demand (VOD), and to establish a method of using metadata in network control processes, *e.g.*, to guarantee quality [4].

At the same time, the trend toward individual viewing means that both metadata itself and when it is delivered will become viewer oriented, which in turn means that communication channels suitable for unicasting should be more efficient for transmitting metadata. However, to deliver program content on a broadcast channel and metadata on a communication channel, a function is needed to link the communications and broadcast systems (Fig. 2). In addition, if broadcast programs and metadata are delivered to viewers along the same optical fiber, then broadcast services and communication services will be integrated and the system for generating, delivering, and using related metadata must likewise be integrated.

4. Video portal for digital asset management

The Media Asset Management Platform [2] provides a digital asset management function that can store and manage content metadata in a flexible manner based on MPEG-7, an international standard prescribing a multimedia-content description format. It also enables diversified and high-speed content searching based on such metadata. In a joint experi-

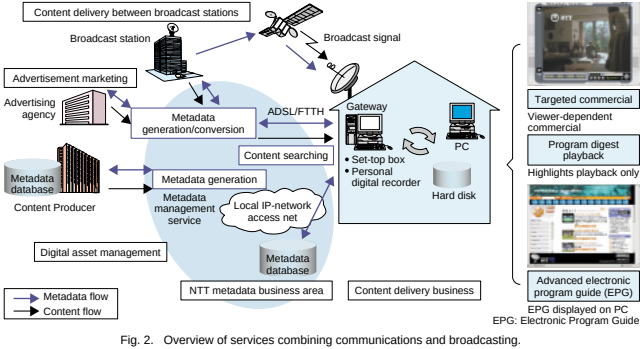

Fig. 2. Overview of services combining communications and broadcasting.

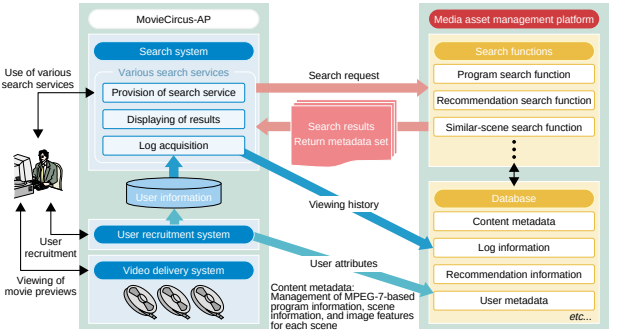

Fig. 3. Example of constructing a DAM service.

ment conducted with Toei Corporation, we investigated a video portal service called MovieCircus [5] using this platform (Fig. 3).

4.1 Metadata management

A relational database was used internally to manage data in a complex XML format. A multidimensional index was also generated for high-speed similarity searches based on visual features from representative images in a scene. These functions helped to provide high-speed searching.

4.2 Metadata searching

Content searching was made more convenient by providing product searches based on metadata such as movie genre, title, performers, and production staff; by displaying a list of scenes in a movie preview; and by providing similar-scene searches using a similar-image search function, in other words, by supporting both semantic (keyword) and emotive (image-feature) types of metadata searching. Various services based on user metadata were also provided such as restricted viewing by user age, and product rankings and recommendations based on viewing logs of each user group classified by age and sex.

5. Map-like content navigation system

AssociaGuide, a map-like content navigation system, provides a new environment for encountering content (Fig. 4). It consists of a "content exploring space", which is visualized in a spatial sense based on content metadata, and a video surfing function that operates in this exploration space. This system uses an intuitive interface to guide users through a huge volume of content provided by many content holders, which will promote the popularity of content distribution services.

5.1 Visualization of metadata

The system begins by collecting metadata using a publicly released metadata online registration tool on the Web. It then uses "genre information" and "program commentaries" to configure the content exploring space by natural language processing. Content thumbnails that correspond to similar contents are placed close to each other, which means that one item of content can lead the user to encounters with other items of content in an associative manner.

5.2 Content filtering

The system also incorporates various content filters to narrow down the content that the user encounters in the exploration space. These filters include a "new arrival filter" that presents new content or content whose broadcast time is approaching based on registered metadata; a "ranking filter" that presents popular content based on user access logs; and a "keyword-search filter" that performs full-text searches on metadata. Content thumbnails that have been filtered

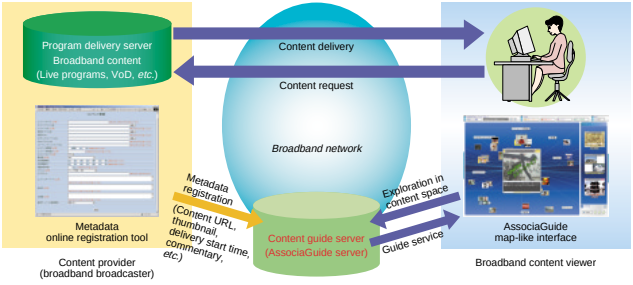

Fig. 4. Configuration of map-like content navigation system.

in the exploration space are displayed with emphasis; the user is provided with various types of "views" for examining content.

6. Hyperinteractive services

Metadata can be used to establish a link among various items of interactive content and to have them cooperate with each other. These are value-added content services that simplify and streamline the collection and organization of content as well as its distribution to people and content exchanges among people by processing the metadata affixed to individual items of content.

6.1 Interactive cinema

One example of a hyperactive service is an interactive cinema, in which interactive content associated with a drama scene is linked to the drama video itself using the VisionMark system (Fig. 5). While you are watching a drama, a VisionMark automatically appears in any scene that has interactive content hyperlinked by metadata. You can click on this VisionMark to interact with this linked content and get more details about the program. In short, interactive cinema provides a new style of enjoying content.

6.2 Interactive cinema delivery experiment

We conducted an interactive cinema delivery experiment in cooperation with Kadokawa Shoten Publishing. The results demonstrated the feasibility of providing a new type of contents service. The experiment received especially high praise from content creators for opening up not only a new form of video expression but also a new approach based on related interactive content.

7. Metadata-linked services mediation

Metadata can be used to introduce a user to products (*e.g.*, services and contents) related to content that they have shown an interest in. The user can be steered toward other distributed content or electronic commerce (EC) (Fig. 6).

7.1 Service mediation

If a user is introduced to a product and reaches a business agreement with the EC site, the mediator receives a commission (introduction and handling fees). First, the system extracts a unique ID specifying the content currently being viewed as a subject of interest to the user. Commonly used IDs include cID*1, URL*2, ISBN*3, and CDDB*4. Technology for binding such an ID to content includes digital watermarking that embeds information in the content itself without greatly affecting quality and Distributed Content Descriptor that sets metadata in a file's header or elsewhere. Using a camera to capture printed

*1 cID (Content ID): ID standardized by the Content ID Forum for identifying content.
*2 URL (Uniform Resource Locator): Method of assigning addresses to various forms of information on the Internet (rfc1738).
*3 ISBN (International Standard Book Number): Uniform code for identifying books (ISO 2108-1798: JIS X0305-1988.
*4 CDDB ID: Compact disc database ID for identifying music CDs. While not an international standard, it is widely used on the Internet.

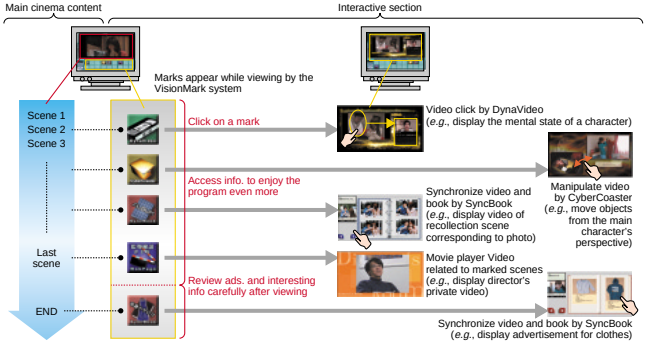

Fig. 5. Mechanism behind interactive cinema.

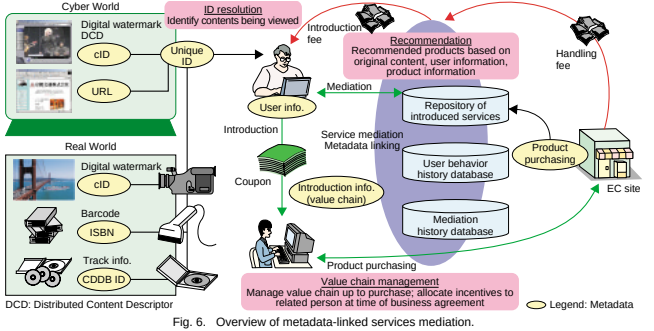

Fig. 6. Overview of metadata-linked services mediation.

matter with an ID embedded by digital watermarking or reading a bar code affixed to a book makes it possible to introduce services not only from the cyber world but also from the real world.

Next, to introduce the most appropriate products to a user, recommendations can be made based on the metadata of the content currently being viewed, of the user, and/or of the product being introduced. User metadata includes user presence (age, sex, address, terminal, line speed, *etc.*), user preferences (hobbies and tastes), and user behavior (viewing history, purchasing history, *etc.*).

7.2 Viral marketing

"Viral marketing" attempts to get users to introduce products to each, which can lead to virus-like geo-

metrical growth. It requires value chain management that tracks what service was introduced to who by which original content, who introduced a purchasing user, and what product was purchased at what EC site, for example. This system manages distributed metadata called “introduction information” in the form of coupons so that incentives can be allocated to information providers.

8. Conclusion

This article has introduced our efforts to visualize metadata application services to expand digital content businesses. We will continue to undertake research and development on metadata handling technologies and promote services that use metadata.

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