

## Design and Implementation of Digital Content Resource Registration Service System

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**Abstract**—In response to the current rampant piracy of Internet criminals and the difficulty of protecting the rights of contents authors, with reference to the existing copyright protection systems or platforms, a set of digital content resource registration and service systems have been designed and implemented. It mainly includes modules such as registration management, user management, content management, identification code management, tool management, and information push. Users can register different types of digital works metadata on the system, including but not limited to video, audio, image and other types. After user registration and system review, the system will produce and distribute copyright identification codes based on the work metadata and platform information to be released. The user can use the local tool provided by the system to load the identification code into the work, or use the tool to parse the identification code from the work. Users can use the parsed identification code as evidence for rights protection.

**Keywords:** *digital content resources; registration; copyright protection; metadata; copyright identification*

### I. INTRODUCTION

With the rapid development of the Internet, more and more creative works are uploaded to various works platforms. However, many criminals arbitrarily steal the results of others, perform simple cropping or even upload them to the work platform in their own name for illegal profit. The original creators have been obliterated because of wanton infringement and difficulty in protecting their rights. Related laws and regulations have been proposed for copyright protection both at home and abroad. The market urgently needs a copyright protection system that can protect the copyright of works and is convenient for authors to use without changing the viewing of works.

After analyzing the advantages and disadvantages of copyright protection systems at home and abroad, this paper proposes a digital content resource registration service system based on logo tracking. After the user registers the

metadata of the work in the system, the system will produce and distribute the copyright identification code. The user can load the identification code into the work using the tools provided by the system. Loading the identification code into the work will not affect the use and appreciation of the work. When defending rights, the identification code in the work can be parsed out and compared with the identification code in the server.

### II. RELATED WORK

Digital Rights Management (DRM) is currently the mainstream copyright protection system on the Internet. The DRM system protects copyright by encrypting works and generating digital licenses, and controls the use and dissemination of digital content resources<sup>[1]</sup>. In academia, there are many studies on DRM technology. For example, for the Android platform, Wang Zhen and others proposed a DRM system using the 3DES encryption algorithm<sup>[2]</sup>, which meets some requirements for copyright protection of digital content on the Android platform, but it is only limited to the Android side and can be decrypted on a mobile phone with a general configuration. The speed is slower for large files. In addition to the DRM system, there are also some other copyright protection platforms, such as a copyright management service platform based on the Digital Copyright Identifier (DCI)<sup>[3]</sup>. This type of platform is to register digital content works on the platform and form a unique DCI code and DCI certificate. Although these platforms have the function of digital content registration, the registered contents do not have any anti-piracy measures, and the issued DCI codes and certificates cannot achieve permanent and unique binding with the content. Even if pirated contents are discovered, the process of confirming, tracing pirated contents is cumbersome and may require additional costs.

In practical applications, many well-known companies and enterprises at home and abroad have adopted DRM technology. Their overall functional design and technology are similar, but they differ only in some details. For example, the FairPlay system of Apple's iTunes company in the United

States<sup>[4]</sup> only supports a few limited content formats. It was used in iTunes in 2003 and stopped in 2009. The Uplay system<sup>[5]</sup> of Ubisoft, a well-known game manufacturer in France, has long been criticized by players. Because its DRM system is often cracked within one month of the release of new contents, users must connect to the Internet when using their contents, otherwise they will be kicked out, Ubisoft's servers often have various problems causing users to be disconnected frequently. Many players who support genuine products will even choose to purchase genuine contents to use pirated contents. China's Haihaisoft's DRM-X digital copyright protection system<sup>[6]</sup> is a relatively well-known DRM platform in China. However, in order to ensure the safety of DRM, users must use customized software when using their published contents. A lot of trouble has come, and the experience of using customized software is not as good as that of popular players or readers on the market. Among the registered copyright protection platforms, the more well-known is China Copyright Protection Center<sup>[7]</sup>, which is a digital content registration copyright protection platform based on the DCI system, which can provide users with functions such as rights protection and copyright identification in copyright services. Its shortcomings are also obvious. First, the registration process is more troublesome and takes a long time. When pirated contents are discovered, rights can't be confirmed as soon as possible, and additional time and money are required for copyright identification.

The existing copyright protection system on the market is mainly DRM, which is also a system with higher technical content. These systems are similar in usage and protection technology. The digital content needs to be encrypted first, and the system generates a digital license and saves it on the user's computer and server. When using, users must verify whether the digital licenses at both ends are the same. In order to prevent digital licenses from being destroyed, many DRMs often require special software to use digital contents. In addition to DRM, there are some copyright protection platforms and systems with low technical content. They only issue identification codes based on the content information, which are of little use and are beyond the scope of this article. At present, there are some DRMs on the market that are relatively mature, but still have some difficulty to overcome problems. This article proposes some solutions to these problems:

- 1) The DRM system must be connected to the Internet when verifying the user key or digital license, but it is easy to be cracked by hackers during transmission. The system described in this article packages the copyright identification loading and analysis tool into a whole for users to use. After the user downloads it locally, the copyright identification is loaded and analyzed locally. The process of loading and analysis does not need to be connected to the Internet, and the user does not need to upload the content to the system, and there is no need to worry about being intercepted or cracked during the transmission of the content.

- 2) In order to ensure the security of the algorithm, the DRM system will use a complex encryption algorithm. After

encryption, the file and digital license will be packaged into a DRM file. However, it turns out that the encryption algorithm can be easily cracked and intercepted by hackers. Digital watermarking technology is to protect copyright by adding some digital information to digital content such as images, audios, and videos. This system adopts the digital watermark technology independently developed by the research group<sup>[8]</sup>, which guarantees robustness, security and stability<sup>[9]</sup>. The watermark algorithm is difficult to crack, which reduces the risk of malicious deletion of copyright signs by illegal elements.

- 3) The DRM file after the DRM system packs the file and the license requires customized software to be used normally. DRM of different platforms is almost incompatible. This is contrary to the Internet's pursuit of simplification. On the other hand, the user experience of customized software provided by the DRM system is much different than that of professional software on the market. Some DRM systems even run in the background all the time, continuously occupying CPU and memory. Since the copyright identification technology will not produce changes that can be distinguished by the human senses of the content, nor will it change the file format and usage methods, the users of the content do not need to download and use additional customized software, and they will not feel that the content is embedded with the copyright mark.

The system proposed in this paper is improved based on the above-mentioned shortcomings of the DRM system. The user first needs to register the metadata of the content in the system. After passing the review, the system will generate a copyright identification code based on the metadata. After selecting the platform that you will release, you need to apply for an identification code again based on the selected platform information. After the review is successful, the system will issue an identification code based on the platform information. After the user downloads the copyright identification loading and analysis tool from the system, the identification code can be loaded or extracted when the local network is disconnected. After loading, you can publish the content to the corresponding content platform. This system effectively solves the existing problems of easy interception of contents, separation of content and copyright information, and limited dissemination and use, which greatly improves user experience and fundamentally improves the level of digital content resource copyright management and services.

### III. DESIGN OF DIGITAL CONTENT RESOURCE REGISTRATION SERVICE SYSTEM

#### 3.1 System architecture and functions

According to the overall functional requirements of the system and the problems to be solved, the digital content resource registration service system architecture is mainly composed of the following six functional modules, each of which is composed of several small functional modules, as shown in Figure 1.

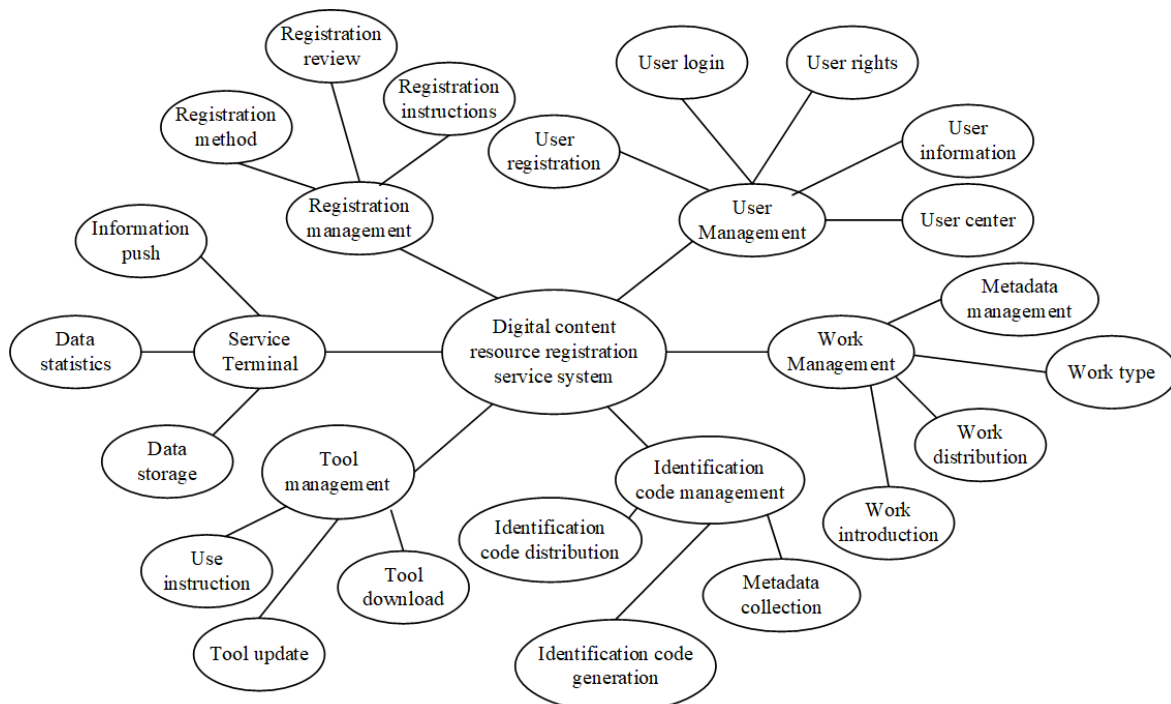


Figure 1. System architecture diagram

The main function:

1) User management. It is mainly for the management of user login registration, user type, user information, user authority settings, and user personal center functions. Users can be divided into individual ordinary users, enterprise users, and administrators. Different types of users have different authority requirements.

2) Contents management function. It is mainly for the management of contents metadata, content type, content distribution, content introduction and other functions. Metadata is data describing the data of the content. Different types of contents have different metadata. Content distribution means that after obtaining the identification code issued by the system, the user can use the copyright identification code loading and analysis tool to load the copyright identification, and then distribute the content to the selected social platform or content platform. The content introduction is a brief introduction to the content.

3) Identification code management function. The system will collect content information provided by users, that is, content metadata. Metadata will be converted into an identification code composed of English letters, numbers and other symbols according to the encryption algorithm. After the identification code is generated, it is stored in the database and distributed to users. The user can use the loading tool provided by the system to load the identification code into the content. The process of loading and parsing the identification code does not require networking. The user can also use the analysis tool to parse the identification code in

the content and compare it with the identification code stored in the server.

4) Tool management function. The system encapsulates the loading and analysis technology of the digital content copyright identification into a tool, and the user only needs to download the tool locally in the system to use it locally. The tool is also very easy to use. The user only needs to import the digital content file and the identification code assigned by the system into the tool according to specific rules to get the file with the identification code. These files can be saved for possible comparison in the future, or can be distributed to other platform. The extraction process also only needs to parse the document with the identification to obtain the identification code, which is used to compare with the identification code distributed by the system for rights protection. The flowchart is shown in Figure 2.

5) Server side. Server-side functions mainly include data storage, information push and data statistics functions. This system only needs to store user registration information and content metadata, and does not require users to upload original contents. The simplest way to implement information push is to send emails to remind users of some to-do items. On the one hand, statistics are to show users website-related data and contents-related data, and on the other hand, administrators use internally to analyze system data.

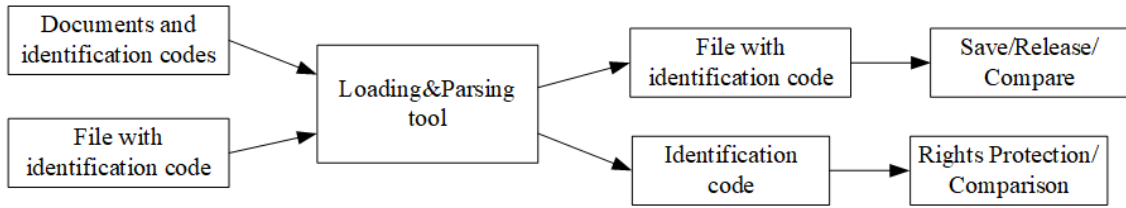


Figure 2. Flow chart of identification embed and extract tool

6) Registration management function. Registration is the key function of this system, which mainly includes registration instructions, registration methods and identification code issuance. The registration instructions are for the convenience of users who are not familiar with the registration process. For most users, the registration method is generally a single upload, and the batch upload function is also provided. After the content is registered, the content must be reviewed. Those who pass the review can be issued an identification code, and those who fail the review need to be reviewed again.

### 3.2 Registration Process

The user needs to register when using the system for the first time, and an audit will be conducted during this process. After logging in, you can start to register your content. First, the user should fill in the registration form based on the metadata of the content, and wait for review after submission. If the review fails, you can rewrite the submission or apply for manual review intervention. The system will issue an identification code once the registration form is approved. After the first review, the user can submit and review the registration form for the second time based on

the platform information to be released, and the system will issue the identification code again based on the platform information. After the user gets the identification code, he can download, load, and analyze tools from the system. The process of loading and parsing can be done offline, without internet connection. The content after loading the logo can be directly published by the user to the selected platform for dissemination. The flowchart is shown in Figure 3.

Generally speaking, there are two possibilities for users to discover that their own contents have been infringed. One is that users find themselves or receive fans reporting that someone has stolen user contents. Users can put digital content contents into analysis tools to obtain identification codes as evidence of rights protection. The other can be connected to the copyright monitoring system of the research group. The copyright monitoring system will monitor suspected infringing contents on the entire network. Once found, the contents will be crawled down and the identification code will be extracted and compared with all identification codes in the database. Once the identification code the copyright owner will be notified of the match. Figure 4 is a flow chart of infringement discovery.

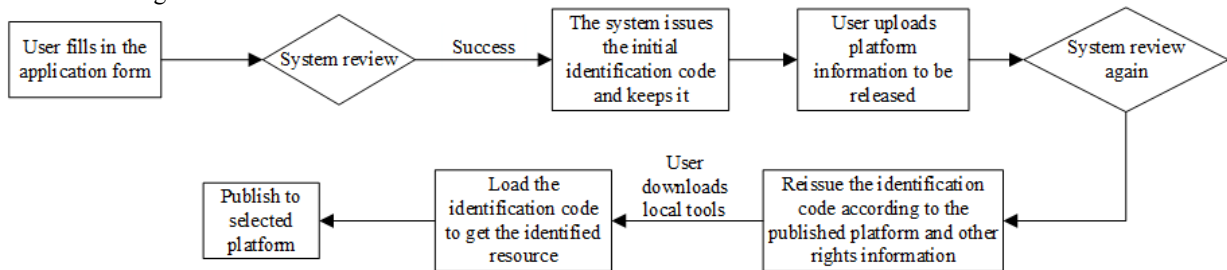


Figure 3. Flow chart of registration

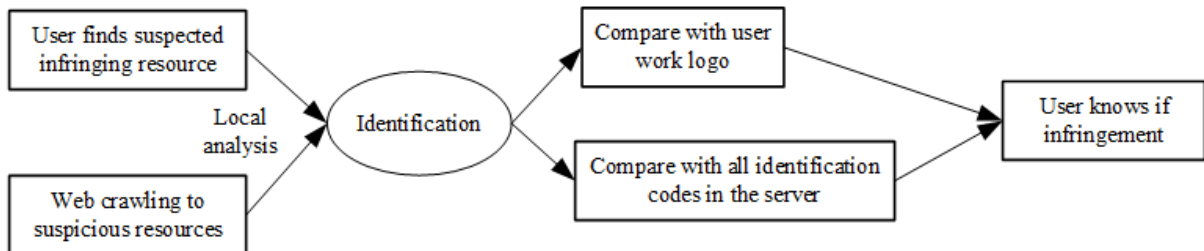


Figure 4. Flow chart of infringement found

### 3.3 Standards and specifications

For a specific content, you need to fill in the content metadata according to the form provided by the system when registering. The metadata of the content will be transformed into an identification code composed of English letters, numbers and other symbols in the background. The basic content information that must be filled in includes: content name, author, release (creation) date, size, etc. It is best to submit more complete content information, which can increase the chance of review and ensure the security of the content information. Different types of contents have different contents metadata. For example, audio and video contents have content duration, while image contents do not have this metadata. Metadata generally includes Chinese name, English name, value type, length, value range, selectivity, remarks, etc.

In the pursuit of uniformity and rigor, this system mainly produces specifications and standards based on two aspects, namely "Digital Media Content Copyright Mark Generation Standard" and "Digital Media Content Copyright Registration Specification". Among them, the copyright identification generation standard and registration specification are mainly supported by digital content metadata, including video<sup>[10]</sup>, image<sup>[11]</sup>, audio<sup>[12]</sup> metadata forms based on national standards. Table □ provides a brief metadata form for reference.

TABLE □. METADATA FORM

English name	Ranges	Remarks
Title	indefinite	Content's title
Author ID	GB 11643-1999	Author's ID number
organizing/institution code	GB 11714-1997	Organization or social credit code
Date	GB/T 7408	Date related to the content
Format	IMT	Content format
Time	indefinite	Duration of the content, image contents do not have this item

## IV. SUMMARY

Based on some existing digital rights management systems and digital content registration systems on the market, this paper proposes a new registration service system for digital content resources based on identification tracking. The system allows users to register contents metadata and platform information on it, and the system generates and issues identification codes based on this information. After obtaining the identification code, the user can use the tools provided by the system to load and analyze the identification code locally without networking. Users do not need to upload their own contents to the system. The copyright identification loading and analysis

technology uses the digital watermark technology independently developed by the research group, which is generally difficult to crack. The loaded identification code cannot be destroyed even if the criminal gets the identification code of the content or the tool provided by the system. No additional custom software is required after the content loads the identification code. There is no difference between the experience and method of users when using digital content contents normally and using original contents. When digital content authors monitor infringing contents through the entire network or independently discover infringing contents, they can download the content locally, use a parsing tool to parse the identification code from the content, and compare it with the identification code issued to the user by the system. Rights protection, such as reporting to the content platform or directly contacting pirates and showing relevant evidence, greatly simplifies the process of confirming the rights of contents.

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