Service Model Innovation for Medical Literature Information Resources Aimed at Publication Content Enhancement: Postprint

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Abstract

[Objective/Significance] Medical literature information resources constitute an essential prerequisite for users to acquire medical knowledge and conduct medical research. However, existing medical literature information resources exhibit problems such as unstructured data and singular presentation formats. Consequently, this paper proposes a content enhancement framework for medical publications in order to provide users with improved services for the organization and utilization of medical resources.

[Method/Process] Guided by semantic publishing, CMeSH (Chinese Medical Subject Headings) medical subject terms are integrated into the processes of element identification, semantic mapping, semantic description, and multi-dimensional association to achieve the transformation from traditional medical publications to enhanced medical publications. Meanwhile, taking pediatrics as the application context, an instance of medical publication content enhancement is constructed to verify the feasibility of digital publishing content enhancement in medical literature resource services.

[Results/Conclusion] The study finds that through a series of content enhancement processes, traditional medical publications can be transformed into enhanced medical publications, thereby optimizing the user learning process for medical knowledge and enabling efficient learning.

Full Text

Innovation in Medical Literature Information Resource Service Models Oriented to Publication Content Enhancement

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Abstract:
[Objective/Significance] Medical literature information resources are essential prerequisites for users to learn medical knowledge and conduct medical research. However, existing medical literature information resources suffer from problems such as unstructured data and monotonous presentation formats. This paper proposes a content enhancement scheme for medical publications to provide users with better organization and utilization services for medical resources. [Method/Process] Guided by semantic publishing, the Chinese Medical Subject Headings (CMeSH) are integrated into processes of element recognition, semantic mapping, semantic description, and multi-dimensional association to transform traditional medical publications into enhanced medical publications. Using pediatrics as the application context, this study constructs a medical publication content enhancement example to verify the feasibility of digital publishing content enhancement in medical literature resource services. [Result/Conclusion] The study finds that through a series of content enhancement processes, traditional medical publications can be transformed into enhanced medical publications, thereby optimizing the user learning process for medical knowledge and enabling efficient learning.

Keywords: content enhancement; digital publishing; medical literature information resources; CMeSH; semantic publishing
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With the advent of the big data era, medical information resources have grown exponentially, making massive medical information resources a burden for users seeking medical knowledge. In fact, as medical research accelerates, digital publishing has become the primary publishing method for medical academic journals. However, existing digital publishing suffers from monotonous patterns, poor document interactivity, and a lack of professional medical content interpretation. Content enhancement provides a solution to these problems in medical literature information resources. Content enhancement is an enhancement behavior in the digital publishing process, and semantic publishing is an effective approach to achieving digital publishing content enhancement. Content enhancement, guided by semantic publishing, possesses the characteristics of semantic publishing and serves as an important method for enriching publication knowledge content and presentation methods. This paper employs semantic

publishing technologies to propose new ideas and models for medical literature information resource services oriented to content enhancement, aiming to enhance the readability of medical publications while ensuring their standardization, improve the academic publishing function of medical literature, increase the utilization of medical literature information resources, and ultimately provide users with more systematic and comprehensive medical literature information resource services.

Related Research

To conduct research more scientifically and effectively, it is necessary to summarize and analyze the research objects and methods involved through literature research methods. Digital publishing content enhancement and medical literature information resource construction and service constitute the research foundation of this paper.

Digital Publishing Content Enhancement Research

Digital publishing is a publishing method that uses digital technology to edit and process content and disseminates it through computer networks [1]. Digital publishing content enhancement is guided by semantic publishing, possesses the characteristics of semantic publishing, and represents a form of semantic-enhanced publishing [2]. Internationally, the Royal Society of Chemistry (RSC) was the first to explore digital publishing content enhancement, continuously achieving dynamic expansion of scientific papers from single articles to "Rich-HTMLarticle" through rich text markup language [3]. Subsequently, Elsevier conducted deep indexing of massive medical information resources, facilitating users' access to more comprehensive resources on the same platform [4]. The Nature Publishing Group used linked data to improve the content derivation capability of literature, effectively helping users obtain more comprehensive and logical journal resources [5]. To date, foreign digital publishing content enhancement has achieved certain results, with smart articles [6], articles of the future [7], and ubiquitous articles [8] launched by various platforms becoming important manifestations of digital publishing content enhancement. Domestic research on digital publishing content enhancement started later than abroad. The Chinese Medical Association launched a Chinese medical journal storage and exchange standard based on the Journal Article Tag Suite (JATS), effectively achieving resource integration for its journals and taking a crucial step toward full-text digital publishing of Chinese medical literature [9]. Cui Yujie et al. [10] proposed new ideas for journal digitalization construction by discussing the dissemination content of enhanced publishing. Song Ningyuan et al. [11] conducted comparative analyses of various enhanced publication models. Zhu Linfeng et al. [12] summarized development strategies for Chinese academic journal content enhancement by reviewing relevant practices in digital publishing content enhancement both domestically and internationally.

Both domestically and internationally, research on digital publishing content

enhancement cannot be separated from the discussion of semantic issues. In fact, semantic publishing is an advanced form of digital publishing, and digital publishing content enhancement serves as an important transition from digital publishing to semantic publishing. Therefore, it is necessary to introduce semantic publishing when discussing digital publishing content enhancement issues. D. Shotton first proposed the concept of semantic publishing in 2009 [13], and Wang Xiaoguang et al. introduced the concept of semantic publishing to China in 2011 [14]. Subsequently, Su Jing et al. [15] compared digital publishing with semantic publishing, finding that digital publishing emphasizes the open sharing and reuse of scientific data, while semantic publishing focuses more on using technologies such as linked data to promote the rich semanticization of literature content. Li Nan et al. [16] summarized the technical framework of semantic publishing by analyzing relevant practices both domestically and internationally. Le Xiaoqiu et al. [17] launched Dpaper, a structured paper writing tool for semantic publishing, in 2016, which to some extent achieved the structuring of papers during the writing stage and became an important practice in Chinese semantic publishing.

Through long-term research by scholars, digital publishing has achieved relatively mature research results. However, digital publishing still cannot solve problems such as monotonous presentation of academic resources and lack of in-depth content processing. Semantic publishing, which focuses on deep content and mining semantic information, opens up new ideas for digital publishing. However, it is worth noting that due to limitations in Chinese semantics and technical difficulty, directly applying semantic publishing to Chinese literature information resource construction presents certain difficulties. Therefore, digital publishing content enhancement oriented to semantic publishing becomes a better choice for literature information resource services.

Medical Literature Information Resource Construction and Service Research

Literature information resources are a collective concept with a broad scope, including professional literature information resources categorized by disciplinary characteristics, among which medical literature information resources represent an important category. Foreign practices in medical literature information resource construction are relatively mature. As early as 2004, the European Medicines Agency built a clinical trial data platform to provide centralized information sharing services for researchers conducting clinical trials [18]. Additionally, the U.S. National Center for Biotechnology Information aggregated medical literature from over 100 journals to build an important platform for medical retrieval [19]. In contrast, domestic medical information resource construction and service are still in the initial and rapid development stages. On the one hand, researchers consider medical libraries as important foundations for medical literature information resource construction and sharing, thus discussing from the perspective of medical libraries, such as Fang Fang et al. [20]

who introduced the practice exploration of the Fudan University Library Consortium in terms of resource ordering and librarian training. Cheng Hong et al. [21] conducted feasibility and necessity analyses for building provincial medical digital library consortia. On the other hand, more researchers utilize new technologies to explore possibilities in medical information resource construction, such as Su Chunping et al. [22] who proposed a medical library information service model based on semantic web and SOA technologies to provide medical semantic intelligent retrieval services for medical professionals. Zhang Junliang et al. [23] used semantic association technology to build a multi-source information resource discovery system to provide scientific research and clinical decision-making services for clinicians. Zhai Shanshan et al. [24] combined knowledge retrieval with faceted retrieval to construct a faceted retrieval system for online medical communities for chronic diseases.

It is not difficult to find that compared with other types of literature information resources, medical literature information resources have a higher degree of structuring and have achieved certain research progress. However, some obvious problems remain: (1) In terms of resource distribution, although China has accumulated massive medical literature resources through long-term medical research and practice, these resources are widely distributed across different medical fields and institutions. Systematic construction of medical resources across hospitals, regions, and fields is very difficult, with a relatively obvious "information silo" phenomenon. (2) In terms of resource presentation, medical literature has a monotonous presentation format, with PDF still being the most common resource acquisition format. Constrained by this, medical literature lacks sufficient association, and knowledge mining of highly professional medical literature cannot be conducted. (3) In terms of resource description, although many scholars have attempted to optimize medical literature services using new technologies such as ontologies and knowledge graphs, China still lacks a unified and professional medical metadata scheme. Additionally, the lack of domain ontologies and public ontologies also means that medical literature construction lacks basic conditions. (4) In terms of resource services, domestic medical resource platform construction is not perfect, and users still need to spend considerable effort identifying key information, which places high demands on users' information retrieval and identification capabilities. Therefore, this paper proposes a content enhancement-oriented medical literature information resource service framework, hoping to provide solutions to existing problems in Chinese medical literature information resources to a certain extent.

Overall Approach to Innovation in Medical Literature Resource Publication Content Enhancement Services

Under the guidance of content enhancement, medical literature information resource services have generated a series of new demands. This paper designs an overall scheme for medical literature resource publication content enhancement based on these demands.

New Demands for Content Enhancement-Oriented Medical Literature Information Services

In the long-term exploration of medical research and practice, literature information resources have become the primary means of condensing medical achievements. However, as the academic research process continues to accelerate, users increasingly pursue medical literature information resources with clear structure, highlighted key points, diverse presentation, and rich content, hoping to accelerate the medical knowledge learning process while improving resource utilization efficiency. Traditional medical publications based on conventional digital publishing mostly present content in text form, and constrained by disciplinary attributes, their content is often obscure and difficult to understand. Even medical workers with disciplinary backgrounds need to spend considerable time and energy on medical research. During this lengthy learning process, large amounts of valuable medical literature information resources are missed or even ignored, making medical literature information resource learning often half as effective for twice the effort. Compared with traditional digital publishing, medical enhanced publications after content enhancement have significant advantages in content expression and knowledge expansion, achieving content enhancement mainly from the following four aspects:

Enhanced Structuring of Publications For a long time, traditional bibliographic items could meet users' basic cognitive needs for publications. However, as publications are organic entities with rich connotations, users still need to go through complex reasoning processes to acquire knowledge from them, which places high demands on individual capabilities. Therefore, digital publishing content enhancement needs to structure traditional medical publications from two aspects: on the one hand, medical enhanced publications retain traditional metadata publishing methods, such as keywords, titles, institutions, and other information; on the other hand, based on traditional metadata publishing methods, digital publishing content enhancement combs through the reasoning process of publications, introduces functional structures into enhanced publications, emphasizes information such as problems, hypotheses, methods, data sources, empirical evidence, and conclusions, and annotates them to help users sort out reasoning processes and quickly locate key information. After structural processing, medical enhanced publications present effective information to users in the most intuitive way, greatly accelerating users' acquisition of medical knowledge.

Enhanced Semanticization of Publications Deeply mining content semantics at the content level is a key condition for users to acquire medical knowledge. On the one hand, medical publications contain numerous content elements. Simply and effectively presenting content elements and their relationships is a basic prerequisite for users to quickly grasp key information. Therefore, it is particularly crucial to analyze content elements such as graphs, tables, definitions, formulas, datasets, and algorithms. On the other hand, knowledge acquisition is the ultimate goal of users reading publications. Therefore, medi-

cal enhanced publications fully mine medical entities, entity types, and entity attributes based on knowledge, and fully utilize knowledge tools such as knowledge graphs to assist users in understanding resources, thereby promoting the maximization of resource knowledge value.

Enhanced Richness of Publications Enhanced publishing enriches medical publications from two aspects to provide users with richer services: on the one hand, enhanced publication content is more abundant, including not only text, charts, and audio information but also adding data information such as user retrieval, browsing, downloading, borrowing, ordering, and commenting. Effective log data or UGC data makes personalized services for users possible; on the other hand, the richness of metadata in medical enhanced publications is enhanced. Based on controlled vocabularies, medical descriptive metadata flexibly defines resource structures and their characteristics, effectively alleviating compatibility issues during resource integration. In addition to descriptive metadata, medical enhanced publications also contain rich administrative metadata, better meeting user needs through access and usage information and resource feedback.

Enhanced Open Association of Publications Under traditional publishing, medical publications contain limited data and information. Users need to conduct certain retrieval behaviors to ensure comprehensive knowledge acquisition. Therefore, it is necessary to associate as many relevant resources as possible with publications. The open association of medical enhanced publications is divided into two types: explicit association and implicit association. Through explicit association, medical enhanced publications link references, citing literature, and cited literature with direct link relationships to achieve the transformation and application of extended content, meeting users' greater needs for information acquisition and transmission. Through implicit association, medical enhanced publications establish association relationships between entities and their attributes based on knowledge, achieving horizontal expansion and vertical extension of medical publications from both internal and external association perspectives.

Overall Scheme Design for Medical Literature Resource Publication Content Enhancement

Traditional digital publishing includes processes such as manual intervention, structure recognition, and format parsing, which are cumbersome and yield unsatisfactory final presentation effects [25]. Semantic publishing mainly includes three processes: semantic element recognition and description, semantic relationship revelation and association, and semantic network display and interaction. This paper simplifies the digital publishing process and combines it with semantic publishing to propose an overall framework for medical publication content enhancement, as shown in Figure 1 [Figure 1: see original paper].

As shown in Figure 1, the overall framework for medical literature resource publication content enhancement consists of two major parts: implementation process and innovative services. Traditional medical publications undergo four steps—element recognition, semantic mapping, semantic description, and multi-dimensional association—to achieve digital publishing content enhancement, with the results called medical enhanced publications. Medical enhanced publications achieve content enhancement of medical literature information resources from four aspects: degree of structuring, degree of semanticization, degree of richness, and degree of open association. In fact, traditional medical publications lack deep processing of content, and the medical literature services users actually obtain are very limited. Therefore, users need to spend considerable time understanding obscure and dry professional medical knowledge, resulting in low knowledge conversion efficiency. Medical enhanced publications provide users with more comprehensive, flexible, and complete services from retrieval, reading, and acquisition aspects, laying the foundation for user knowledge exchange during the publishing stage.

Implementation of Enhanced Medical Publication Innovation Service Model

Through the processes of element recognition, semantic mapping, semantic description, and multi-dimensional association, traditional medical publications are transformed into enhanced medical publications, achieving service mechanism innovation from three aspects: retrieval, browsing, and resource acquisition.

Element Recognition

Semantic elements can reflect the semantic characteristics of resources, so it is necessary to mine the semantic elements of resources and analyze their internal logical relationships. Traditional medical publications are often limited to coarse-grained knowledge units. To achieve content enhancement of medical publications, it is necessary to present the potential knowledge contained in publications in the most intuitive way possible. Medical publications contain rich and complex professional medical content, so they need to be split to identify key elements from different fragments (as shown in Figure 2 [Figure 2: see original paper]). Element recognition for medical content enhancement proceeds from two aspects: external characteristics and semantic characteristics of medical publications.

External characteristics are the basic bibliographic field information of traditional medical publications, such as publication source, institution, and author information. The external characteristics of medical publications are distinct and easy to obtain. In fact, through long-term exploration and research in academic journals, bibliographic external information has become an effective field for precise expression. Therefore, fully grasping and recognizing the external

characteristics of medical publications is very necessary, and recognizing the external characteristics of medical publications is also a necessary prerequisite for launching medical literature information resource content enhancement. Semantic characteristics require going deeper into the content level of publications, identifying and analyzing semantic elements from multiple levels such as chapters, words and sentences, and pragmatics. Through semantic elements, the knowledge connotation of medical literature resources is reflected, and these elements combine to form several knowledge units rich in knowledge information, which are key points for users to understand and learn medical publications.

Element recognition is the primary prerequisite for medical publication content enhancement. Through element recognition, complex medical publications are structured at the source. Users do not need to study them word by word but can directly conduct detailed and appropriate, prioritized knowledge learning with the assistance of medical enhanced publications. Medical enhanced publications filter out redundant information for users to a certain extent, directly presenting necessary key information to users, making it possible for medical researchers to conduct efficient deep learning.

Semantic Mapping

Semantic mapping is a key step in medical literature information resource content enhancement. Semantic mapping maps the split bibliographic elements and semantic elements. Semantic mapping needs to fully utilize the CMeSH subject heading list. CMeSH, or Chinese Medical Subject Headings, is a controlled medical thesaurus compiled by the Institute of Medical Information of the Chinese Academy of Medical Sciences. Describing medical literature information resources with CMeSH subject headings is an important form of organization and expression in authoritative biomedical literature databases. Using medical standardized terms can effectively eliminate ambiguous phenomena such as "same word with different meanings" and "different words with same meaning." It is worth mentioning that CMeSH expresses literature themes through concept coordination. These standardized terms are based on conceptual logic and inherently contain semantic relationships such as synonymy, subordination, and relevance under the 加持 of the thesaurus. In addition, CMeSH arranges subject headings that are unrelated in the alphabetical list in a step-by-step manner according to disciplinary systems and logical relationships, generating a tree structure table with distinct hierarchical relationships. Users can use the CMeSH subject tree for knowledge exploration.

As a standardized subject heading list, CMeSH's expressions differ from commonly used natural vocabulary. For example, the free term "小儿麻痹" corresponds to the subject term "脊髓灰质炎." To achieve standardized description of resources and to more fully utilize the semantic relationships inherent in CMeSH, it is necessary to achieve mapping from user free terms to CMeSH vocabulary. Sun Haixia et al. [26] integrated biomedical word length and CMeSH semantic relationships to propose an automatic semantic mapping scheme from

free terms to CMeSH subject headings (as shown in Figure 3 [Figure 3: see original paper]). The mapping from free terms to CMeSH standardized subject headings follows two accuracy principles of CMeSH: (1) The longer the CMeSH subject term, the more accurate the concept expressed; (2) In the CMeSH thesaurus, the farther from the root node, the more accurate the concept expressed. Based on this, the basic process for mapping free terms to subject terms is determined: (1) Use word segmentation technology to set a threshold; words below the threshold are not saved as keywords and can be directly excluded, while those above the threshold are retained for continued subject term mapping. (2) When there is a unique subject term, directly establish the mapping relationship between the free term and the subject term. (3) When there are multiple subject terms and a common 上位 subject term exists, select the nearest common 上位 subject term (when there are multiple nearest common 上位 subject terms, compare paths and select the longer one; if path lengths are the same, select the longest string; if both are the same, select randomly). (4) When subject terms are not unique and no common 上位 term exists, select the longest string with the highest similarity. This paper uses the mapping scheme to map identified free terms to CMeSH subject terms and stores these standardized terms as metadata keyword items in the database to ensure standardized description of medical resources.

Semantic Description

Semantic description is the central step in medical publication content enhancement. Metadata-related technologies are the implementation method for content enhancement semantic description. Metadata is data about data, used to understand and interpret resources. By establishing a metadata scheme for full-text semantic description of publications, it can effectively assist in the open access of medical literature information resources and explain semantic information from a micro perspective. For medical literature information resources, there are two common types of metadata schemes: one directly uses DC metadata, only expanding restricted attributes; the other is based on DC metadata, combined with CMeSH to propose new metadata fields. This paper draws on the MCM (The Medical Core Metadata) metadata scheme [27], which directly reuses 15 DC metadata elements and expands some restricted attributes based on the CMeSH thesaurus. In addition, this paper references the "News Publishing Content Resource Processing Standards" to add a core element "processing depth identifier" to identify the depth of resource content revelation, with values of "no processing, coarse processing, deep processing" corresponding to different granularities of resource presentation, ultimately forming a complete medical literature information resource metadata scheme, as shown in Table 1 .

Semantic description is the foundation for multi-granularity resource presentation. Traditional medical publications mostly display resource content in full-text units. Coarse-grained resource presentation lacks focus and is not conducive to user knowledge acquisition. To meet users' multi-granularity information

needs, it is necessary to use semantic technologies to improve traditional single-granularity information organization methods. Variable-granularity medical literature information content reorganization is based on traditional coarse-grained publishing methods, adding medium-granularity and fine-grained knowledge organization methods. Variable-granularity content reorganization uses keywords as the smallest knowledge units. Through CMeSH semantic mapping, this paper converts keywords contained in content into subject terms, thereby aggregating all resources containing the same subject terms together (as shown in Figure 4 [Figure 4: see original paper]). Through content reorganization, more intuitive medical information can be presented to users, and variable-granularity resource presentation provides users with more learning methods, allowing them to choose resources with different presentation methods according to their needs.

Multi-Dimensional Association

Multi-dimensional association is a necessary process in medical publication content enhancement, aiming to enrich medical publications with effective external resources to help users acquire as much knowledge as possible with minimal browsing and retrieval. This paper uses linked data technology to achieve multi-dimensional association of medical literature information resources from two perspectives: explicit association and implicit association.

Explicit association refers to associations with directly obtainable link relationships, such as references, requiring no processing and directly using existing link relationships for association. Implicit association refers to association relationships that require processing, divided into internal association and external association, establishing relationships between entities and their attributes. Internal association refers to resource association achieved based on basic bibliographic features of medical publications, such as author collaboration networks, institutional co-occurrence, and keyword co-occurrence. Currently, internal association under traditional bibliographic items is relatively mature and can be directly constructed using knowledge graph tools. External association is based on semantics or knowledge elements. This paper uses mapped CMeSH subject terms as the basis for association, where different granularities of knowledge units can demonstrate different levels of semantics. It should be emphasized that external association includes associations established between medical publications and other linked datasets on the network. Figure 5 [Figure 5: see original paper] shows the association between medical literature and six types of external resources: medical-related responsible persons, medical conferences, medical institutions, medical projects, medical databases, and medical encyclopedias, where associations between instances are revealed through class attributes [28].

On the one hand, medical enhanced publications have good dynamic characteristics supported by HTML technology, thus breaking the static limitations of traditional medical publications and effectively achieving dynamic expansion of medical content. On the other hand, enhanced medical publications impact iso-

lated island barriers to a certain extent through multi-dimensional association, thus assisting users in conducting scientific research.

Medical Content Enhancement Platform Service Innovation Mechanism

The process of knowledge service is a process of meeting user needs, and meeting users' knowledge needs is also the core of knowledge services. This paper innovatively introduces the CMeSH medical subject heading list into publication content enhancement according to the characteristics of medical publications, meeting users' multi-level medical knowledge acquisition needs from retrieval, browsing, and resource acquisition aspects.

Retrieval Innovation Users can directly conduct free term retrieval and knowledge element retrieval on the medical content enhancement platform. Medical literature information resources contain a large amount of professional medical vocabulary. Using professional vocabulary for retrieval can yield more precise resources, but correspondingly, non-professionals cannot master effective professional vocabulary and mostly use free terms for retrieval. Through the "free term (keyword)-CMeSH subject term" mapping established in this paper, users can directly use free terms for retrieval and obtain relatively precise medical resources. As shown in Figure 8 [Figure 8: see original paper], when "小儿麻痹" is entered, the platform maps it to the corresponding "脊髓灰质炎." In fact, the CMeSH subject heading list contains not only standardized terms but also semantic relationships between standardized terms. As shown in Figure 9 [Figure 9: see original paper], the platform presents the semantic relationships contained in subject terms through a subject tree, helping users break through thinking limitations and proactively providing users with more related subject terms. Thus, users can not only understand relevant knowledge systems but also use related subject terms to obtain more needed information.

Browsing Innovation The medical content enhancement platform can not only highlight key information in publications through highlighting and semantic annotation but also provide users with variable-granularity resource browsing services through content reorganization, enabling users to directly obtain variable-granularity literature resources, paragraphs and chapters containing search terms, and standardized subject terms and their interpretations corresponding to search terms, 尽可能 meeting the different needs of different users. In addition, when users input any search term, the platform can present related subject terms to users in the form of a subject tree, which can 启发 users to conduct medical knowledge exploration to a certain extent and 挖掘 users' potential information needs.

Resource Acquisition Innovation Users can obtain resources in multiple formats such as PDF and HTML through the medical content enhancement

platform, and can also obtain network health information related to scientific papers. This paper uses linked data technology to conduct explicit and implicit associations, adding multi-types of network health information on the basis of traditional publications. Users can not only obtain text resources but also obtain related pictures, data, and other resources. It is worth mentioning that internal associations based on semantic associations are different from traditional bibliographic item associations. Based on CMeSH subject term associations, they go deep into content and ensure the completeness of user resource acquisition from the semantic level as much as possible.

Innovative Application of Pediatric Literature Information Resource Services for Medical Enhanced Publications

Based on the analysis of the characteristics of pediatric medical literature resources, this paper applies the overall framework of medical enhanced publications to pediatric literature information resources and introduces the pediatric medical resource content enhancement platform.

Analysis of Pediatric Literature Information Resource Characteristics

Pediatrics is an important medical field. From the perspective of disciplinary research, infants and young children are in the early stage of life development and have important reference significance for research in other medical fields. However, existing medical digital platforms mostly treat pediatrics as an ordinary disciplinary category, and the academic community urgently needs a more professional and convenient platform to obtain professional pediatric knowledge. From the perspective of research objects, pediatric treatment objects are in the growth and development period, involving many basic disciplines, leading to complex and voluminous related resource content and structures. Multi-source and heterogeneous pediatric literature information resources urgently need to be reorganized. From the perspective of user needs, the research and service objects of pediatrics are infants and young children who lack autonomous capabilities and have relatively weaker resistance, requiring guardians to actively learn medical knowledge. However, most users are accustomed to seeking needed information from unstructured information, and large amounts of processed structured medical literature are often ignored. Therefore, it is necessary to rely on more readable pediatric medical enhanced publications to provide services to users, allowing more users to obtain higher quality and more scientific medical information. In summary, achieving pediatric publication content enhancement is very necessary.

Implementation of Pediatric Medical Enhanced Publication Service Innovation

This paper uses MCM metadata to achieve semantic description of pediatric medical resources. Metadata is a special type of data used to represent knowl-

edge. Any marked metadata can be implemented through RDF. RDF uses XML syntax and RDF Schema to convert metadata descriptions into data models, providing support for metadata interoperability. As a relatively mature data technology, RDF has also been widely applied in the biomedical field, and there are many large-scale medical RDF datasets on the network. Therefore, to ensure the professionalism and uniformity of medical information description, this paper 尽可能 reuses the existing medical RDF triple dataset PubMed. However, it should be noted that this dataset contains nearly 500 million triples in the medical and biological sciences fields. This paper only 截取 the pediatric field. On this basis, to better meet the description needs of pediatric resources, this paper 规范 and expands part of the restricted attributes through user-defined methods according to the MCM medical metadata scheme described above.

Based on the above-mentioned multi-dimensional association construction 思路 for medical literature information resources, the construction of pediatric literature information resource linked data also starts from explicit and implicit levels. On the basis of fully establishing explicit resource associations, this paper goes deeper into the content level of resources, 挖掘 semantic associations between text resources around mapped CMeSH subject terms. This paper extracts the pediatric-related parts from the CMeSH thesaurus, including three types of subject terms: pediatric diseases, diagnosis and treatment, and disciplinary organizations. Figure 6 [Figure 6: see original paper] shows a partial relationship diagram of pediatric disease subject terms. The platform uses the free term-subject term mapping relationship constructed earlier to represent texts in the form of subject terms, and then achieves semantic association between text resources based on the semantic relationships inherent in subject terms.

Display of Innovative Service Functions of the Pediatric Content Enhancement Platform

To more vividly demonstrate the various functions of medical content enhanced publications, this paper specifically builds a pediatric content enhancement platform in the field of pediatric medical literature information resources to help users query, browse, and learn medical semantics from different dimensions. Due to factors such as intellectual property rights, this paper selects six pediatric medical journals including the *Chinese Journal of Practical Pediatrics* and *Chinese Pediatric Emergency Medicine*, temporarily not considering medical literature from non-pediatric journals, as specifically shown in Figure 7 [Figure 7: see original paper].

First, the pediatric content enhancement platform can directly provide free term retrieval services for users. Medical vocabulary is highly professional, and ordinary users often use free terms for retrieval. However, using free terms for retrieval usually yields less precise results. The platform automatically converts free terms used by users into subject terms through free term-subject term mapping, directly presenting corresponding subject term retrieval results to users.

As shown in Figure 8 [Figure 8: see original paper], when "小儿麻痹" is entered, the platform maps it to the corresponding "脊髓灰质炎" based on the mapping relationship. In fact, the CMeSH subject heading list contains not only standardized terms but also semantic relationships between standardized terms. As shown in Figure 9 [Figure 9: see original paper], the platform presents the semantic relationships contained in subject terms through a subject tree, helping users break through thinking limitations and proactively providing users with more related subject terms. Thus, users can not only understand relevant knowledge systems but also use related subject terms to obtain more needed information.

Second, the pediatric content enhancement platform can present multi-granularity literature information resources to users through content reorganization. Coarse-grained literature presentation is the basic function of the platform, while medium-granularity and fine-granularity pediatric literature information resource presentation provides more possibilities for user knowledge acquisition. As shown in Figure 10 [Figure 10: see original paper], the platform presents search results in medium granularity with fragments as units. These fragments all come from the literature database contained in the platform, presenting all fragments containing corresponding subject terms to users. The corresponding subject terms in the fragments are also highlighted in red. Compared with coarse-grained literature presentation, users can obtain effective information more directly. In addition, the platform goes deep into the literature semantic level through content reorganization, presenting knowledge in fine granularity. As shown in Figure 11 [Figure 11: see original paper], the platform reorganizes pediatric information resources from ten aspects including definitions, characteristics, and diagnosis, directly selecting key information from the database contained in the platform and presenting it to users, greatly reducing the pressure on users to acquire needed knowledge from massive resources.

Finally, the pediatric content enhancement platform integrates traditional publications with network health information to achieve content enhancement of traditional publications. As shown in Figure 8 [Figure 8: see original paper], searching for "小儿麻痹" can not only obtain encyclopedia explanations about "脊髓灰质炎" but also obtain related network pictures. As shown in Figure 11 [Figure 11: see original paper], the platform reorganizes knowledge on "脊髓灰质炎," presenting treatment hospitals, doctors, and related videos related to "脊髓灰质炎" from the network together with users, achieving multi-type resource content aggregation on the basis of text, thereby providing users with more comprehensive knowledge information.

Conclusion

This paper proposes a medical publication content enhancement scheme based on digital publishing and oriented to semantic publishing to solve existing practical problems in medical literature information resources and to provide users with better medical literature information resource services. Using pediatric lit-

erature information resources as an example, this paper builds a pediatric publication content enhancement platform to demonstrate the feasibility of medical publication content enhancement in a semantic environment.

Of course, this research is only an application scheme, and the built pediatric content enhancement platform is not mature enough and still lacks feedback measurement of empirical effects. In addition, in the semantic environment, various technologies continue to advance. Technologies such as knowledge graphs can go deep into knowledge units and directly mine knowledge associations of resources, while visualization technologies such as AR can present medical knowledge more vividly. Therefore, medical publication content enhancement still needs to continuously utilize new technologies to achieve medical knowledge mining and utilization. Finally, in the open network environment, obtaining external medical resources is not difficult, but due to constraints such as copyright and region, comprehensive acquisition of external resources remains a problem that still requires support from various medical publishers. This paper provides an exploratory implementation scheme for the construction and realization of medical enhanced publications, hoping that users can obtain better medical information services with the assistance of medical enhanced publications.

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Innovation of Medical Literature Information Resource Service Modes Oriented to the Enhancement of Publication Content

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Note: Figure translations are in progress. See original paper for figures.