Postprint: Collaborative Innovation of AIGC Technology in Converged Media Content Creation

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Abstract

Objective: To explore innovative applications of AIGC technology in converged media preparation systems and construct an efficient, intelligent integrated communication model.

Method: Based on collaborative innovation theory, this study analyzes current application scenarios and implementation pathways for AIGC technology in converged media preparation systems, proposing an innovative framework of "content production + intelligent processing + distribution and dissemination."

Results: An intelligent preparation system encompassing intelligent acquisition, multimodal generation, and cross-platform distribution was established, enabling resource sharing and collaborative creation.

Conclusion: Deep integration of AIGC technology with converged media preparation systems enhances communication effectiveness and advances the transformation and development of traditional media.

Full Text

AIGC Technology in Collaborative Innovation of Converged Media Content Creation

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Abstract

[**Objective**] To explore the innovative application of AIGC technology in converged media preparation systems and construct an efficient and intelligent integrated communication model. [**Method**] Based on collaborative innovation theory, this paper analyzes the application scenarios and implementation paths of AIGC technology in current converged media preparation systems, and proposes an innovative framework of "content production + intelligent processing + distribution and dissemination." [**Results**] An intelligent preparation system encompassing intelligent acquisition, multimodal generation, and cross-platform distribution has been established, achieving resource sharing and collaborative creation. **Conclusion** The deep integration of AIGC technology with converged media preparation systems helps enhance communication effectiveness and promotes the transformation and development of traditional media.

Keywords: AI-generated content; converged media preparation; multimodal processing; collaborative innovation; intelligent distribution
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1. AIGC Technology System in Converged Media

1.1 Core AIGC Technology Modules

AIGC technology in converged media preparation systems primarily comprises four core modules: First, deep learning-based multimodal content generation technology capable of intelligent creation across text, images, audio, video, and other formats. Second, large-scale pre-trained model-based content understanding and processing technology for intelligent classification, tagging, and quality assessment of source materials. Third, intelligent review technology that employs computer vision and natural language processing to identify sensitive information and filter non-compliant content. Fourth, personalized recommendation technology that achieves precise content delivery based on user profiles and behavioral data. These modules work in concert to form a complete intelligent content production chain.

1.2 Converged Media Content Production Chain

The converged media content production chain consists of four key stages: planning, acquisition, editing, and distribution. In the planning stage, the system analyzes trending topics and user needs to assist in topic selection. In the acquisition stage, intelligent crawlers and automated collection tools gather multi-source heterogeneous data. In the editing stage, AIGC technology intelligently processes and integrates materials to generate content tailored to each platform' s characteristics. In the distribution stage, intelligent recommendation algorithms enable precise multi-channel dissemination. This optimization and reshaping of traditional production workflows through AIGC technology significantly enhances content production efficiency [1].

1.3 Human-Machine Collaborative Creation Model

The human-machine collaborative creation model represents a deep integration of AIGC technology with traditional media production. In this model, AIGC technology primarily handles foundational tasks such as material processing, content generation, and quality inspection, while human editors focus on high-level work including content planning, creative design, and in-depth processing. The system establishes standardized collaboration workflows and intelligent task allocation mechanisms to achieve complementary advantages between human and artificial intelligence. Through continuous data accumulation and model optimization, the AI system' s creative capabilities are continuously improved, forming a virtuous cycle of collaborative evolution. This creation model ensures both the efficiency and scale of content production while guaranteeing the quality and value of the output.

2. Innovation Architecture for Deep Collaboration

2.1 Content Planning and Intelligent Acquisition

The intelligent content planning and acquisition process comprises three layers: First, big data-based topic planning, where the system intelligently generates topic suggestions and content planning proposals through analysis of trending events, user interests, and communication effectiveness. Second, intelligent data acquisition, which achieves automated collection and integration of multi-source data through web crawlers, IoT devices, and user contributions. Third, intelligent preprocessing, which automatically classifies, tags, and quality-assesses raw data to provide a high-quality material repository for subsequent content production. Additionally, the system establishes an intelligent copyright management mechanism to automatically identify and process copyright information, ensuring compliant content usage. A comprehensive data governance framework ensures the accuracy and usability of collected data through quality assessment, cleansing, and standardization, laying the foundation for subsequent intelligent processing. The system also employs deep learning models for intelligent evaluation of content value, prioritizing acquisition based on multiple dimensions including media attributes, timeliness, and audience needs to ensure timely processing of important content. A multi-source verification mechanism is introduced during acquisition to guarantee information authenticity and accuracy (Figure 1 [Figure 1: see original paper]) [2].

2.2 Multimodal Material Generation

Multimodal material generation represents the core application of AIGC technology. Based on deep learning models, the system enables intelligent generation of content across text, images, audio, video, and other modalities. For text generation, large-scale pre-trained language models automatically produce news articles, headlines, and summaries based on prompts. For image generation, diffusion models convert textual descriptions into high-quality images. For audio and video, neural rendering technology enables virtual anchor broadcasting, video editing, and scene reconstruction. The system also supports style transfer and intelligent editing of multimodal content to meet diverse creative scenario requirements. To ensure quality, multiple assessment mechanisms are introduced, including content relevance evaluation, style consistency checks, and quality scoring, with support for human intervention and adjustment to ensure generated content meets dissemination needs. Leveraging transfer learning technology, the system rapidly adapts to new content generation requirements, supporting few-shot learning and domain adaptation. A knowledge base for content generation accumulates excellent cases and model parameters to continuously improve generation effectiveness. For breaking news, the system can quickly generate multi-modal content based on existing templates [3].

2.3 Cross-Media Resource Integration

Cross-media resource integration aims to break down barriers between different media formats and achieve efficient resource consolidation and reuse. The system establishes a unified media resource center for centralized management of text, images, audio, video, and other materials. Semantic analysis technology creates a multi-dimensional resource tagging system to support intelligent retrieval and recommendation. Cross-modal content understanding technology enables intelligent association and conversion between different media formats. Visual resource orchestration tools allow editors to conveniently compose and arrange multimedia content, enhancing production efficiency [4]. To further improve resource utilization, an intelligent resource evaluation mechanism analyzes material usage frequency and dissemination effectiveness to guide resource optimization and renewal. An intelligent resource recommendation mechanism proactively suggests relevant materials based on editors' usage history and preferences, improving retrieval efficiency. The system also intelligently aggregates resources related to trending events into multimedia resource packages to support rapid deployment and secondary creation. Real-time material processing and distribution are also supported [5].

2.4 Intelligent Distribution and Dissemination

The intelligent distribution and dissemination stage adopts a data-driven approach to achieve precise content delivery and effectiveness optimization. Based on user profiles and behavioral data, the system constructs intelligent distribution strategies to push personalized content to different users. A dissemination effectiveness prediction model assesses content' s propagation potential to optimize release timing and channel selection. The system also supports real-time monitoring of content dissemination paths and user feedback, continuously optimizing distribution strategies through machine learning algorithms [6]. Simultaneously, a unified publishing platform for the all-media matrix achieves an intelligent communication pattern of "one-time acquisition and editing, multiple generation, multi-terminal distribution." An intelligent public opinion monitoring mechanism tracks content dissemination effectiveness in real time, promptly identifying and addressing potential communication risks to ensure controllability and effectiveness. The system introduces an intelligent timing wheel to automatically optimize content release times based on user activity patterns across different platforms. For important content, it supports differentiated distribution strategies across multiple versions and channels. A content influence evaluation system assesses dissemination effectiveness from dimensions including reach, depth, and interactivity to guide subsequent content optimization.

3. Collaborative Innovation Technology Support System

3.1 Cloud Computing and Distributed Architecture

The collaborative innovation technology support system employs a cloud computing-based distributed architecture to build a high-performance, scalable technology platform. The core system uses containerized deployment, microservicing functional modules such as content processing, model training, and data storage to enable elastic scheduling and load balancing. Distributed computing clusters provide sufficient computing power for AIGC models. Unified media resource pools based on object storage technology enable cross-regional, multi-node data sharing and collaborative access. Standardized API interfaces support flexible integration with third-party systems, forming an open technical ecosystem. Additionally, the system uses Docker container technology for rapid application deployment and migration, with Kubernetes for container orchestration and management to enhance maintainability [7]. For data storage, a hybrid architecture combining distributed file systems and relational databases ensures both data access performance and security/consistency. Service mesh technology enables intelligent routing, load balancing, and fault transfer between microservices. Edge computing technology deploys lightweight processing units at network edge nodes for proximity processing and accelerated response. Intelligent load balancing strategies ensure optimal system resource utilization. The network architecture employs a multi-active data center design for higher disaster recovery capability and service availability [8].

3.2 Intelligent Algorithms and Model Training

Intelligent algorithms form the core engine of the entire system, primarily comprising deep learning models in natural language processing, computer vision, speech recognition, and other domains. The system builds algorithm models using a pre-training + fine-tuning approach, first training base models on large-scale public datasets, then optimizing them with professional content from media organizations for domain adaptation. In practical applications, the system selects appropriate algorithm models for different business scenarios and achieves lightweight deployment through model distillation and quantization compression. A continuous optimization loop iteratively updates models based on data accumulated from production practice to improve algorithm performance. AutoML technology automates feature engineering and model selection to lower algorithm development barriers. To improve training efficiency, distributed training frameworks support multi-GPU parallel computing. A comprehensive model version management mechanism supports rapid rollback and A/B testing to ensure controllable algorithm iteration. For algorithm security, adversarial training enhances model robustness [9]. Federated learning technology supports collaborative model training across multiple institutions, improving model effectiveness while protecting data privacy. A complete algorithm evaluation system assesses performance across accuracy, real-time capability, and resource consumption dimensions, supporting online upgrades and rapid deployment to ensure continuous system optimization.

3.3 Data Middle Platform and Business Middle Platform

The data middle platform serves as the system' s data infrastructure, uniformly managing structured and unstructured data. Standardized data collection, cleansing, and labeling processes ensure data quality. A unified data service layer provides data support for upper-layer applications. The business middle platform, based on microservices architecture, componentizes and encapsulates core business capabilities to support flexible business orchestration and scenario reuse. The middle platform system effectively solves data silo and capability fragmentation problems, enhancing overall system collaboration efficiency. Particularly for breaking news and major events, existing capabilities can be quickly invoked to complete content production and distribution. The business middle platform also provides visual capability orchestration tools, enabling business personnel to flexibly combine various service capabilities according to actual needs, greatly improving business response speed and innovation capability [10]. For data governance, a complete metadata management system enables unified cataloging and classification. Data analysis technology enables full lifecycle data tracking and management. Real-time computing engines support real-time analysis and processing of massive data to meet immediate data needs for live streaming scenarios. Knowledge graph technology constructs a media knowledge base to support intelligent content analysis and knowledge discovery. The platform also provides rich visualization components to support self-service data analysis for business personnel.

3.4 Security Protection and Quality Monitoring

The system establishes a comprehensive security protection system including identity authentication, access control, data encryption, and other multi-layer security measures [11]. In content production, a multi-level review mechanism performs quality control and compliance checks on AIGC-generated content. Real-time monitoring functions track key metrics including computing resource usage, service response time, and task execution status. Comprehensive log auditing and anomaly alerting mechanisms ensure stable system operation. Disaster recovery backup solutions for critical data guarantee business continuity. The quality monitoring system provides strong support for the entire content production process. During sensitive periods, the system automatically elevates security levels and strengthens content review to ensure correct political orientation and value orientation. Full-link tracing technology enables end-to-end monitoring of business requests. An intelligent operations platform enables automatic fault detection and handling. For content security, deep learning-based content recognition technology intelligently intercepts prohibited content. A comprehensive emergency response mechanism with detailed fault handling plans ensures rapid system recovery under various abnormal conditions. AI-based anomaly detection mechanisms can identify and warn of potential security threats in real time. A complete data encryption system ensures data security throughout its lifecycle. For content quality control, a multi-model collaborative intelligent review mechanism improves review accuracy while maintaining efficiency [12].

4. Reconstruction of Converged Media Production Workflow

4.1 Organizational Structure Optimization

The introduction of AIGC technology necessitates optimization and adjustment of traditional converged media organizational structures. First, dedicated intelligent content production teams should be established to oversee AIGC technology application and optimization. Second, technical support and operations teams should be strengthened to ensure stable system operation. Third, editorial team structures should be optimized to cultivate interdisciplinary talent proficient in both journalism and technology. Flat management structures break down departmental barriers and establish flexible project-based operation mechanisms. Reasonable incentive mechanisms encourage both technological and business innovation, forming a healthy innovation ecosystem [13]. For talent development, systematic AIGC technology application training enhances digital literacy across the organization to meet intelligent transformation needs. Dedicated data analysis teams should be established for data mining and business insights. Innovation labs should be set up to conduct cutting-edge research and application exploration of AIGC technology [14]. Cross-departmental agile teams improve organizational responsiveness. Performance evaluation mechanisms should be optimized to incorporate technological innovation achievements, motivating innovation enthusiasm across the workforce. Regular technical exchange mechanisms promote knowledge sharing and capability enhancement among teams (Figure 2 [Figure 2: see original paper]).

4.2 Production Process Reengineering

Traditional production workflows must be comprehensively restructured to accommodate AIGC technology characteristics [15]. In content acquisition, intelligent topic selection systems identify trending topics and user needs through big data analysis. In content production, production chains for graphics, video, live streaming, and other formats are integrated to achieve "one-time acquisition, multiple generation, multi-terminal distribution." In review, a human-machine collaborative intelligent review system improves efficiency and accuracy. In distribution, precise push and intelligent adjustment are achieved based on user profiles and dissemination effectiveness. Standardized interfaces enable seamless connection between stages, significantly improving production efficiency. Data analysis continuously optimizes workflows to form an agile and efficient production system [16]. Workflow design adopts agile development concepts, transforming traditional linear workflows into parallel collaborative agile models. Low-code development platforms enable business personnel to rapidly build customized workflows. A content creation knowledge base accumulates excellent content templates and creative experience. A/B testing mechanisms continuously optimize content product effectiveness. The system also supports multi-version content management for rapid iteration and optimization [17].

4.3 Resource Allocation Mechanism

An intelligent resource allocation platform enables unified management and intelligent distribution of computing, storage, and human resources. For computing resources, cloud-native architecture supports elastic scaling. For storage resources, a tiered storage system optimizes cost-effectiveness. For human resources, intelligent scheduling and task allocation systems improve personnel utilization efficiency. A resource usage efficiency evaluation system continuously optimizes resource allocation strategies through data analysis [18]. During major news event coverage, the system can automatically adjust resource allocation to ensure smooth execution of core business. Reasonable resource allocation mechanisms balance resource demands across business stages, improving overall operational effectiveness. Intelligent prediction technology forecasts resource demand trends based on historical data, enabling advance scheduling and preparation. Resource pooling management mechanisms improve utilization efficiency. For cost management, refined cost accounting optimizes resource input-output ratios. The system also supports cross-regional resource coordination and allocation, achieving resource complementarity and sharing across regions. Resource usage warning mechanisms promptly identify and address resource bottlenecks [19].

4.4 Evaluation and Feedback System

A multi-dimensional evaluation and feedback mechanism comprehensively assesses AIGC technology application effectiveness. Evaluation metrics are established across dimensions including content quality, production efficiency, user feedback, and dissemination effectiveness. Data collection and analysis objectively evaluate system performance. A dynamic feedback optimization mechanism continuously improves algorithm models and business processes based on evaluation results. At the user level, questionnaires and interviews collect feedback to understand user needs and experiences. At the system level, performance monitoring and fault analysis promptly identify and resolve issues. The evaluation feedback system provides a scientific basis for continuous system optimization. An intelligent evaluation and analysis platform supports multi-dimensional data visualization. Machine learning technology enables automatic calculation and analysis of evaluation metrics [20]. For feedback collection, an intelligent user feedback system supports real-time collection and analysis of user opinions. An evaluation result tracking mechanism ensures effective problem resolution and optimization. The system also supports automatic generation of evaluation reports to provide data support for management decisions.

Conclusion

The deep integration of AIGC technology with converged media preparation systems represents an inevitable trend. By constructing an intelligent collaborative innovation system, content production efficiency and dissemination effectiveness can be significantly enhanced, driving the transformation of traditional media toward intelligence and digitalization. Future efforts must continuously refine technical solutions in practice to form more mature application models. Simultaneously, content quality must be carefully controlled to achieve unity between technological empowerment and value dissemination. As media convergence advances toward deeper integration, AIGC technology will continue to serve as an innovation driver, promoting profound transformation in media production methods and communication patterns.

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