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## A Preliminary Study on Cloud Newspaper Post-prints Based on Image Recognition Technology

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### Abstract

In the context of rapidly advancing information technology, Internet new media has emerged swiftly as a novel communication paradigm. Leveraging characteristics such as diversification, timeliness, rapidity, interactivity, and extensive reach, Internet new media continually challenges the development of traditional print media. This paper primarily elucidates how image recognition technology can bridge traditional print media and Internet new media, enabling the static content of newspapers to become dynamic and vivid, expanding and enriching limited editorial space, presenting peripheral advertisements in three dimensions, and giving rise to entirely new business models.

### Full Text

### Preamble

#### A Brief Discussion on Cloud Newspaper Based on Image Recognition Technology

**Abstract:** In today's era of rapid information technology development, Internet new media has emerged as a novel communication method, rising swiftly like bamboo shoots after a spring rain. Leveraging characteristics such as diversity, timeliness, speed, interactivity, and broad reach, Internet new media continuously impacts the development of traditional print media. This paper primarily introduces how image recognition technology can bridge traditional print media and Internet new media, enabling static newspaper content to become dynamic and vivid, expanding limited space, presenting advertisements in three dimensions, and giving rise to entirely new business models.

**Keywords:** image recognition; cloud newspaper; traditional print media; integration; application

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## 1.2 Overview of Cloud Newspaper

Amidst the sudden rise of Internet media and the ensuing impact on traditional print media, do we need to abandon traditional newspapers and shift entirely to emerging media? The answer is no. In the new media era, information quality varies wildly and truth is often difficult to discern, yet the professional integrity developed by print media over decades maintains an almost rigorous adherence to authenticity. Simultaneously, traditional print media typically boasts powerful editorial teams as its backbone.

Cloud newspaper refers to the use of image recognition technology where readers capture newspaper images, layouts, headlines, and other information through smart mobile terminals to access corresponding multimedia interactive content from the cloud. By integrating the strengths of both traditional print media and Internet media, this deep convergence has become imperative.

## 2.1 Current Status and Deficiencies of Integration

As the Internet develops, humanity exists not only in the physical world of direct experience but is also surrounded by a virtual world. As a member of the physical world, how can traditional print media change the awkward situation of incompatibility between these two realms? Currently, most traditional print media simply move their paid reading and advertising models from paper to online platforms. To address this purely digital text conversion, most media now publish hyperlinked QR codes in their layouts, while some employ interactive newspapers or personalized reporting methods, attempting to bridge the vast gap between the two—yet these efforts often struggle to stay afloat.

QR codes do not belong to newspaper layout content, nor do they fall under advertising or news image categories; they are essentially “patches” forcibly applied to newspaper pages. While they provide readers with a “portal” to richer newspaper content, they compromise the aesthetic appeal and intuitiveness of the layout. Interactive newspapers suffer from high costs, complex processes, and failure to achieve mass production, causing them to “lose their way before gaining traction” on the path to integration. Personalized newspapers require complex technology and large editorial staffs, resulting in niche markets and complicated printing processes. Additionally, readers must preview their interests in advance, creating substantial time costs for both readers and editorial staff.

## 1.1 What is Image Recognition Technology?

Image recognition technology refers to the process of obtaining image information through image scanning and acquisition platforms, preprocessing images to remove irrelevant information, converting original images into image features suitable for computer processing, and ultimately calculating, comparing, and analyzing these features to determine the state or nature of the image and obtain final output results.

### 1.1.1 Image Information Acquisition

Image information acquisition involves representing original images through pixel points in an image matrix via scanning or screen capture methods, with each pixel stored as an 8-bit grayscale value (0-255) for the three primary colors of red (R), green (G), and blue (B). Screen capture methods include keyboard capture, software capture, video capture, camera photography, camcorder recording, network downloads, and graphics tools.

### 1.1.2 Image Preprocessing

Image preprocessing primarily aims to eliminate irrelevant information in images (interference, noise, variations, etc.), converting original images into features suitable for computer processing. Generally, image preprocessing mainly includes image enhancement and image restoration [1]. Image enhancement technology selectively highlights image features of interest during processing while reducing or removing irrelevant information, including grayscale adjustment, smooth denoising, and image sharpening.

### 1.1.3 Image Feature Extraction and Analysis

Image feature extraction aims to organize, analyze, and summarize image information, extracting feature values that accurately reflect the essence of the image while maximizing data simplification. Ultimately, these feature values should possess conciseness, completeness, accuracy, and measurability.

## 2.2 Integration Measures—An Analysis of Image Recognition Technology in Cloud Newspaper Platforms

Readers use image recognition tools on smart terminal devices (smartphones, PCs, etc.) to scan or capture images, layouts, and text from traditional or digital newspapers. The captured regions are processed and recognized as images on the terminal, ultimately achieving access to cloud newspaper content. Using text—one of the core components of newspapers—as an example, this section presents a preliminary understanding of how image recognition technology serves as a connecting thread in cloud newspapers. Figure 1 [Figure 1: see original paper] illustrates the text recognition architecture of the cloud newspaper platform.

### 2.2.1 Data Collection/Storage Module

This module completes image acquisition by scanning paper newspapers or using crawler technology to periodically collect and store digital newspapers, thereby obtaining research samples. Since image files require processing, the system combines database and file system approaches: collected images are directly stored in the file system, while the database stores image paths, recognition results, and other information to lay the foundation for dictionary generation.

### 2.2.2 Image Preprocessing Module

This module primarily performs three operations: image threshold segmentation (grayscale conversion, binarization, etc.), edge extraction, and morphological processing. The extracted edge information is then used to calculate text shape features.

### 2.2.3 Feature Extraction Module

Gabor transformation belongs to windowed Fourier transforms, and Gabor functions can extract relevant features at different scales and directions in the frequency domain. Additionally, Gabor functions resemble human eye biological functions and are widely used in image texture recognition. This module convolves normalized images with Gabor filters to obtain Gabor features. Under poor image quality conditions, to improve platform recognition rates, a feature weighting technique can be introduced. This method weights features according to the dispersion degree of neighboring components in the feature vector, thereby strengthening the role of feature components with relatively small dispersion in classification while weakening those with relatively large dispersion [2]. The basic approach involves forming a feature weighting group from neighboring feature extraction sub-windows, calculating weights within the group according to corresponding rules, and finally applying these weights to each feature value in the group. The Gabor transformation results are then input into the classification and recognition module.

### 2.2.4 Classification and Recognition Module

This module uses libSVM or Matlab's SVM as support vector machine implementations, with libSVM being elaborated here. The platform employs libSVM for training and classification, selecting 3,755 commonly used Chinese characters from the national first-level character library as well as second-level characters and some low-frequency characters. For each character,  $m$  common fonts and  $n$  size template parameters are used to generate  $m \times n$  samples, with  $(m-1) \times n$  samples used as training data for the SVM learning process input vectors. After learning is complete, classification testing is performed on the remaining  $n$  test sample images to achieve text recognition.

### **3.1 Application of Cloud Newspaper in Video—Cloud Broadcasting**

Cloud broadcasting primarily includes cloud live streaming and cloud on-demand, with cloud conferencing and cloud education being important current manifestations. As one of the most advanced communication technologies, cloud conferencing frees users from time and geographical constraints, enabling real-time high-definition remote meetings and exchanges through networks. As an important component of promotional systems, cloud newspapers use their broad dissemination nature to preview conference start times, locations, content, and participants. Readers need only scan newspaper images to enter the conference venue punctually, where participants can express suggestions, journalists can write stories, and audience readers can comment—creating an immersive experience.

### **3.2 Application of Cloud Newspaper in News—Cloud News**

Cloud news refers to news network platform services based on cloud computing business models. On cloud platforms, all news suppliers, agents, planning service providers, strategic decision-makers, value managers, strategic investors, producers, industry associations, management institutions, industry media, and legal structures are integrated into resource pools. These resources display and interact with each other, communicate on demand, reach intentions, achieve amplified corporate value growth and sustainability, thereby reducing costs and improving efficiency [3].

### **3.3 Application of Cloud Newspaper in Social Networking—Cloud Social**

With the introduction of cloud social networking, newspaper layouts need only retain basic information such as name, gender, age, and occupation. Readers can scan to display corresponding detailed profiles in the cloud (instant QQ, MSN, WeChat, mobile numbers, etc.), making social interaction more timely, intuitive, convenient, open, and extensive compared to traditional newspaper social features.

### **3.4 Application of Cloud Newspaper in Marketing Planning—Cloud Marketing**

Cloud marketing under cloud newspapers (hereinafter referred to as cloud marketing) relies on cloud software and major media such as newspapers and mobile smart terminals to transform static marketing into real-time participation on smart terminals through networks. For example, coupons issued by promotional units published in newspapers allow users to scan and directly enter to claim and redeem them, achieving “see the newspaper, get the discount.”

### 3.5 Application of Cloud Newspaper in Advertising and Consumption—Cloud Advertising and Cloud Consumption

Cloud advertising under cloud newspapers (hereinafter referred to as cloud advertising) is an advertising service platform based on cloud computing business models, presenting static advertisements in diverse static or dynamic forms through smart terminal scanning or capture of newspaper images. Cloud consumption under cloud newspapers (hereinafter referred to as cloud consumption) breaks through traditional store area limitations, display limitations, inventory limitations, time and space constraints, and product/service limitations. By scanning or capturing newspaper images through smart terminals, products or services are displayed to users in monetary form, enabling quick and secure payment through cloud payment methods. Cloud advertising and cloud consumption, as two important branches of cloud marketing, generate enormous business opportunities.

## 4. Conclusion

Cloud newspaper operation requires substantial editorial staff and new media operations personnel who need to support each other and collaborate fully. As one of the current important frontier computer technologies, image recognition technology represents just a drop in the ocean of its application fields, with cloud newspaper being merely one example. As newspaper professionals and technical workers, we need to explore more deeply and apply this technology to various fields of newspaper development. In the Internet era, using image recognition technology enables the interconnection of all things and the interconnection of all “images.”

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

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