

# Markit: A digital clipping interaction from paper media using sticky note metaphor

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## **Abstract**

*We demonstrate a digital clipping system, called Markit, which enables users to clip information on printed books or magazines digitally. Advance in technology has changed the form of information clipping from only paper media to digital media. However, clipping information from a paper to digital media is still a burden task for users; they must first capture information by camera or scanner and manually organize the captured data. This research focuses on reducing the cost of clipping paper-based information as digital media information. For this purpose, we propose Markit, which is a digital information clipping system by marking sticky notes on the paper media. Our system offers users benefits of both paper media and digital media.*

## **1. Introduction**

The spread of information technology, such as WWW, has provided us various information as digital media [1]. It has many advantages compared with paper media such as the newspaper and the magazine. For instance, it can deal with large amount of information and users can rapidly retrieve information. Information on paper media is being digitalized, and for a part of the article to be offered on the Web to take advantages of digital media. On the other hand, we still use paper media such as magazines or newspapers, since it has advantages against the digital media, for example, it can be easily browsed anywhere without power supply. Consequently, there are many research for combining the both strength of paper media and digital media [2][3]. In addition, there exists interfaces that links paper media and digital media, such as two dimensional bar code.

In the case of clipping, there is a kind of clipping style that we define as **digital clipping**. Digital clipping is a fruitful style, since users receive information through paper media that are easy to read and use, while preserve it by a digital format that can deal with large amount of information and can update information dynamically. However, digital clipping has a problem that the interface to convert information on paper media to digital media is not intuitive. The conversion is achieved using two dimensional bar code or scanners. They interrupt reading and are tedious tasks. The conversion interfaces prevent us to leverage advantages of both paper format and digital format simultaneously. It leads people to stick to single media when they collect and organize information, rather than a combination of paper-based and digital-based method.

This paper proposes **Markit**, a novel system for digital clipping. Markit offers users an intuitive interface using sticky notes. The act of pasting sticky notes is daily operation done when users are interested in the contents of a magazine or a book. In addition, because sticky notes remain on the paper media, it is convenient for the user to look them back at. Markit enables users to clip paper information in a digital format easily and intuitively, and organize the information effectively.

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## 2. Markit: A digital clipping system using sticky note metaphor

### 2.1. Markit overview

Markit enables users to collect paper-based information as digital information without tedious task such as using scanner and classifying scanned data manually. As illustrated in Figure1, for successful clipping the paper article as the digital media, users only need to put a sticky note near the article which the user wants to clip. Then Markit system recognizes the article and stores it automatically. The user can classify the articles by using distinct color of sticky notes. The user registers the correspondence of colors and genres beforehand. We are familiarized with putting sticky note for managing the articles. Therefore, Markit provides easy and intuitive way to collect paper information digitally.



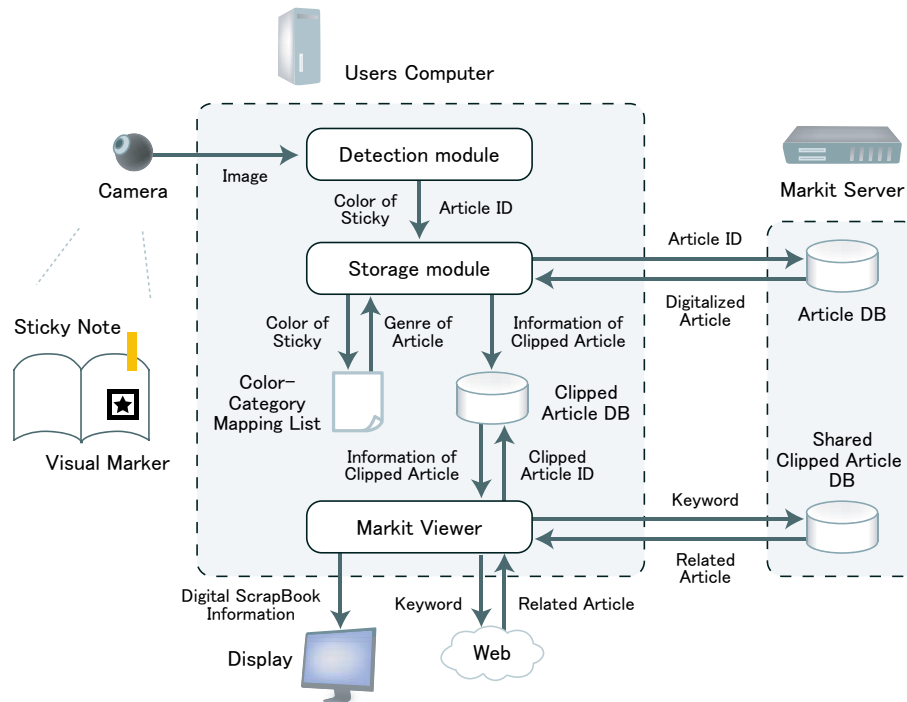
**Figure 1. Markit overview: Collecting paper articles as digital information by using sticky note metaphor**

Collected information through sticky note interaction is managed by Markit Viewer, a digital scrap-book application. With Markit Viewer, the user can view not only collected articles but also related information on the Web. This feature enhances the user experience when the user reviews collected articles.

### 2.2. Design and Implementation of Markit

#### 2.2.1. System Architecture

We suppose that every paper media has a visual marker printed beside each article and everyone could obtain a digitalized article from the database on the Web. Users are also required to read a magazine or a newspaper under the camera. As illustrated in Figure 2, Markit system consists of the following 4 modules. When the user puts sticky note to an article, the Detection module detects the interaction and analyzes the Article ID from visual marker which is the nearest to the sticky note. Then, the Storage module obtains the article corresponded to the Article ID from Article DB on the Markit Server and extracts the keywords of the article from the title and contents of the article. Obtained keywords are used by Markit Viewer for adding related information. the category of article is obtained from Color-Category Mapping List which has mapping information between the color of sticky note and article category. And the Storage module stores the article information into Clipped Article DB. Finally, Markit Viewer shows both the clipped article and related information on the display.



**Figure 2. System Architecture of Markit**

### 2.2.2. Prototype System

We have implemented the prototype of Markit system. For detecting the action of putting a sticky note, the Detection module uses background subtraction technique. When the user put a sticky note to the article, the module detects the square sticky note which has registered color. Current implementation can recognize 5 colors which are often used for sticky notes. And we used the JARToolKit[4] to recognize visual markers. We also use ChaSen [5], which is a library of Japanese morphological analysis to acquire keywords from the article that the user have clipped.

Figure 3 shows the prototype of Markit Viewer. Markit Viewer has a simple interface to browse the collected information. Each article is classified in accordance with the article category, and the user can select the category through the tabbed browsing. When the user selects an article title from the list shown on the left, the detail information is displayed on the right window. Furthermore, the list of additional information related to the article is shown around the article. When the user clicks the related information title, the detail of the related information appears. For obtaining the related information, we used GoogleAPI [6].

## 3. Limitation of current implementation

Though we confirmed several advantage of Markit through initial user experiment, its current implementation has several limitations. Firstly, the number of article which can be detected by Markit system is limited because there are many articles without visual marker. Secondly, Markit system forces the user to clip information under the desktop light which mounts camera. This, in turn, reduces portability, which is the great advantage of the paper media. To solve these limitations, we are developing article detection technique based on optical character recognition technique, and using wearable camera.

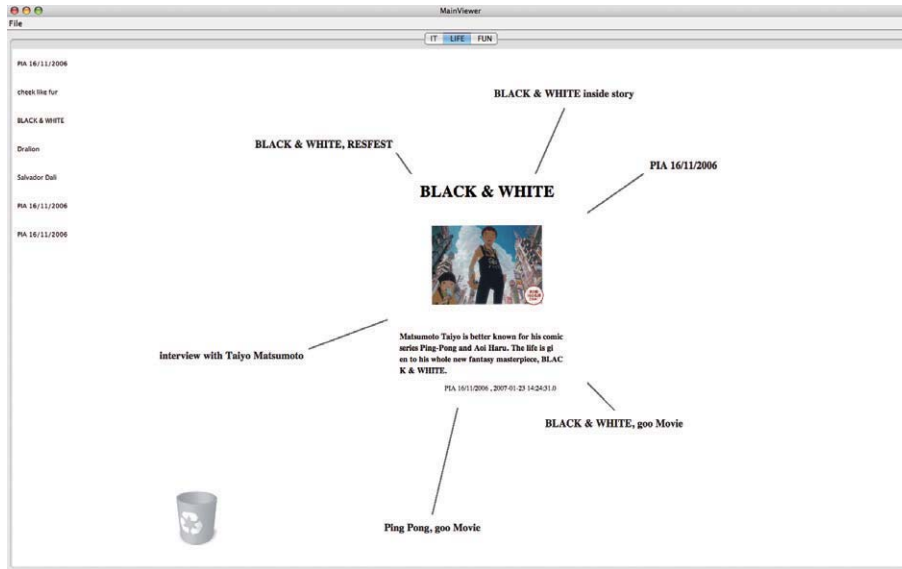


Figure 3. Markit Viewer shows a clipped article

## 4. Conclusion

Providing an easy way to access digital world from physical world is the key technology to realize pervasive computing environment. This paper proposes a novel approach called Markit to clip paper information easily and intuitively. With Markit, users can collect articles on the paper digitally just by putting sticky notes to the article. In addition, we have implemented Markit Viewer to browse not only collected article but also related information on the web. These features of Markit can boost up user experience of gathering information from both physical media and digital media.

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