

# 임베디드 시스템을 이용한 이미지 검색 시스템 설계에 관한 연구

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## 요 약

최근, 멀티미디어는 인터넷의 확산과 하드웨어의 발전에 이르기까지 과거와 비교할 수 없을 만큼 형성, 제공, 그리고 공유되고 있다. 따라서 국제적으로 멀티미디어의 메타 데이터에 대한 적절한 표현을 제공하기 위해 MPEG-7의 표준이 설립되었다. 그리고 이미지 검색 중 MPEG-7을 사용한 멀티미디어의 다양한 데이터에 대한 연구가 진행되고 있다. 이미지 검색 시스템에는 meaning-based 검색과 content-based 검색이 있다. meaning-based 검색은 검색 속도가 빠른 것이 장점이지만, 이미지에 대한 기술적인 지식에 의해 기술과 정밀도가 영향을 받는다. content-based 검색은 이미지에 대한 의미와 사용자의 의도를 제대로 이해하지 못해 검색의 정확도가 감소하고 있다. 이 연구에서는 이러한 문제들을 해결하기 위해 두 가지 방법을 결합하여 검색 시스템을 설계하였다. 또한 시스템을 휴대용 장치 즉, 휴대용 PDA 또는 스마트 폰으로 이미지 데이터를 검색하고 관리하기 위해 임베디드 시스템에 적용할 수 있도록 설계하였다. 이 시스템을 사용한다면, 휴대용 장치로 멀티미디어 데이터를 효율적으로 검색하고 활용할 수 있다.

## A Study on Design of the Image Retrieval System Using Embedded System

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### ABSTRACT

Recently multimedia has been formed, provided, and shared enough not to compare with the past, due to the proliferation of Internet and the development of hardware relating to multimedia. Accordingly to internationally give a proper expression to metadata of multimedia, the standard of MPEG-7 has been established, and researches for image search among various data of multimedia using MPEG-7 are going on. Thus there are meaning-based search. In the former there is a merit that search speed is fast, but technology and accuracy by technical knowledge on the image. In the latter the accuracy of search is decreasing because of not understanding the meaning about image and the internet of users. In this study to solve these problems a search system has been designed by combining the two methods. Also the search and manage image data by handheld devices such as portable PDA or smart phone, a system. Once this is used, multimedia data can be efficiently searched and utilized by handheld devices.

Key words : Embedded System, XML Database, XML

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## 1. Introduction

Recently, multimedia devices such as digital camera, camcorder and others that can connect to a computer are gaining great acceptance from general public. Additionally, with the open network system of Internet, users can easily provide and share multimedia data with a click of the button [1]. As multimedia data itself entails information that is distinctive and that involves high-capacity and atypical in nature, unlike data that is text-based, it is difficult to manage in an efficient manner. In view of that, the multimedia data needs different approach in search method and tools to effectively manage the data than currently available search that is skewed toward more text based [2].

The image search system that is described in this paper, through the integration of content-based search through example image and semantic-based search through keyword and by providing XQuery search function, a powerful XML mechanism, it endeavors to overcome the currently available search limitations. As MPEG-7 is provided through XML schema form, for more efficient administration, it will use Berkeley DB XML, an imbedded XML database.

This paper will introduce the embedded system and MPEG-7 in chapter 2, describe the functions and structure of search system in chapter 3, and in last chapter, chapter 4, it will present the conclusion.

## 2. Relevant Study and Technology

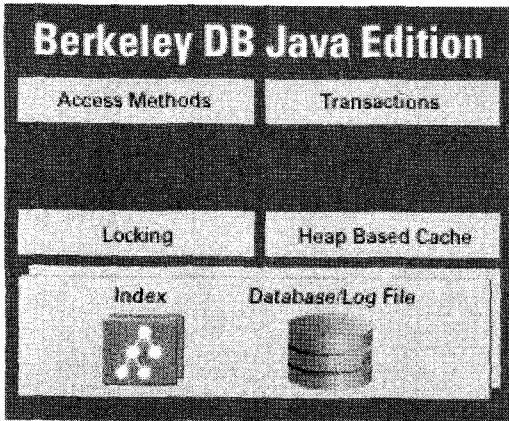
Due to the fact that multimedia data itself en-

tails information that is highly distinctive and significant, and that involves high-capacity and atypical in nature, it is difficult to manage its data in comparison to the text-based data. Following that, unlike search engine that is tailored toward more text-based, it is necessary to devise an approach and search tools that are more appropriate for the multimedia data [3]. Currently available image search systems have common problems in that they cannot support complex query structure, as well as the fact that the research results are not accurate [4]. Consequently, XQuery that can support query structure has come to the fore as it can solve above problems [5]. Moreover, with the increasing usage of small-sized devices that have high function capabilities, the need for system that can utilize the strengths of embedded system has also dramatically increased.

### 2.1 XML Database

Berkeley DB XML is a special purpose data management, built on top of the Berkeley DB to manage native XML data. It is fast, reliable, enables cost-saving storage and provides retrieval of native XML data and semi-structured data. In addition, Berkeley DB XML is an embedded database that is distinctly designed for the native storage and standardize XML document, and can store and retrieve data without translating or converting to other data structure [6]. (Figure 1) is the Berkeley DB Java Edition.

Berkeley DB XML is an open source, embedded database engine that can be used in Window NT, Unix, Linux and other major platforms, and it is small and fast, easy to understand and

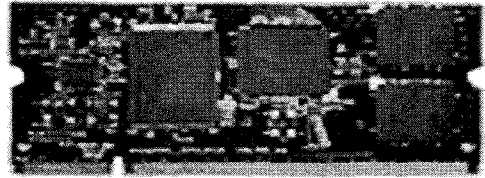


(Figure 1) Berkeley DB Java Edition

use, and that is reliable. The system provides library that allows direct connection to a program in which it can meet the demand of application that needs high function save and search of key/data pair. Currently, it provides the interface so that it can support C++, Perl, Tcl, Java and other programming languages[7]. Moreover, it not only provides Java, C, C++, Tcl, Python and API of PHP, but it also can be operated in Unix, Linux, MS-Windows and other platforms, as well in high-end Internet server, desktop, notebook, and other devices.

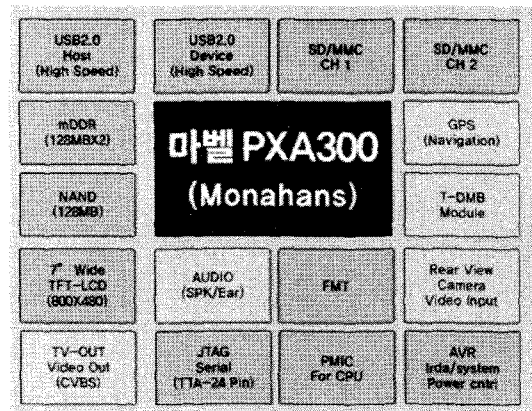
## 2.2 XScale Processor

The XScale processor is a 32-bit processor, ARM5TE core based, and the successor to the Inter Strong ARM line of microprocessors. Intel PXA 255, which uses the said processor, in addition to ALU (Arithmetical and Logical Unit), address bus, data bus and registry basic functions, in one chip, it embedded devices for arithmetic operation, input/output device, registry for memory control and other peripheral devices.



(Figure 2) MV300 Main CPU Module

Micro controller, similar to above function, is used for control and is embedded with input/output device that is necessary for ROM and for control of various peripheral devices controls. The XScale processor is a high function 32-bit microprocessor, 0.35um, 3 Layer Metal CMOS and has 2.6 million transistors. The processor can transfer data in various speeds and consumes less power, and supports various cache modes and interfaces with diverse peripheral devices.



(Figure 3) PXA300-NAVI SYSTEM

The PXA300 processor, with scalable performance to 624 MHz and video performance capabilities enables the development of cost-efficient smartphones industrial embedded solutions, and handheld devices such as GPS, Built on a low-

power 90nm process technology, and with the ability to dynamically scale voltage and frequency on demand, the PXA300 supports today's stringent requirements for longer battery life.

### 3. Image search system structure

In image search system described in this paper, users execute Berkeley DB search function for saved metadata and image through the module. The search supports Keyword, XQuery, similar image search via example image, and that unifies keywords and example image.

In essence, XQuery is a powerful query method utilizes the best of XML. It returns a result that the users have sought through the query process that seeks for the pertinent data from the database.

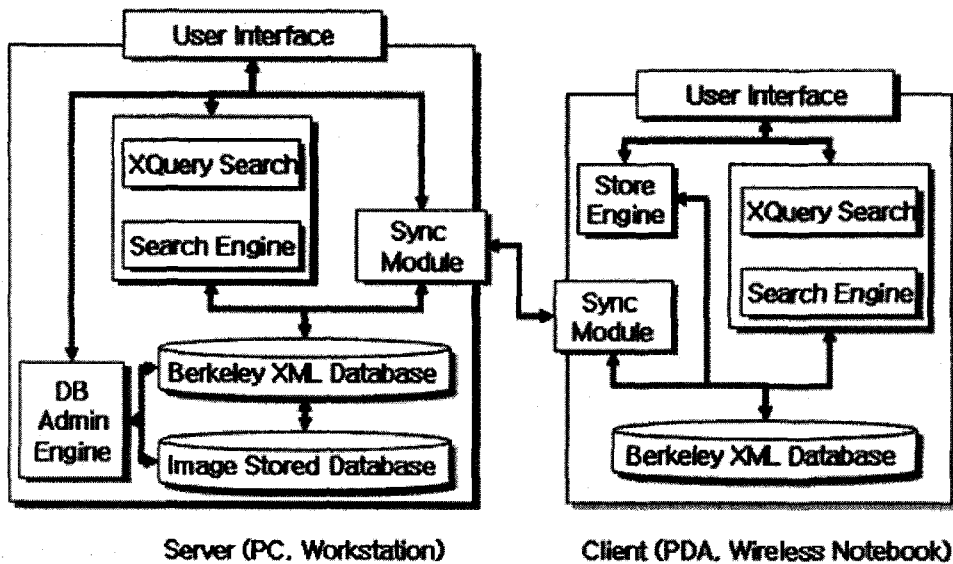
The semantics-based keyword searches are

impossible in content-based searches. Additionally, because similar image search via example image queries based on the vector-based, although content-based search is possible it has disadvantage in that it can't do semantic-based search. In view of that, to overcome above limitations, this paper sought to integrate keyword search example image search.

Moreover, it used XML schema that applied MPEG-7, a metadata standard in multimedia data and for the efficient management of XML schema in embedded system, it was based in Berkeley DB XML.

(Figure 4) is a XML DB-based image search system structure in embedded system.

In server side, there is a DB Admin Engine for image storage and administration and Sync module is a module for the purpose of linking client side database and for modifying and updating data automatically or manually. As mo-



(Figure 4) Image Search System Structure

mobile devices is, due to the unavailability of Internet in some regions or instability in power source, not possible to connect to the server at all times and as such, sync module transfers, when communication is possible, from client side to the server side.

#### 4. Conclusion

The search system that is proposed by this paper endeavors to overcome the currently available image search tools where semantics-based search that uses high-level metadata cannot search content-based images, and conversely, where content-based search that uses low-level metadata cannot search semantics-based search, as well as its inaccuracy in the returned results by integrating two search methods. Furthermore, it added image search through XQuery, a powerful XML mechanism, and for the efficient administration of XML schema in a server system that provides embedded system and information,

It was built on top of Berkeley DB XML, a native XML database.

As a result, it overcomes the search speed degradation through XML document parsing and furthermore, it will add to the strength of its system by utilizing the Berkeley DB functions, including transaction, recovery, multiple access communications such as DBMS(Database Management System) and others.

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