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# A Mechanism for Location Based Library Services

## - Implementing Remote Book Lending System using Open Source Software -

### 位置情報を用いた図書館サービス

#### - オープンソースソフトウェアによるリモート図書貸出システムの導入 -

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**ABSTRACT:** GIS and Location Based Services (LBS) have now matured and can be applied in many aspects of social life. In Japan, several public services such as banking, postal and courier delivery are provided through “always open” convenience stores. There is an increasing possibility to offer LBS through a dense network of convenience stores. One of the socially relevant services that is already being implemented by some local governments in Japan is the delivery of books from public libraries to designated convenience store specified by the library member. In this paper, we describe an online system for remote book lending/delivery by integrating OPAC, Web-GIS and shopping cart functionality in a single application. Such a GIS-aware book lending/delivery system will not only enable optimal use of library material but may also allow easy and convenient access to public library resources.

**KEY WORDS:** Library Resource, GIS, LBS, Book Lending

**概要：**現在、GIS や位置情報サービス（LBS）は発展し、現代社会生活の多くの面において応用されている。日本では銀行、郵便、宅配便などの多様な公共サービスが24時間365日営業のコンビニエンスストア（以下、コンビニ）によって取り扱われている。密度の高いコンビニのネットワークを利用して、様々なLBSが利用できる。その一つがコンビニを通じた図書貸出/配達システムである。このシステムは社会サービスに関係した一つの例として考えられ、実際にいくつかの地方自治体によってすでに導入されている。これは利用者が希望した図書を指定されたコンビニで受け取ることができるサービスである。本論文ではOPAC、Web-GIS およびショッピングカート（買い物かご）アプリケーションを一つのオンラインシステムに統合したリモート図書貸出/配達システムについて述べる。GISを利用した図書貸出/配達システムは、公共の図書資源を最大限に利用でき、簡単で便利な環境を利用者に提供できる。

**キーワード：**図書資源、地理情報システム、位置情報サービス、図書貸出

## 1. INTRODUCTION

Nowadays in Japan, the libraries are all well equipped; automation is available in many parts of books and media management and delivery. OPAC systems are available on Internet allows readers to search and browse for books easily via an easy-to-use web interface. However, life in Japan is quite busy; it takes much time for people to travel to a library for browsing and borrowing a book. These create a barrier to the reading culture of Japanese.

Meanwhile, the distribution network of daily-use materials and services is widely available almost everywhere in Japan especially in big cities where we can find one almost in every 50m on crowded streets. Many such the convenience stores like 7-Eleven, Yamazaki, Lawson, etc., are running 24 hours through out the week and providing various services such as banking, postal and courier delivery.

Recently, the possibility to provide new services through convenience stores are being explored

and expanded. One of the socially relevant services being considered and also being already implemented by some local governments in Japan is the delivery of books from public libraries to designated convenience store specified by the library member; for instance: Gifu prefecture, Tokorozawa city, Yokosuka city, etc. Local government of Gifu prefecture has deeply considered optimizing the use of convenience store for enhancing local public services and reported the advantages for the library delivery service based on demonstrative trials that:

- The service site has been increased and covered much wider area. Especially it is very useful for aged people or the people who do not drive.
- The service can be available for 24 hours everyday. The user can use library service anytime.
- The people who do not use library usually have used library service through the convenience store delivery service. Especially the most of them borrowed technical books.

This paper explains the development of a system namely “**Online Book Delivery System**” which allows user to browse and borrow the books remotely via Internet and have books delivered through convenience stores. In addition, this paper shows the advantages of location based services making use of Web-GIS technology.

## 2. SYSTEM

### 2.1. System structure

The Online Book Borrow application is an integrated system consists of 2 main parts: Library (or Borrow) component and Convenience

Stores (or Delivery) component, they are developed under prototype approach (Figure 1).

The **Library component** integrates libraries’ OPAC with a delivery cart application in a single web-view (using frame) allowing readers to search and browse for books in the library (using OPAC) while can enter book information into the shopping cart at the same time (Step 3 on Figure 1).

After selecting the books, borrower will be redirected to the **Delivery component** which is a GIS application allowing user to navigate on the map of his home city and select the nearest convenience store for the books to be delivered to (Step 4).

The system will then come to a summary page to confirm the borrower’s contact information, list of the books and location of the convenience store (Step 5). Upon completion, an email will be generated (Step 6) and sent to the administrator of the library (Step 7) and borrower (Step 8) about this borrowing order.

As the common element of the system, a user information database and login script is used in all parts of the system to ensure that only registered and verified persons can access and borrow books via Internet (Step 2).

### 2.2. Hardware and software environment

This system is developed on Free Open Source Software environment using Mandriva 2006 Linux distribution as the operating system with Web server environment packages such as Apache, PHP, MySQL database server and also includes main necessary software for Geoinformatic such as GDAL, PROJ.4, GD and MapServer & PHP/MapScript version 4.6.2.

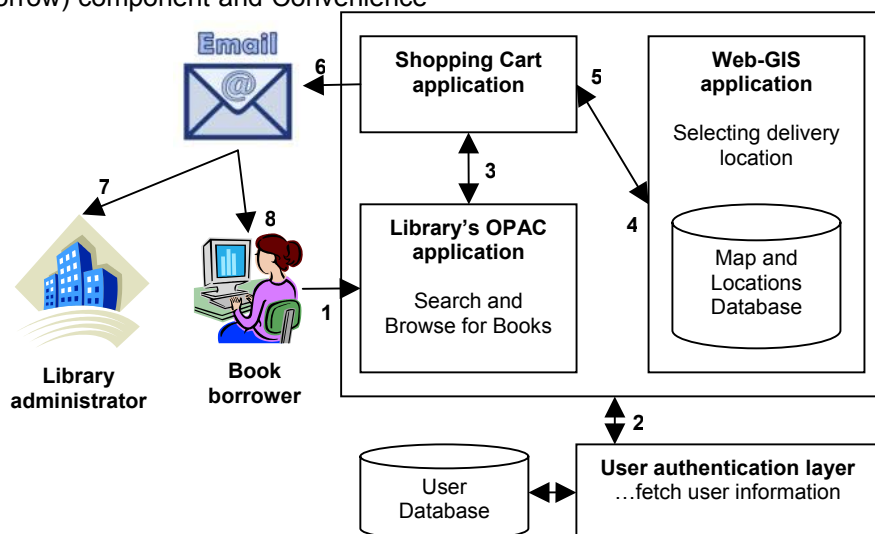


Figure 1: System architecture (<http://gisws1.media.osaka-cu.ac.jp/library/bookborrow>)

### 3. DATA USED

#### 3.1. Users database

This simple database contains following fields: username, password, fullname, address, telephone number, email. There is also another table saving list of the books that users has borrowed so far.

#### 3.2. Maps and associated information

The first one available is the map of Uji city in Kyoto prefecture using Orkney GIS Data Pack ([www.orkney.co.jp/data/datapack.html](http://www.orkney.co.jp/data/datapack.html)) at 1:25,000 scale which composed of following layers:

- City boundary
- Main road
- Railway
- River and water body
- Building block
- Subway station
- Administrative location
- Convenience stores location

Each convenience store has two associated information which is name and postal address.

### 4. SYSTEM FEATURES AND WORKFLOW

**4.1. Selection of Library:** Firstly, user coming to the website of the application at <http://gisws1.media.osaka-cu.ac.jp/library/bookborrow/> has to select a library that he/she wants to borrow books from. Each library may have “Simple Book Search” and “Advanced Book Search” interfaces in English and Japanese

corresponding with those functions in that library’s OPAC system (Figure 2).

**4.2. Searching for the books:** Using library’s OPAC screen, library user can search for his needed books as he is standing in the library. Note that in the upper part of OPAC screen, a shopping cart application has been integrated in a frame with an authentication interface which allows only registered library users to login (Figure 3).

**4.3. Adding books information to the shopping cart:** Once he/she has found his needed books, just drag-and-drop book name and NCID number to corresponding text box in the shopping cart application (Figure 4). Upon finishing, user clicks the “Check Out” link to be navigated to web-mapping application interface to select a destination convenience store to deliver the books.

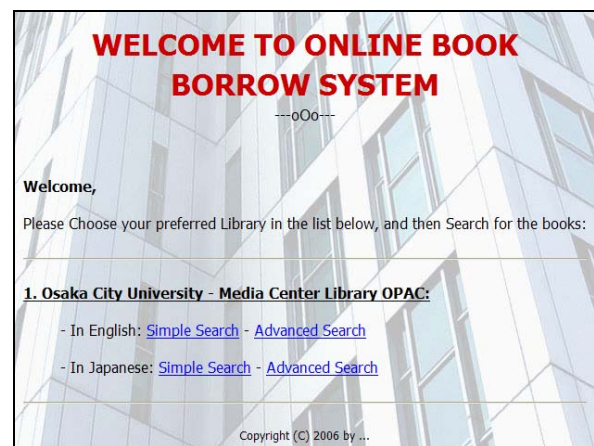


Figure 2: Select a library to begin

Figure 3: Advanced book searching in Osaka City University’s OPAC; upper part is the book borrow cart



Figure 4: Browsing for information and selecting books to the shopping cart

**4.4. Check-out to the web-mapping application:** this module is used to select the nearest convenience store for book delivery (Figure 5). The convenience stores will be shown within city map and infrastructure map (containing roads, rivers, schools, etc.) as icons. User can select a brand of convenience stores (classified by shop name) by clicking the logo on shop selection menu to have all selected-brand convenience stores to be shown on the map with name and address information. The position of convenience store can be checked by “Zooming to Shop” function that will set extent of map to the selected shop position on the map.

**4.5. Select a convenience store to deliver:** Finally, user selects a convenience store for the book to be delivered to by clicking on “Delivery” button (Figure 6).

**4.6. Summary of the order:** then, a confirmation page for the book borrows order will be shown which is composed of detail contact information of the user, book list and destination convenience store location. User can also type his further requests to the library (Figure 7).

This page’s content will then be sent as a HTML email to the administrator of the library. The order will then be carried out as in library’s standard book lending procedures.



Figure 5: Specify the nearest convenience store on the map

ID	Zoom To	Deliver to this Convenient Store	Nomee	Address
1	<a href="#">View</a>	<input type="button" value="Delivery"/>	サンクス宇治伊勢田店	京都府宇治市伊勢田町浮面39-5
2	<a href="#">View</a>	<input type="button" value="Delivery"/>	サンクス宇治六久保店	京都府宇治市広野町西裏49-1

ID	Zoom To	Deliver to this Convenient Store	Nomee	Address
1	<a href="#">View</a>	<input type="button" value="Delivery"/>	ファミリーマート 宇治瓶島町店	京都府宇治市瓶島町薄合43
2	<a href="#">View</a>	<input type="button" value="Delivery"/>	ファミリーマート 宇治若森店	京都府宇治市宇治若森29-7
3	<a href="#">View</a>	<input type="button" value="Delivery"/>	ファミリーマート 志水宇治本郷店	京都府宇治市本郷西中12
4	<a href="#">View</a>	<input type="button" value="Delivery"/>	ファミリーマート 壺池御蔵山店	京都府宇治市六地藏奈良町56
5	<a href="#">View</a>	<input type="button" value="Delivery"/>	ファミリーマート 藤田宇治神明店	京都府宇治市神明宮北31-1
6	<a href="#">View</a>	<input type="button" value="Delivery"/>	ファミリーマート宇治市役所前店	京都府宇治市宇治下居5
7	<a href="#">View</a>	<input type="button" value="Delivery"/>	ファミリーマート宇治武庫店	京都府宇治市宇治武庫50-1
8	<a href="#">View</a>	<input type="button" value="Delivery"/>	ファミリーマート宇治東インター店	京都府宇治市菟道西車上り10-8
9	<a href="#">View</a>	<input type="button" value="Delivery"/>	ファミリーマート京都文教学園店	京都府宇治市瓶島町千足80

ID	Zoom To	Deliver to this Convenient Store	Nomee	Address
1	<a href="#">View</a>	<input type="button" value="Delivery"/>	エーエム・ピーエム近鉄小倉駅前店	京都府宇治市小倉町神楽田11-1

Figure 6: Decide a convenience store for the books to be delivered

**BORROW BOOKS**

**Username:** tanaka

**Full name:** Tanaka Yobisu

**Address:** Sumiyoshi-ku, Osaka

**Tel. number:** 0805-XXXX-XXXX

**Email:** abc@def.net

**I want to borrow:**

1. BA42733205: Advances in remote sensing and GIS analysis / edited by Peter M. Atkinson and Nicholas J. Tate.
2. BA51396398: GISの基礎と応用：空間情報の統合化技術 / 電気学会・空間情報統

**Please deliver to:** ID: 8  
Type: fmart  
Name: ファミリーマート宇治東インター店  
Phone: 0774-38-2296  
Address: 京都府宇治市菟道西車上り10-8

**Your requests:** Please deliver it with a notification to Mr.Tanaka!

Figure 7: Final check of the books borrow order before submitting to the library

## 5. CONCLUSION

This paper has briefly introduced the development of an integrated system between library's OPAC with a simple delivery cart application and a GIS application in order to simplify the process of borrowing books from a library; allowing user to search, borrow books and specify the nearest delivery location to his/her home via Internet. This demonstrated how location-based services can be applied to optimize and also promote the use of library resources. The prototype system developed as a part of the present research needs to be tested for practical use. The system has also the potential for application in other Location Based Services.

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