

RFID LIBRARY SYSTEM MANAGEMENT

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Acknowledgements

Abstract

Özet

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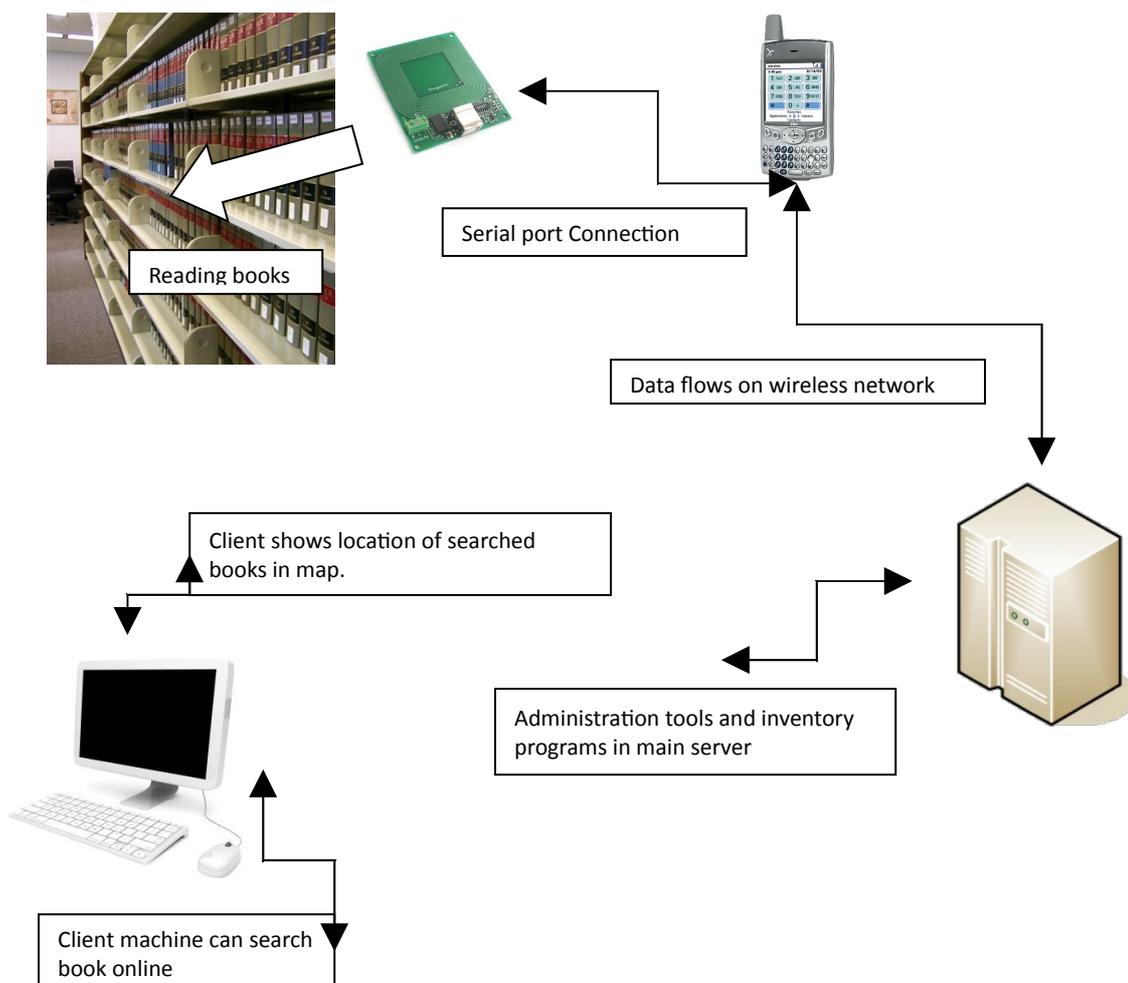
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1. INTRODUCTION

The great increase on RFI based implementations has showed that the implementation of a wireless solution provides a great development on the speed of processing, mobility to the user and also give comfort to the people. For example a simple inventory operation for a huge data stroges can be done in a few seconds with using any controller based on RFID. Aim of this project is implementing new generation of Library Management System.

A simple diagram of this project can be show as below:



2. BACKGROUND

2.1. Information

2.2 What is RFID?

RFID is a contraction of Radio Frequency Identification, which is a wireless communication technology that is used to identify tagged (in the form of uniquely serial number) objects or people. RFID is the basic technology which provides wireless data communication. Although available since a long time, because of cost and lacking of standardization between manufacturers, the use and to become prevalent of technology is delayed.

To understand RFID technology and its implications it is very important to learn where it came from and where it is going.

2.3 History of RFID

The history of RFID is starting with the advent of radio technology. The Germans, British, Americans and Japanese were all using radar system in 1935 to recognize approaching planes. According to research paper which was prepared in “VU University Amsterdam” Scottish physicist Sir Robert Alexander Watson-Watt showed that how his invention of radar could use radio waves to locate physical objects. This is the first big application during World War II, because it detected incoming planes via sending pulses of radio energy and detected the incoming signal which echoes back from planes (Dean Boys, 2005). But still it could not tell what kind of aircraft which was received via signal or to whom they belong.

3. METHODOLOGY

The main purpose of this project is to facilitate librarian works. In this way librarian book searching, finding books which are located in a wrong place has become very simply works.

Libraries have very high level databases that are used for finding location and also information of books. The result of searching book for any user is only text based information. RFID technology with image based searching is used to improve this text information.

The first step is to decide on which kind of RFID reader and tag wil be used for this project. The importances of reader are what kind of tag it reads operating frequency,capability of near reading, writing inside the tag , connection type with computer or any mobile devices such as PDA. After lots of researching on net decided to choose this rfid starter kit.



Picture 1: rfid starter kit QB-RFIDKIT

The main reason of choosing this product is that it is programmable and has standart tag reading features. (Read/write ISO15693 RFID Tags, Read ISO14443A RFID Tags).

The second important device to get information from RFID device is PDA which has lots of features with its operating system. Moreover any PDA device can be used to make bridge between RFID and the main software because all PDA devices which are produced nowadays have JAVA runtime platform support. The only problem is to decide the connection type between PDA and RFID. RFID has serial port connection and lots of PDA devices don't support serial port connection. On the other hand there is a converting device to resolve this problem which support to conversion between serial port to USB 2.0.

The first section of this chapter is about mobile part of the project. Implementation of first part is based on JAVA technology. The reason behind JAVA is that it has lots of abilitiy and simulation models to implementation a mobile software. The next section of the project is only the use of library information system administrator.

In second part of project is like a any desktop application. The purpose of this application is letting the administrator creating library layout which can be used after at all operations in library. Searching, checking book locations, making an inventory of books can be done easily after the second part of project is used by administrator.

Since this application is depend on the operating system type; proگرامing language for implementing this kind of software must be suitable for all operating systems. JAVA is the best proگرامing language for this kind of softwares. This application has the graphical interface and let the user to draw shelf object on uploaded layout image. Like a any drawing tool it will have lots off features let the user make changes on image and create its own image. After administrator finish his/her job on this tool then the result of the application will be saved to database and also he/she can get the new created image with shelf objects inserted on layout image.

The third part of the project can be used by both administrator and client side users. This part also has some administrative functions but generally this part shows search

results on map, stock inventory and makes bridge with mobile device on wireless network. Administrator and librarians can look up the stock inventory, wrong located books and normal users like students can search books via internet and find the results not in a string format. Normal users can find the search results on layout of the library with a point. Since the features of this part, it have to be implemented on web based technology. To ensure the integrity between the parts of the project web based part will be developed in again JAVA technology. In java web based frameworks are very populer. Projects which have lots of data transfer implemented in java with using Struts2, Spring or Servlet technology. Web part of the project will be implemented with using Struts2.

In database part of this project MySQL sql language is used to make database transfer between user , mobile device and applications. MySQL is the open source query engine and supports lots of features like ORACLE.

The previous section of methodology is about technologies which are used to generate communication between hardware,software and users .

3.1 RFID and Web based software communication

Libraries have some standardizations on making catalogs of books. LC (Library of Congress) is the most popular classification method. Books have specific ids which is related to shelf id, category id, author id, title and publication date.

PL 248 .Y373 I53 1999

PL	Shelf id
248	Classification id
Y373	Author surname + author id
I53	Author's book first capital + book id
1999	Publication date

Table 1: Library of Congress Classification method

In this project most important part of this classification is shelf id. RFID reader with mobile devices recognizes the first shelf id then starting to read tags in books. This structure has 2 parts;

- Tags which are located in book are binding with the specific id difference from LC id of book. However, creating specific id for each book is important and costly operation; for security reasons each book must have specific id difference from its own LC id. This binding operation is created in the web part of this project. First of all with mobile device software shelf id is chosen then all shelf is scanned by device. Then huge data send to the web server via wireless network. During the incoming data transfer of web server, shelf id is the base point of the hole data. Moreover in administration side, shelf id's are specific properties and relevant to the image pointing based searching mechanism of web part.
- The second properties of this structure is during making an inventory progress librarian again choose shelf id from mobile device then start the scanning all shelf. In this part simultaneously data sending done between mobile device and web server.

(Later Work : Images: related to diagram of flow information between devices)

As shown in figure reader reads tags during server control the incoming data and sending true/false signal to warn librarian. While books are being read and their information sent, server controls the previously incoming data and sending signal to the mobile device. This process done simultaneously. If the book numbers in shelf more than the average counting book any shelf then to higher the process time all book information sending to mobile device before the scan starting .

After finishing scan process librarian can get the information in two ways according to scan method:

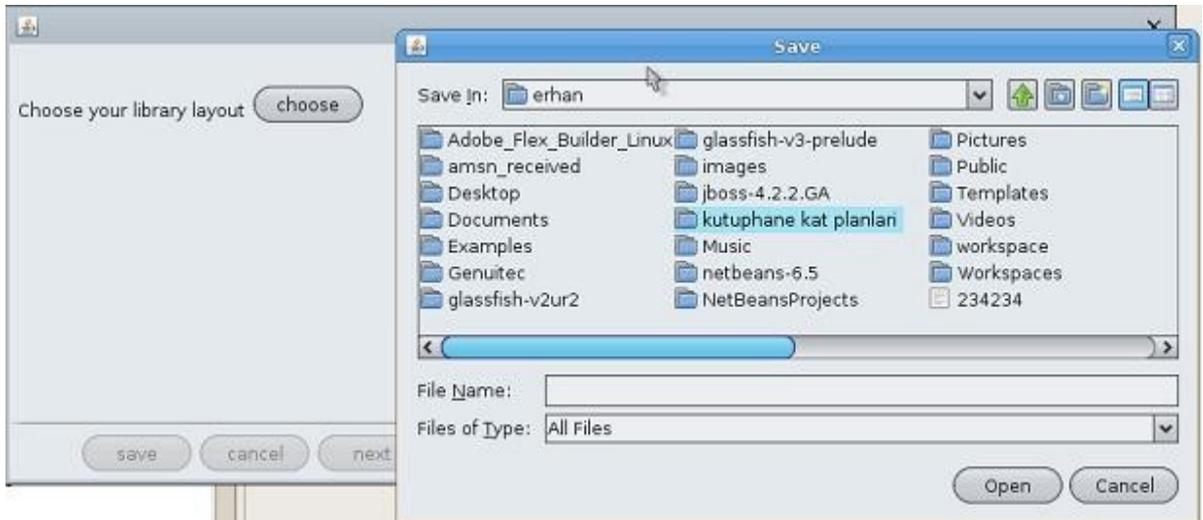
- If librarian choose full scan of library, then web application side of project will respond to this process. After finishing all library scan, there is a layout map tool on web application and this tool points the all wrong books and their true places on the map. This tool also gives some statistical information about all library scan like a count of all books.
- if librarian choose normal scan mode then at this point mobile device responses simultaneously the wrongly located books name and id with their true places.

(Later Work: images related to mobile devices software are located after)

3.2 Creating New Layout of Library Using Layout Creation Tool

3.2.1 Preparing Drawing Tool

The first point of project to creating a new layout with dynamic shelf objects using Library Layout Map Creation Tool. At first step program wants to upload a clearly visible layout of library.



Picture 2: Image upload

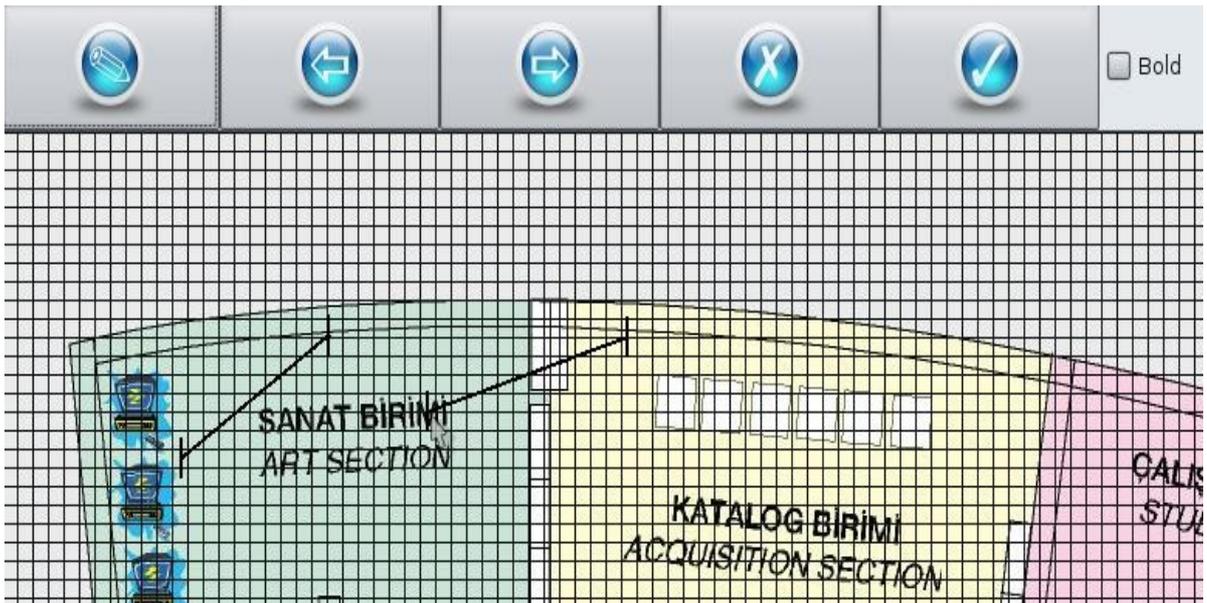
After upload process is done; at back stage of the system image is saved in a temporary place on computer. When next button pressed drawing tool is starting with a clear screen and also with a background of uploaded image.

At the first step administrator can choose projects which have been prepared before but not finished yet from list that located at the right side of the screen. When any saved project is selected then tool is prepared using previously saved informations. In order to do so; database connection is established then all objects related to project selected and located in drawing part of the tool.

image

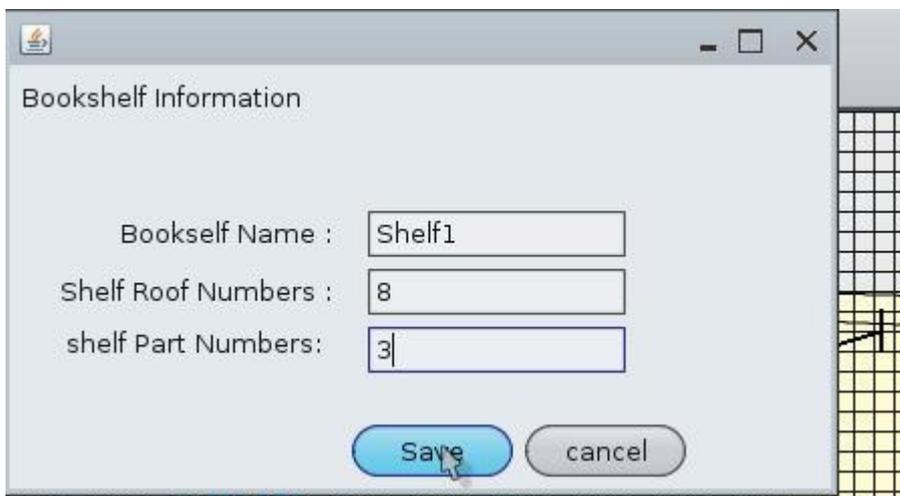
3.2.2 Drawing a Shelf Using Layout Creation Tool

The main purpose of the second step of the program is to provide administrator an easy way to draw shelf objects using smart user interface similar to any image editing program. At the first step user can create shelf objects on the layout image with the aid of grids.



Picture 3: Drawing a shelf object

When mouse released a pop-up screen is appeared to save informations corresponding shelf objects. System needs two important information from user to make relation with books and shelf objects in search criteria. This inputs are very important to guessing the books locations that comes from mobile device or from search part of the project



Bookshelf Information

Bookshelf Name :

Shelf Roof Numbers :

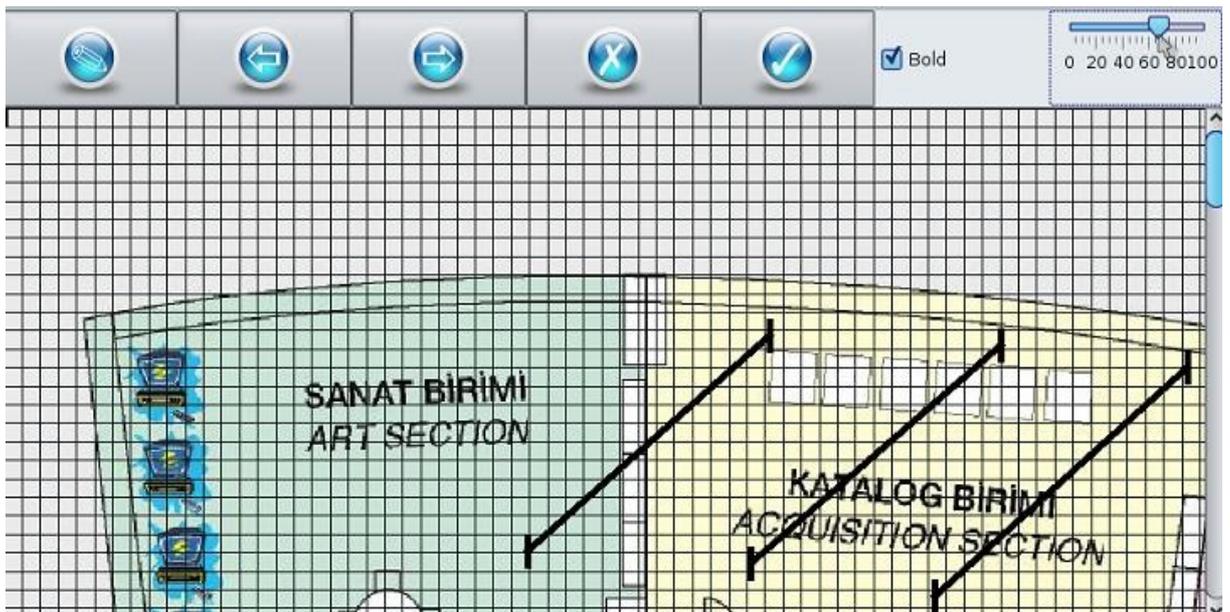
shelf Part Numbers:

Picture 4 : Pop-up

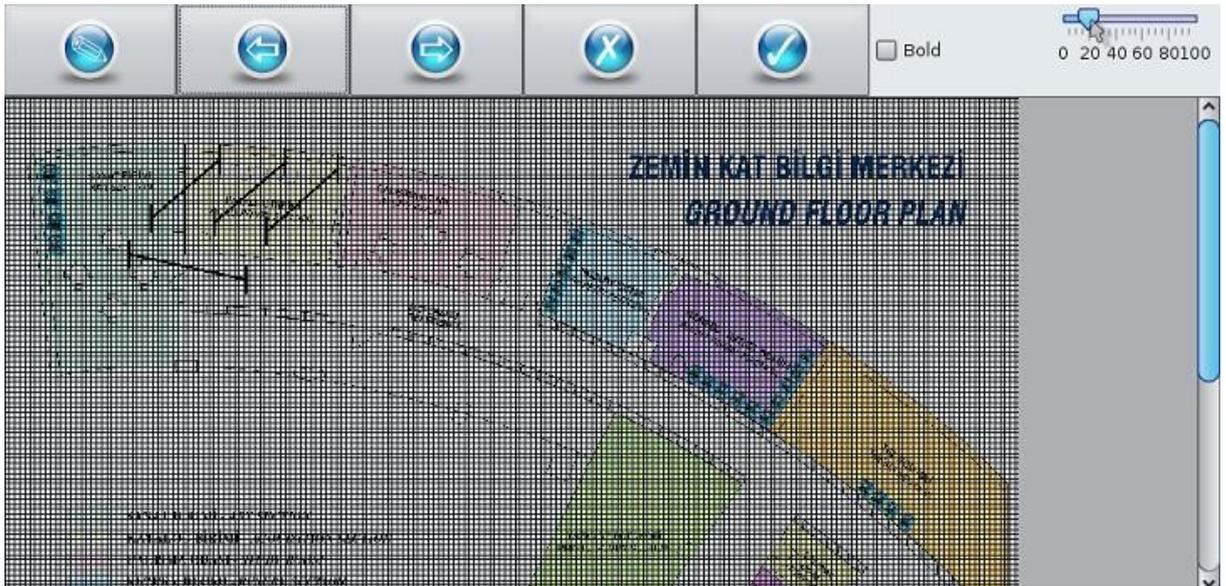
Shelf roof number and shelf part number are used to map books position in the shelf. If shelf has 3 part which means shelf consist of 3 blocks. First book in the upper roof at he first block in the shelf is the one element and last book in the last block of the shelf is the second element. After calculation of the capacity of the shelf any given book is can be pointed according to getting this two element.

Afterwards closing pop-up user can edit an image just click the shelf object. User can change all information and also can erase the drawn shelf object from layout.

The other properties of tool like any image editing tool user can redo and undo while drawing process is standing. Also user can resize the image via using zoom slider.



Picture 5 : Zoom – in action



Picture 6: Zoom – out action

After a while any shelf object is created and after the shelf information saved; user can make changes on this objects just clicked the created object. Finally; if user want to close program then all created objects and saved informations will be saved to database with using "save all" button. Moreover, user can create a new image which contains designed shelf objects and uploaded layout image .

In conclusion; shelf objects and their all information can kept easily through using Layout Creation Tool and all library content without books can be simulated on an image. This shelf objects and their saved informations will help the web content of this project.

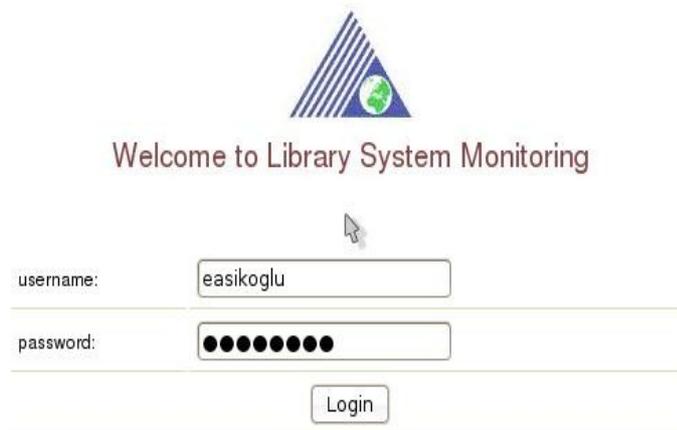
3.3 Web Component Part of the Project

The main purpose of creating a web component for this kind of project is that to make use of informations which are collected from mobile device and Layout Creation Tool. Actually project consist of two main parts as mentioned before, finding incorrectly located books places and resulting the search criteria not only a basic string also answering user with pointing given book on map in the web browser

application.

The web system provides services for two type of users. First user type is the librarian which can get lots of information about inventory. The other type of user is the students or any user who try to find book location in the library.

All librarian has their own accounts and login to the system with using this information.



The image shows a login form for the 'Library System Monitoring' application. At the top center is a logo consisting of a blue triangle with white diagonal lines and a small globe icon. Below the logo, the text 'Welcome to Library System Monitoring' is displayed in a dark red font. A mouse cursor is positioned over the text. The login form consists of two input fields: 'username:' with the value 'easikoglu' and 'password:' with ten black dots representing a masked password. A 'Login' button is located below the password field. The form is enclosed in a thin yellow border.

Picture 7: Login Form

After login operation is made successfully then librarian can make some specific operations using this web component.

3.3.1 Search Criteria

Search mechanism of the project services users independent from their user type. After any keyword is given then search results are shown on the screen.



Search

Search:	<input type="text" value="Yaşar Kemal"/>		
<input type="button" value="Go"/>			
Book Title	Book Id	Book Shelf Id	
İnce mehmed	PL 248 / Y373 I53 2000	PL	Show On Map
Çakırcalı Efe	PL 248 .Y373 C35 2002	PL	Show On Map

Picture 8 : Search Result List

When "show on map" option is chosen; then related book is searched in index file according to corresponding shelf id and position in this shelf with transactional operations.

Existing book index in library will be used in this project with binding this index with shelf id's using mobile device and web component. Search index will be refactored with using apache lucene index searching method.

3.3.2 Binding Operation

Binding operation is the important structure to make visual search results in this web project. As mentioned before libraries have specific demonstration for books id and getting shelf id from this classification method is very simple. Although specific id set for shelf object in Layout Creation Tool , in library one shelf has more than one id and to handle this problem in this web application shelf objects are binded to specific ids related to library classification method.

4. IMPLEMENTATION

5. TESTING AND ANALYSIS

6. CONCLUSION

REFERENCES