Final Report

IDCODE

Mobile Application for Scanning Barcodes

Done by:

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Supervised by:

Mr. Omar IRAQI HOUSSAINI

December 12th, 2017
IDCODE

I confirm that this work is my own work and that all the design phase part presented in this final report is ethical. In addition, all the designing tools used are open source tools.

Abderrahman Darhmaoui

Approved by the Supervisor

Dr. Omar Iraqui Houssaini
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Special thanks and appreciations go also to my friends Abdelmaoula Atanane, Oumaima Gaga or proposing and suggesting many ideas that helped me develop the code and design of this project.
ABSTRACT

ID Code is a mobile application that aims to facilitate access and retrieval of information stored in a web server through a simple scan of a barcode. A large information could already be compressed in a single barcode. IDCODE is meant not only to retrieve this information from the webserver, but also generate new barcodes for the new registered users.

I implemented IDCODE for:

- Business card information sharing and retrieving.
- Event poster information sharing and retrieving.

IDCODE allows users to easily update their personal information stored in a dedicated server. Modifications appears automatically to other users.
INTRODUCTION

What is a barcode?

Barcodes are optical machine-readable codes in the form of numbers and patterns mainly used to identify products. They were created to store information that doesn’t need to be displayed to customers. This idea of hiding information in printed varying lines was first proposed by Wallace Flint in 1932 to automate products checkout system. Joe Woodland and Bernard Silver, they two graduate students believed in the feasibility of the idea and successfully developed it and they got their pattern registered on the 20th of October 1949.

Other usages of barcodes were developed in time and expanded to different fields. Nowadays, barcodes are displayed on every industrial product.

There are many types of barcodes that could be categorized in two major types:

- Linear or one dimensional (1D) barcodes mainly using a combination of numbers and parallel lines with different widths and spacing.

- Two dimensional (2D) barcodes using small geometric patterns like rectangles, dots, hexagons, etc. 2D barcodes were developed later accounting for the development of optical scanner that could read images.

Examples of 1D barcodes
Figure 1: 1D Barcode types

Example of 2D barcodes:

Figure 2: 2D Barcode types
Barcode uses

Life without barcodes become impossible, in every time we go check out in a mall, barcodes play a role in expediting our purchases. Tracking your inventory is essential. All of this confirm that barcodes become important in our daily life.
SOFTWARE DEVELOPMENT METHODOLOGY

Developing IDCODE is follows the main steps of software development methodology, the “Incremental Model”. The first step in this process was gathering all user requirements. These requirements were first set by my supervisor, then through a survey distributed to some students from Al Akhawayn University, I added few other requirements. This last helped me figure out the main objectives of this mobile application and set its functional and nonfunctional requirements.

After getting done with gathering the requirement, time came to conduct a feasibility study of the application. I studied its feasibility with analyzing its use in all segments Social, Market, Financial, and Technical.

I stepped after that to design its system. I determined first the architecture that would be used which is 3 Tier architecture following the MVC concept. Then I set all the diagrams needed to guide the right structure of implementing the application.

The final phase or step is the implementation and testing, which is building the application with fulfilling all the user requirements and performing different tests with all possible cases to solve bugs.
II- FEASIBILITY STUDY

Costs and risks

One of the main costs of this mobile application is to provide it in other mobile operating systems. My knowledge is only limited to the development of android mobile applications. This will cost me time to learn about new development tools and increase my programming knowledge. This limits the number of users of my application since it be available only in the android store. In addition to that, the risk of fulfilling all the user requirement can make the application useless. More than that, my application can guarantee the correctness of the information retrieved after scanning the barcode. It just gets information filled by the user in the registration form. Mentioning this is important since our community lacks trust of use of technology. More than that, people still don’t consider minimizing the use of paper and be environment friendly as one of their ethics and values in life. Finally, handling confidentiality, availability and integrity is a must but bugs in the system are available however how secure it is. This could be a risk that will make users not trust at 100% filling all their proper personal information on it.

Benefits

The big benefit of this application is to facilitate access to personal information at any circumstances as well as encoding it in a way not only people can access it. It is also a very friendly environmental application that one of its main goals is to decrease printing papers and save some trees.

Social Analysis

After a conducting a social analysis on the product, many people seemed non interested since they don’t hear about barcodes, but after simplifying the words and giving
them real examples, they were really impressed by the idea. I also distributed a survey to 50 students which its results were positive about the project idea. AUI students mentioned as an addition commentary that this application could be integrated in several other applications that will help them fill their personal information automatically while signing up. The results of this social analysis were successful, this led me to move and do a market analysis of the project.

**Market Analysis**

After doing a market research on the subject, I found only one similar application that is available only in Chinese language. Other applications that are available are for other purposes and most of them are paid applications. My mobile application will be free, contain no ads and will mainly focus on helping people minimize the paper use.

**Financial Analysis**

The project will not cost anything since all the tools that will be used are open source development platforms. The application will be a free application after it is done, but it will cost dollars for maintenance and for marketing it. Also, the server to save all the information will be costly depending on the amount of the information that will be stored yearly.

**Technical Analysis**

This project is feasible in the technical sense. All the tools necessary are available; however, it requires a good amount of time to develop a good knowledge about all the tools and to practice them so to achieve a well finalized product. After the success in all the analysis parts, the project become feasible and achievable. This will push me move to the next part design and development.
### Project Schedule

<table>
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<th>Week</th>
<th>Dates</th>
<th>Progress</th>
</tr>
</thead>
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<tr>
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<td>29-31/8</td>
<td>Project selection</td>
</tr>
<tr>
<td>2</td>
<td>4-8/9</td>
<td>Project initial specification</td>
</tr>
<tr>
<td>3</td>
<td>11-15/9</td>
<td>Feasibility study and analysis</td>
</tr>
<tr>
<td>4</td>
<td>17-22/9</td>
<td>Design and architecture of the system</td>
</tr>
<tr>
<td>5-12</td>
<td></td>
<td>Development of the application</td>
</tr>
<tr>
<td>13</td>
<td>20-24/11</td>
<td>Final report</td>
</tr>
<tr>
<td>14</td>
<td>4-8/12</td>
<td>Project defense</td>
</tr>
<tr>
<td>15</td>
<td>11-15/12</td>
<td>Updated final report</td>
</tr>
</tbody>
</table>
II- USER and SYSTEM REQUIREMENTS

1. Functional Requirements

User account management

1. User registration:
   - The application shall allow users to register and create a profile.

2. User authentication
   - When registering, the application shall allow users to authenticate using their user name and password.

3. User Log in
   - Users shall be able to deactivate their accounts.
   - Users shall be able log out.

Event account management

1. Event creation:
   - The application shall allow the creation of event and event profile.

2. Event authentication:
   - After the creation of an event, the application shall allow event managers to authenticate using event name and event password.

3. Event modification:
   - Event managers are able to permanently remove the event.
   - Event managers are allowed to edit event information.

Profile Management

The profiles of users shall contain the following:
• Username
• Password
• Name
• Email
• Job
• Phone
• Address

The profiles of events shall contain the following:

• Event name
• Event Password
• location
• Email
• Facebook
• Address
• Start
• End

Users Management

User profile creation:

• The mobile application shall allow users to choose between using the application as a barcode scanner without accessing its profile or allow him to login and apply modifications.
• Users can scan the barcode from all the angles not specifically one angle.
• Users are able to modify, add information from their profile.
• Users are able to disable their accounts and delete their profiles.

Event Management

Event profile creation:

• Users can add to the required information further data
  - Event type
  - Type of costumes allowed
- Transportation available to the event location

• Users can get information about events by scanning its barcode.

• Users can choose to participate in an event and be notified 24 hours before its starting time.
2. Use Case Diagram

![IDCode System Use Case Diagram](image)

**Figure 3: IDCODE use case diagram**
3. Non-Functional Requirements

Security

The system and the channel must be secured and only authenticated users have access to their profiles in the server. This system must follow the main security rules:

- **Confidentiality:**
  - The user shall specify who gets to see their information

- **Integrity:**
  - Modification of data can be performed only by the owners of the account.

- **Availability:**
  - The application needs to be available and responsible at any time.

- **Authenticity:**
  - No one can modify or delete other people's information.

Performance

The response time of the application needs to be minimized to have a high performance.

Scalability

The system will be used by people from all around the world, this imply that the application must be highly scalable.

Extensibility

The system should be allowing extensibility for the implementation of new services such as signing up using Facebook or google+. As well as allowing the use of several new API's.

Integration

The system could be extended from free to a costly application only for new users without affecting the usage of the application by old users.
**Maintainability**

The maintenance of the system needs to be simple without affecting the user’s data.

**Modifiability**

Changes in the system must not affect the user data and doesn’t affect the usage of the application.
III. STEEPLE ANALYSIS

Social
This application facilitates interactions and help people socialize. It facilitates information access about events or about another person just by scanning their barcodes.

Technology
Nowadays people are more likely to use their mobiles to search for any information. This application is designed to scan barcodes and extract information from those barcodes about people or events.

Economic
This application has no economic implications.

Environmental
This application does not harm the environment; however, it decreases the use of papers which helps solving environmental issues.

Political
The application does not target any governmental nor political organizations.

Legal
The implementation of the application will be legal, it will respect copy rights and use open source software’s.

Ethical
The application will ensure the privacy of user’s information.
IV- TECHNOLOGY ENABLERS

1. SERVER SIDE TECHNOLOGY ENABLERS

The **Java** programming language is used to implement the business logic and the controller on server side.

**Glassfish server** is used to enable communication with the database and the mobile interface.

**NetBeans IDE** is used to implement the business logic and the controller.

Data Management System

**MySQL** is used to populate the tables needed in the database.

**MySQL Workbench** is the IDE that is used to implement the database.

*Figure 4: Server side technology enablers*
2. CLIENT SIDE TECHNOLOGY ENABLERS

*Figure 5: Client side technology enablers*

**Other technology enablers**

<table>
<thead>
<tr>
<th>Android Studio</th>
<th>Adobe Photoshop will be used to design the user interface of the IDCODE application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sketch</td>
<td>Sketch is used to perform more professionalism on provide a very attractive user interface</td>
</tr>
</tbody>
</table>

*Figure 6: UI design technology enablers*
VI- SYSTEM DESIGN AND ARCHITECTURE

A good performance of IDCODE application requires its implementation with MVC model. This concept enables the concept of separation of concerns. My application has a standard approach for the 3 tiers architecture: Client tier, Server Tier, and Data Tier.

The Server Tier has 2 containers: Business container and Web container. Since the application requires to determine the location of the event, the business logic make use of Google maps web service as well as google vision services and is exposed to the RESTful web service. All data is stored in MYSQL database and converted in entity classes using ORM and persisted using Java Persistence API.

The client side is implemented using android studio and it is where the implementation of the user interface is made, with the necessary code to establish connections with the server’s application and send HTTP requests. It is also used to gather the information received from application side.

To send notifications to the client side, the android push notifications are called from the server side, and are transfer to the client side.

The Data tier stores all the data used in the application MySQL database.

Figure 7: System Architecture
Entity diagram

![ERD diagram]

Figure 8: ERD diagram
**Entities and their attributes description:**

This following table is the description for the database tables and their attributes along with the data type of each attribute.

<table>
<thead>
<tr>
<th>Table</th>
<th>Attribute</th>
<th>Data type</th>
<th>Entity description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Users table</td>
<td>Id</td>
<td>Integer</td>
<td>Auto incremented User Id’s saved in the database, as well as the primary key.</td>
</tr>
<tr>
<td></td>
<td>Username</td>
<td>String</td>
<td>The username of the user is a string that the user choose to use it for authentication</td>
</tr>
<tr>
<td></td>
<td>Password</td>
<td>String</td>
<td>The password is set by the user to be used for authentication along with the username</td>
</tr>
<tr>
<td></td>
<td>Email</td>
<td>String</td>
<td>The email of the user, that will be used also to recover the password</td>
</tr>
<tr>
<td></td>
<td>Name</td>
<td>String</td>
<td>First name and last name of the user</td>
</tr>
<tr>
<td></td>
<td>Job</td>
<td>String</td>
<td>The job of the user</td>
</tr>
<tr>
<td></td>
<td>Phone</td>
<td>Integer</td>
<td>The Phone number of the user</td>
</tr>
<tr>
<td></td>
<td>Address</td>
<td>String</td>
<td>The address of the user</td>
</tr>
<tr>
<td>Participant table</td>
<td>eventid</td>
<td>Integer</td>
<td>The Event id (foreign key) that links the user to the event</td>
</tr>
<tr>
<td></td>
<td>Userid</td>
<td>Integer</td>
<td>The user id (foreign key) that links the user to an event</td>
</tr>
<tr>
<td>Event table</td>
<td>Evid</td>
<td>Integer</td>
<td>Auto incremented event Id’s saved in the database, as well as the primary key.</td>
</tr>
<tr>
<td>-------------</td>
<td>--------</td>
<td>---------</td>
<td>--------------------------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>Eventname</td>
<td>String</td>
<td>The name of the event</td>
</tr>
<tr>
<td></td>
<td>Email</td>
<td>String</td>
<td>The email of the event</td>
</tr>
<tr>
<td></td>
<td>Phone</td>
<td>Integer</td>
<td>The phone number of the event</td>
</tr>
<tr>
<td></td>
<td>Start</td>
<td>Date</td>
<td>The date when the event is starting</td>
</tr>
<tr>
<td></td>
<td>End</td>
<td>Date</td>
<td>The date when the event will end</td>
</tr>
<tr>
<td></td>
<td>Longitude</td>
<td>Double</td>
<td>The Longitude of the event’s location</td>
</tr>
<tr>
<td></td>
<td>Latitude</td>
<td>Double</td>
<td>The Latitude of the event’s location</td>
</tr>
</tbody>
</table>
VI- 1. Activity diagram

![Activity diagram]

*Figure 10: Activity diagram*
The following table provides the description of each activity in the activity diagram.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Register</td>
<td>After the launch of the application, the user can create account.</td>
</tr>
<tr>
<td>Scan Barcode</td>
<td>After the launch of the application, the user can scan any barcode and get the information about it.</td>
</tr>
<tr>
<td>Login</td>
<td>After the launch of the application, the user can authenticate to get its personal information and apply modification on it.</td>
</tr>
<tr>
<td>Extract information from Barcode</td>
<td>After scanning the barcode, the user get the information on it.</td>
</tr>
<tr>
<td>Generate Barcode</td>
<td>The user can generate its barcode after authenticating using its username and password.</td>
</tr>
<tr>
<td>Save Barcode</td>
<td>After generating the barcode, the user can save it in the phone or email it to its personal email</td>
</tr>
</tbody>
</table>
Implementation

The first thing I started with in the implementing of IDCODE application is the creation of database that is implemented by MySQL following the requirements gathered from my supervisor and AUI students. After getting done with the database implementation, which was the easiest part in this project, I moved to implementing the back end of the application which is the server side.

During the implementation of the server side of IDCODE, I have faced several issues. It is my first time to learn about the MVC concept and how to implement an application using multi-tier architecture. It took me time to configure Glass fish webserver and implement the business logic of IDCODE using beans. IDCODE is implemented in a POJO class and wrapped using session beans. After implementing the business side, it was really hard to figure out how to establish connection between the server side and client side which I had no clue about. I figured it out after watching several tutorials and understand the use of JSON and how to parse it. After establishing connection between both server and client side, I tried to use multiple web services, but I only succeeded to include only google vision API and google maps API. The first API was used to scan and generate barcodes while the second one was used to get the longitude and latitude of a given address of an event and set it as a marker in the map.

The client side was implemented using android studio, and it is where the user interface is created using XML and connected to activities. Personalizing user interface was done using multiple tools which were Photoshop, sketch and other online tools.
Screen shots of the result

...
Event Login

Eventname

Password

LOGIN

Register Event

Username
anas95
Password
******
Email
anas_95@gmail.com
name
anas Allali
Job
student
Phone
0610947402
Address
N°6 boulevard Abdelkader

UPDATE DELETE GENERATE BARCODE

LOGOUT

IDCODE

Eventname
karoke night
e-mail
k.night@gmail.com
Facebook
https://web.facebook.com/groups/karokenight/?ref=br_tf
Start
03/12/17
End
05/12/17

GeneratorActivity

QR Code Generator

SAVE

EMAIL

IDCODE

Event Login

Eventname

Password

LOGIN

Register Event

Username
anas95
Password
******
Email
anas_95@gmail.com
name
anas Allali
Job
student
Phone
0610947402
Address
N°6 boulevard Abdelkader

UPDATE DELETE GENERATE BARCODE

LOGOUT

IDCODE

Eventname
karoke night
e-mail
k.night@gmail.com
Facebook
https://web.facebook.com/groups/karokenight/?ref=br_tf
Start
03/12/17
End
05/12/17

GeneratorActivity

QR Code Generator

SAVE

EMAIL
Figure 11: Screen shots of the results
X- Future work and Conclusion

IDCODE helped me master several development skills and enrich my background. For the future, I am willing to implement IDCODE in IOS as well as Windows phone. I’m planning to add the login using Facebook and google. I will work after that on hosting the database in webserver in order to be useful by users all over the world. After that will work on deploying it on the Playstore in the next few days to get feedback from different customers.
References

Books


Websites

- https://docs.oracle.com/javaee/6/tutorial/doc/gfirp.html
- https://Stackoverflow.com
- https://youtube.com
- https://www.khanacademy.com
- https://www.udemy.com/
- https://www.coursera.org/