

CS2102 Database Project Report

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1 Introduction

In this project, we are required to build a stuff sharing website. the system allows people to borrow or lend stuff that they own (tools, appliances, furniture or books) either free or for a fee. Users advertise stuff available (what stuff, where to pick up and return, when it is available, etc.) or can browse the available stuff and bid to borrow some stuff. The stuff owner or the system (your choice) chooses the successful bid. Each user has an account. Administrators can create, modify and delete all entries.

1.1 Developing Specifications

After seeing through the relevant products specifications and the website requirements, we decided to use *PHP* as back end programming language, *Javascript* as front end developing language, *MySQL* as our database. We used *Laravel*, which is the most popular web application framework for *PHP*.

From the project requirement, Eloquent ORM in built in *Laravel* to access and manipulate the database is not allowed. Therefore, anything related to database management, access, and manipulation is down by importing *PHP mysqli* library and execute raw *SQL* queries.

To develop this web application, we utilise the Model View Controller (*MVC*) framework.

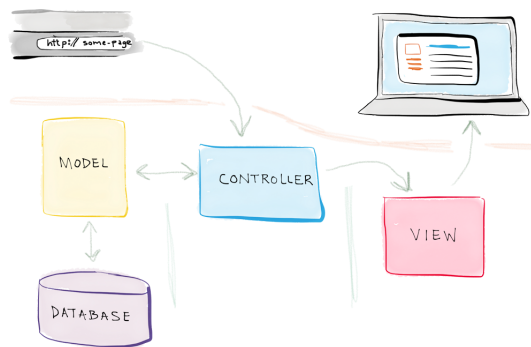


Figure 1: Model View Controller (MVC)

We use *CSS Scaffolding* in *Laravel* to take care of the views. Buttons and redirections from the user side are implemented in *Javascript*. The models and controllers are written in *PHP*. The specific *MySQL* database we used it *root* user's database named *blog*. The website is still hosted on `localhost:8000` only.

From our modelling for this problem, there are two types of users. The admin users will have different interfaces and unlimited access to all entries. From the user management button in the admin user's profile page. All the users information can be modified and deleted. New users can be added on this panel as well.

2 Database Design

2.1 Entity-Relationship Diagram

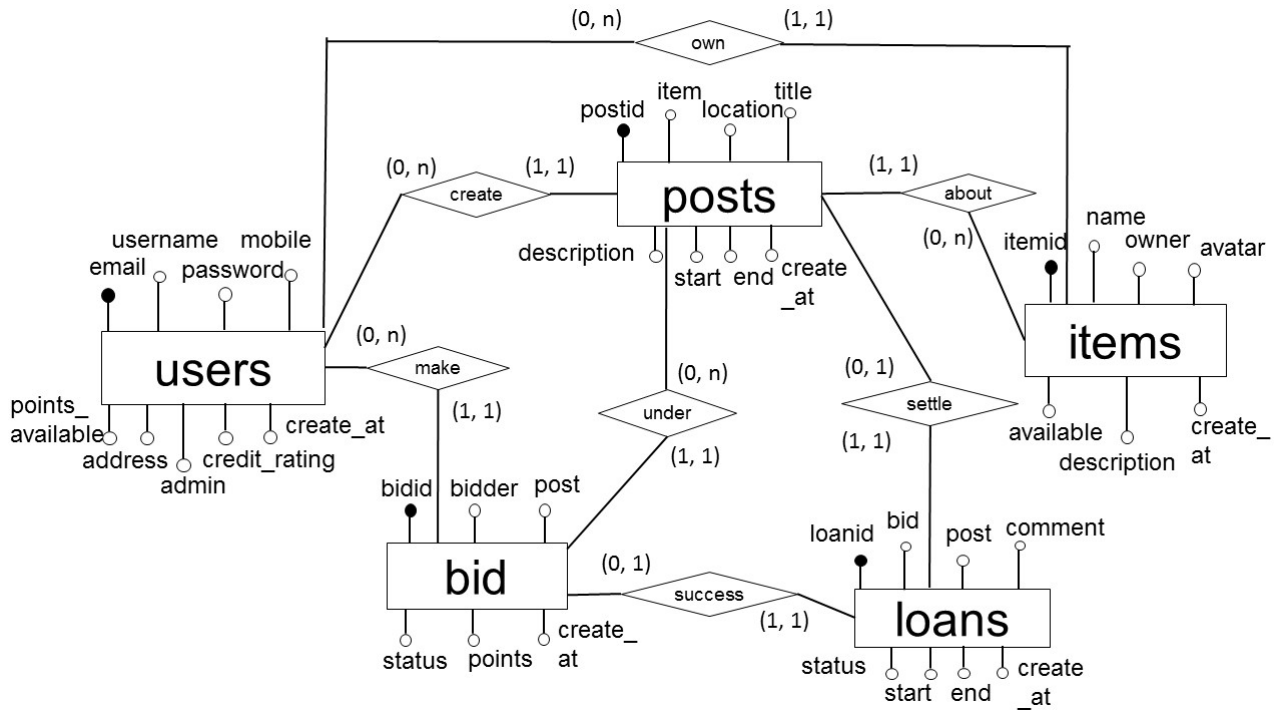


Figure 2: Entity-Relationship Diagram

The *ids* for each table are created to facilitate implementation of the web pages.

2.2 Entities

Users:

| Attribute | Domain |
|------------------|--------------|
| email | VARCHAR(64) |
| username | VARCHAR(64) |
| password | VARCHAR(64) |
| mobile | INT(8) |
| address | VARCHAR(128) |
| points_available | INT(3) |
| admin | INT(1) |
| credit_rating | NUMERIC |
| created_at | TIMESTAMP |

Items:

| Attribute | Domain |
|-------------|--------------|
| name | VARCHAR(64) |
| avatar | VARCHAR(256) |
| owner | VARCHAR(64) |
| description | TEXT |
| available | VARCHAR(5) |
| created_at | TIMESTAMP |

Posts:

| Attribute | Domain |
|-------------|--------------|
| item | VARCHAR(64) |
| title | VARCHAR(64) |
| location | VARCHAR(128) |
| description | TEXT |
| start | TIMESTAMP |
| end | TIMESTAMP |
| created_at | TIMESTAMP |

Bids:

| Attribute | Domain |
|------------|-------------|
| bidder | VARCHAR(64) |
| post | VARCHAR(64) |
| status | CHAR(7) |
| points | INT(3) |
| created_at | TIMESTAMP |

Loans:

| Attribute | Domain |
|------------|-------------|
| bid | VARCHAR(64) |
| post | VARCHAR(64) |
| start | TIMESTAMP |
| end | TIMESTAMP |
| comments | TEXT |
| status | VARCHAR(8) |
| created_at | TIMESTAMP |

2.3 Relational Schema

```
CREATE TABLE users (  
  email VARCHAR(64) PRIMARY KEY,  
  username VARCHAR(64) NOT NULL,  
  password VARCHAR(64) NOT NULL,  
  mobile INT NOT NULL,  
  address VARCHAR(128),  
  points_available INT DEFAULT 500,  
  admin INT DEFAULT 0,  
  credit_rating NUMERIC CHECK (credit >= 0 AND credit <= 5),  
  created_at TIMESTAMP DEFAULT CURRENT_TIMESTAMP  
);
```

```
CREATE TABLE items (  
  itemid INT AUTO_INCREMENT PRIMARY KEY,  
  name VARCHAR(64) NOT NULL,  
  avatar VARCHAR(256),  
  owner VARCHAR(256) REFERENCES users(email) ON UPDATE CASCADE ON DELETE  
  CASCADE,  
  description TEXT,  
  available VARCHAR(5) CHECK(available = 'TRUE' OR available = 'FALSE'),  
  created_at TIMESTAMP DEFAULT CURRENT_TIMESTAMP  
);
```

```
CREATE TABLE posts (  
  postid int AUTO INCREMENT PRIMARY KEY,  
  item int REFERENCES items(itemid) ON DELETE CASCADE,  
  start TIMESTAMP NOT NULL DEFAULT CURRENT_TIMESTAMP,  
  end TIMESTAMP NOT NULL DEFAULT CURRENT_TIMESTAMP,  
  title VARCHAR(64) NOT NULL,  
  location VARCHAR(128) NOT NULL,  
  description TEXT,  
  created_at TIMESTAMP DEFAULT CURRENT_TIMESTAMP,  
  CHECK (start < end)  
);
```

```
CREATE TABLE bids (  
  bidid INT AUTO_INCREMENT PRIMARY KEY,  
  bidder INT REFERENCES users(email) ON UPDATE CASCADE ON DELETE CASCADE,  
  post INT REFERENCES posts(postid) ON DELETE CASCADE,  
  points INT NOT NULL,  
  created_at TIMESTAMP DEFAULT CURRENT_TIMESTAMP,  
  status CHAR(7) CHECK (status = 'SUCCESS' OR status = 'FAILURE')
```

);

```
CREATE TABLE loans (  
  loanid INT AUTO_INCREMENT PRIMARY KEY,  
  bid INT REFERENCES bids(bidid) ON DELETE CASCADE,  
  post INT REFERENCES posts(postid) ON DELETE CASCADE,  
  start TIMESTAMP NOT NULL DEFAULT CURRENT_TIMESTAMP,  
  end TIMESTAMP NOT NULL DEFAULT CURRENT_TIMESTAMP,  
  comments TEXT,  
  created_at TIMESTAMP DEFAULT CURRENT_TIMESTAMP,  
  status VARCHAR(8) CHECK (status = 'ONLOAN' or status = 'RETURNED' or status = 'EX-  
PIRED'),  
  CHECK (start < end)  
);
```

2.4 Schema Functions

The *users* entity stores user information such as username, email, password, address etc. A user can have three different roles, namely owner of item, borrower or admin. An item owner can add posts to indicate the available periods for lending their items. A borrower can browse through the posts to bid for an item. An admin user is able to access information of all users through a user management panel which will be elaborated in section 4.4.

The *items* entity stores all information related to a specific item, including its owner, item name, type, description, and availability. An item must have exactly one valid owner but a user may not necessarily possess any items.

The *posts* entity stores information about an available item, such as start date and end date of one's available period, fee, location for taking the item and description. Borrowers could choose to borrow items based on this information.

The *bids* entity stores information such as bidder's email, post bidded, bidding points, and status(success or failure). Bidders need to offer a price(bidding points) to indicate how much they need to borrow this item.

The *loans* entity stores information such as the successful bid, associated post, start date and end date, and status of the loan(returned or not). Owners of items need to indicate that the item has been returned in the loans table once the successful bidder returns it.

3 SQL Queries

3.1 Simple Queries

The following simple query returns all the information about one particular bidding specified by bidid 101. This is displayed when the bidder wants to edit his own bidding.

```
SELECT *  
FROM bids  
WHERE bids.bidid = 101;
```

The following simple query returns all the information about all the items. This is displayed when user accesses the 'items' page.

```
SELECT *  
FROM item i;
```

The following simple query returns all the information about one particular post specified by postid 251. This is displayed when the poster wants to edit his own post.

```
SELECT *  
FROM posts  
WHERE posts.postid = 251;
```

The following simple query returns all the information about one user with userid specified as 36. This is displayed when the user visited his 'user' page.

```
SELECT *  
FROM users  
WHERE users.id = 36;
```

The following simple query returns all the information about the posts of a particular user specified by his/her email 'typical_user@gmail.com'.

```
SELECT *  
FROM posts p, items i  
WHERE p.item = i.itemid AND i.owner = 'typical_user@gmail.com';
```

The following simple query returns all the information about the transaction history between two users, i.e. their usernames, bidding points, bidding time.

```
SELECT u1.username as owner, u2.username as bidder, b.points, b.updated_at as time  
FROM users u1, users u2, bids b, items i, posts p  
WHERE b.bidder = u2.email AND b.post = p.postid AND p.item = i.itemid AND i.owner =  
u1.email  
AND (b.bidder = email OR i.owner = email);
```


3.2 Aggregate Queries

The following aggregate query returns the maximum bidding points for one particular post with postid specified as 251. This is displayed when the poster wants to check the maximum bid made for his post.

```
SELECT MAX(b.points)
FROM bids b, posts p
WHERE b.post = p.postid AND p.postid = 251;
```

3.3 Nested Queries

The following nested query selects all the information about the items not owned by the user logged in with the email specified as 'typical_user@gmail.com'

```
SELECT p.postid, p.title, p.description, p.created_at, i1.avatar
FROM posts p, items i1
WHERE p.item = i1.itemid
AND p.item NOT IN
    (SELECT i.itemid FROM items i WHERE i.owner = 'typical_user@gmail.com');
```

3.4 Insertions, Deletions and Updates

The following query inserts one bidding record into the bids table.

```
INSERT INTO bids (bidder, post, points) VALUES ('typical_user@gmail.com', 251, 200);
```

The following query inserts one loan record into the loans table.

```
INSERT INTO loans (bid, post, status) VALUES(101, 251, 'ONLOAN');
```

The following query inserts one item record into the items table.

```
INSERT INTO items (description, available, name, owner, avatar) VALUES ('Nil',
    1, 'User', 'typical_user@gmail.com', 'file_name');
```

The following query inserts one post record into the posts table.

```
INSERT INTO posts (item, title, location, description) VALUES (47, 'Available aircon', 'NUS',
    'Nil');
```

The following query inserts one unsuccessful bidding record into the bids table.

```
INSERT INTO bids (status, bidder, post, points) VALUES ('FAILURE', 'typical_user@gmail.com',
    251, 200);
```

The following query deletes one bidding record specified by bidid 101.

```
DELETE FROM bids
WHERE bids.bidid = 101;
```

The following query deletes one post record specified by postid 251.

```
DELETE from posts
WHERE posts.postid = 251;
```

The following query updates the bidding points for one particular bidding.

```
UPDATE bids
SET bids.points = 300
WHERE bids.bidid = 101;
```

The following query sets the bidding status to success.

```
UPDATE bids
SET bids.status = 'SUCCESS'
WHERE bids.bidid = 101;
```

The following query increases the available points of the user specified by userid 36

```
UPDATE users
SET users.points_available = users.points_available + 100
WHERE users.id = 36;
```

The following query updates the loan information to be 'returned' after the borrowed item has been returned to the owner.

```
UPDATE loans l
SET l.status = 'RETURNED'
WHERE l.loanid = 27;
```

The following query updates the post information of a particular post specified by postid 251.

```
UPDATE posts
SET posts.title = title, posts.location = location, posts.description = description
WHERE posts.postid = 251;
```

3.5 Query using view

Create a view item_popularity which contains all the popularity information about the items.

```
CREATE VIEW item_popularity AS
SELECT i.itemid as itemid, i.owner as owner, COUNT(*) AS popularity
FROM items i, posts p, bids b
WHERE i.itemid = p.item AND p.postid = b.post
GROUP BY i.itemid, i.owner;
```

The following query selects the average popularity of the items posted by each user.

```
SELECT u.email, AVERAGE(i.popularity)
FROM users u, item_popularity i
WHERE u.email = i.owner
GROUP BY u.email;
```

The following query selects the average popularity of the items bided by each user.

```
SELECT u.email, AVERAGE(i.popularity)
FROM users u, item_popularity i, posts p, bids b, loans l
WHERE u.email = b.bidder AND b.bidid = l.bid AND b.post = p.postid AND p.item = i.itemid
GROUP BY u.email;
```

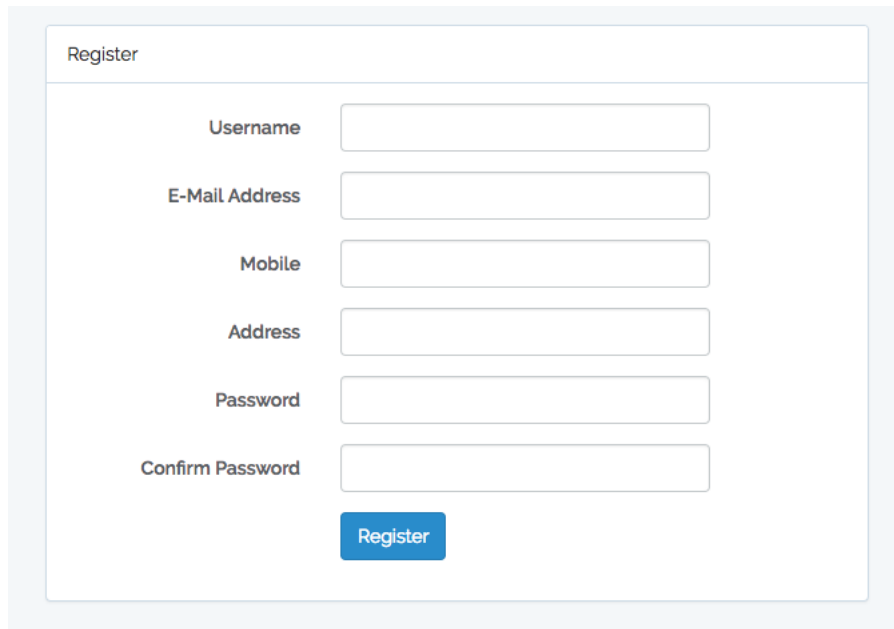
The following query remove the view created.

```
DROP VIEW if exists item_popularity
```

4 Web Interface Design

We aims to have a friendly, easy-to-use interface for our web application. The following sections are about the pages in our web interface.

4.1 Sign Up Page



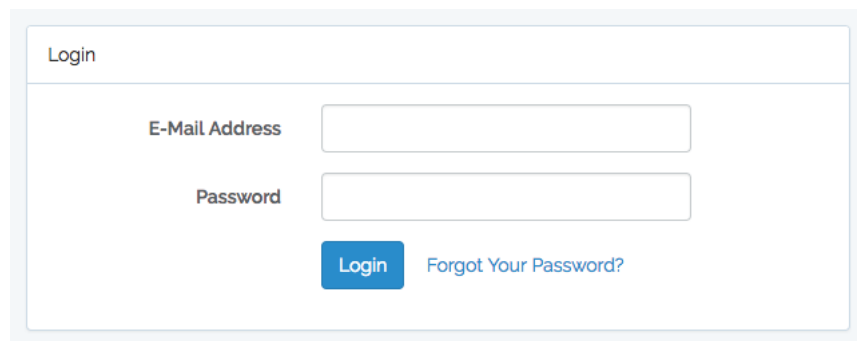
The image shows a 'Register' form with a title bar at the top. Below the title bar, there are six input fields arranged vertically, each with a label to its left: 'Username', 'E-Mail Address', 'Mobile', 'Address', 'Password', and 'Confirm Password'. At the bottom of the form, there is a blue button labeled 'Register'.

Figure 3: New User registration page

From this page, new users will be able to sign up and enter our system.

4.2 Log In Page

Other users will be able to log in via this page.



The image shows a 'Login' form with a title bar at the top. Below the title bar, there are two input fields arranged vertically, each with a label to its left: 'E-Mail Address' and 'Password'. At the bottom of the form, there is a blue button labeled 'Login' and a link labeled 'Forgot Your Password?'.

Figure 4: User login page

4.3 Application

Upon logging in, the user will be directed to his/her dashboard. He can easily see the points available for him or her. Besides that, the items the user owning, the posts he or she has submitted, the posts the user is currently bidding for and the items the user is currently borrowing will be displayed sequentially throughout this the page.

In addition, from the top right drop down list, the user can go to other pages ranging form his

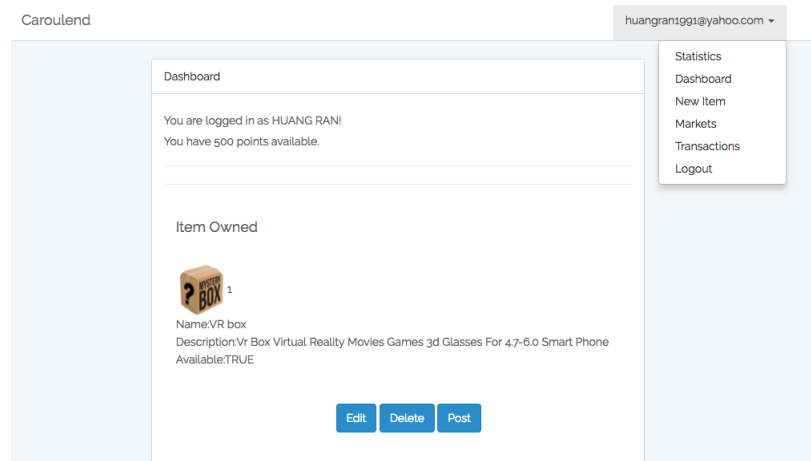


Figure 5: User login page

or her using statistics. User can also create new item, go to the posting markets and checkout current transactions and transacting history. This includes the user's posts that are being bid by other users, the user's current lending items and the past transactions.

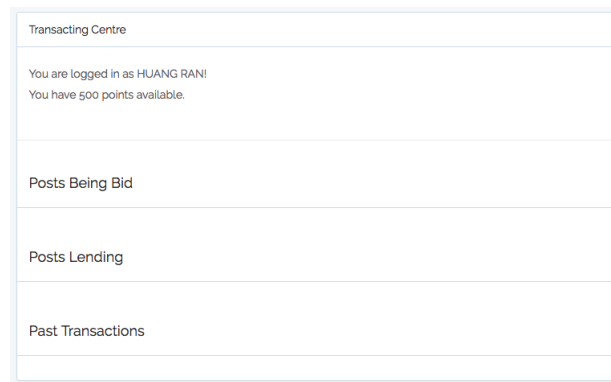


Figure 6: transaction centre page

From the transaction centre, users will be able to see their posts that are being bid, their posts (items) that are currently lent to others, and their past transactions (both for lending and borrowing).

4.4 Administration

There is a special type of user called admin user. They have their admin column equal to 1 and they can have unlimited access to access, delete, update and create any entries in our database. Users are not able to sign up an admin account. The only possible way to become an admin is to update the table in our database directly. Implemented in this way, the administration page is very secure and the current normal users' information are properly protected. As shown in this screen shot,

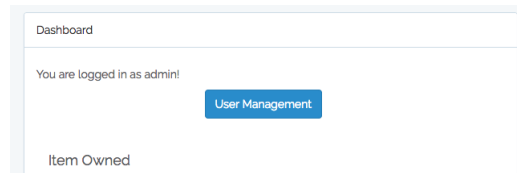


Figure 7: User management panel

the admin user can access any entries inside this application. If he or she wants to manage the current users, they can do so by clicking the user management button and the user records can be updated, deleted or created on our administration user management panel.