Working With CodeIgniter Models

tutorial #tutorial04

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Tutorial Goals

We talked about models in class ... this tutorial is meant to give you an opportunity to explore and practice a bunch of what we talked about :)

I have prepared a starter webapp – a mini "menu ordering system". It has controllers and views, but is incomplete – lacking models, which you are to provide.

Tutorial Revisions

Two main revisions for this tutorial: I have added a bunch of screenshots showing how the webapp remains broken while you are fixing pieces of it, and I have updated the codebase, to work around a change in CodeIgniter 3 since I first put this lab together in the fall.

If you have not updated your framework recently, I suggest doing so, to the latest release candidate, before undertaking this lab. If you base yours on the week 2 version you made, you might find that you get errors referring to "...application/errors/...", as the starter I provided back then was out of date.

Preparation

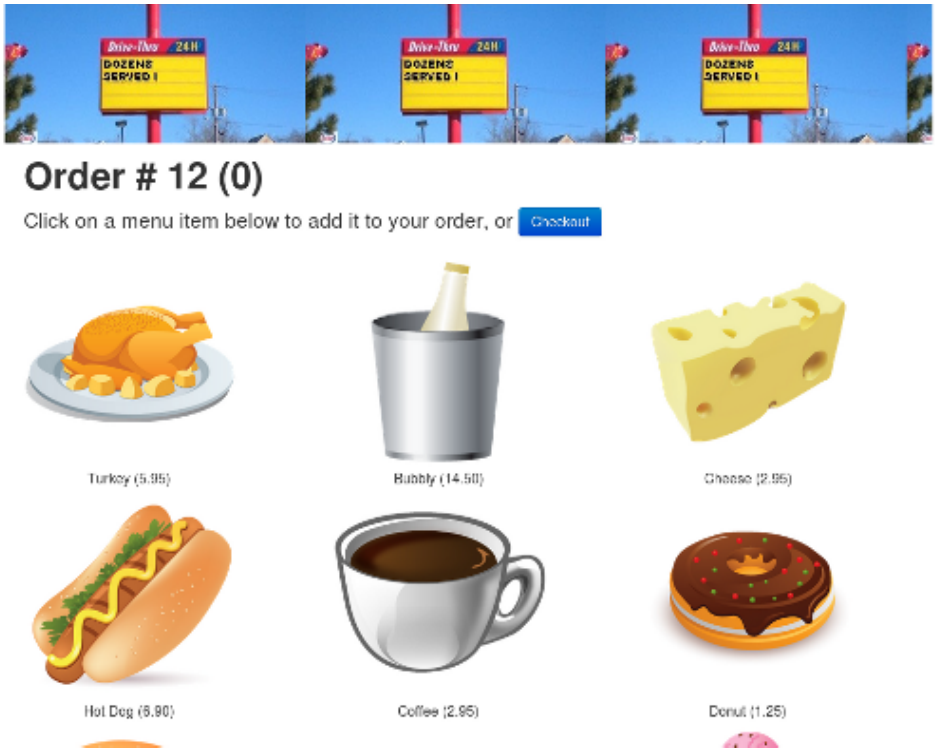
I have prepared a starter webapp. The lab 4 starter, Jim's Joint, is meant to handle ordering in a small restaurant. I have build some database tables for this (menu and then orders & order items), as well as some minimal controllers and views.

The webapp is "broken" as delivered, and will not run properly until you fix it :)

Fork the github project, and clone it locally to work with, the same as you have done with the previous tutorial.

The End Result

This is what the end result should look like, after fixing!



Database Setup

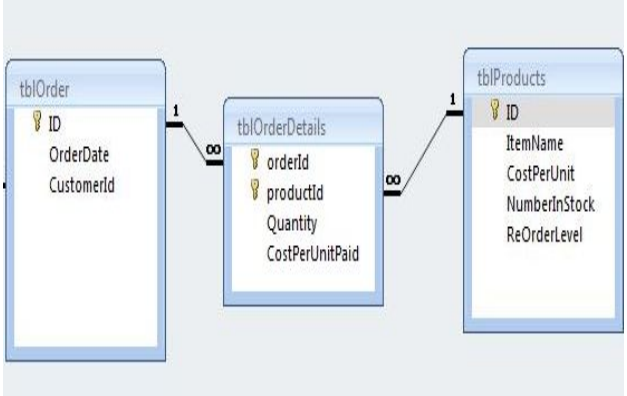
You will need to setup your webapp's database, using the supplied script, `data/comp4711-lab04-setup.sql`. Please name the database "comp4711", so that your webapp will work without additional setup when I run it on my system.

As part of the tutorial, you will then build models for each of the tables contained in it.

Database Design

The RDB data provided is a pretty standard associative entity, very much like the diagram to the right. In our case, OrderItems is the associative entity/table connecting Menu and Orders.

In an O-O world, an ideal implementation would have an Order class, containing a collection of OrderItem objects. If we did that, the focus would end up more on good O-O practices rather than how you work with models inside a framework. The approach that I ended up taking is simple, but defensible.



Data Structure - Menu Table

Field	Description	Notes
code	Unique menu identifier	Primary key
description	Menu item description	Used for alt text when image displayed
price	Price per item	Dollars & cents
picture	Name of item picture	Pictures in /assets/images
category	Menu category	m=meal, d=drink, s=sweet

Data Structure - Orders Table

Field	Description	Notes
num	Order #	Primary key
date	Date/time order placed	Set when created, updated on checkout
status	Order status	a=open, c=complete, x=cancelled
total	Order total	Stored on checkout

Data Structure - Orderitemss Table

Field	Description	Notes
order	Order #	Part 1 of composite primary key
item	Menu item code	Within the order, part 2 of composite key
quantity	Quantity	Positive

Model Implementation

You can use the database and active record classes built into CodeIgniter to complete this (using the CodeIgniter user guide for details), or you can build on the starter models in `core/MY_Model`. The former approach will get you deeper into the CodeIgniter "way", but the latter approach is the easier one.

The base model supplied with the starter app provides for single key tables (MY_Model) as well as composite key tables (MY_Model2).

Controller Expectations

There are two controllers: Welcome and Order. The welcome page displays a summary of the orders handled so far, with a link to the order page to deal with order handling. Methods are provided in the Order controller to create a new order, to add an item to an order, and to "checkout". The checkout prompts for confirmation and takes the user back to the homepage if appropriate.

Each of the controller methods has comments and pseudo-code sufficient to guide you in the intended use of the model classes you need to build.

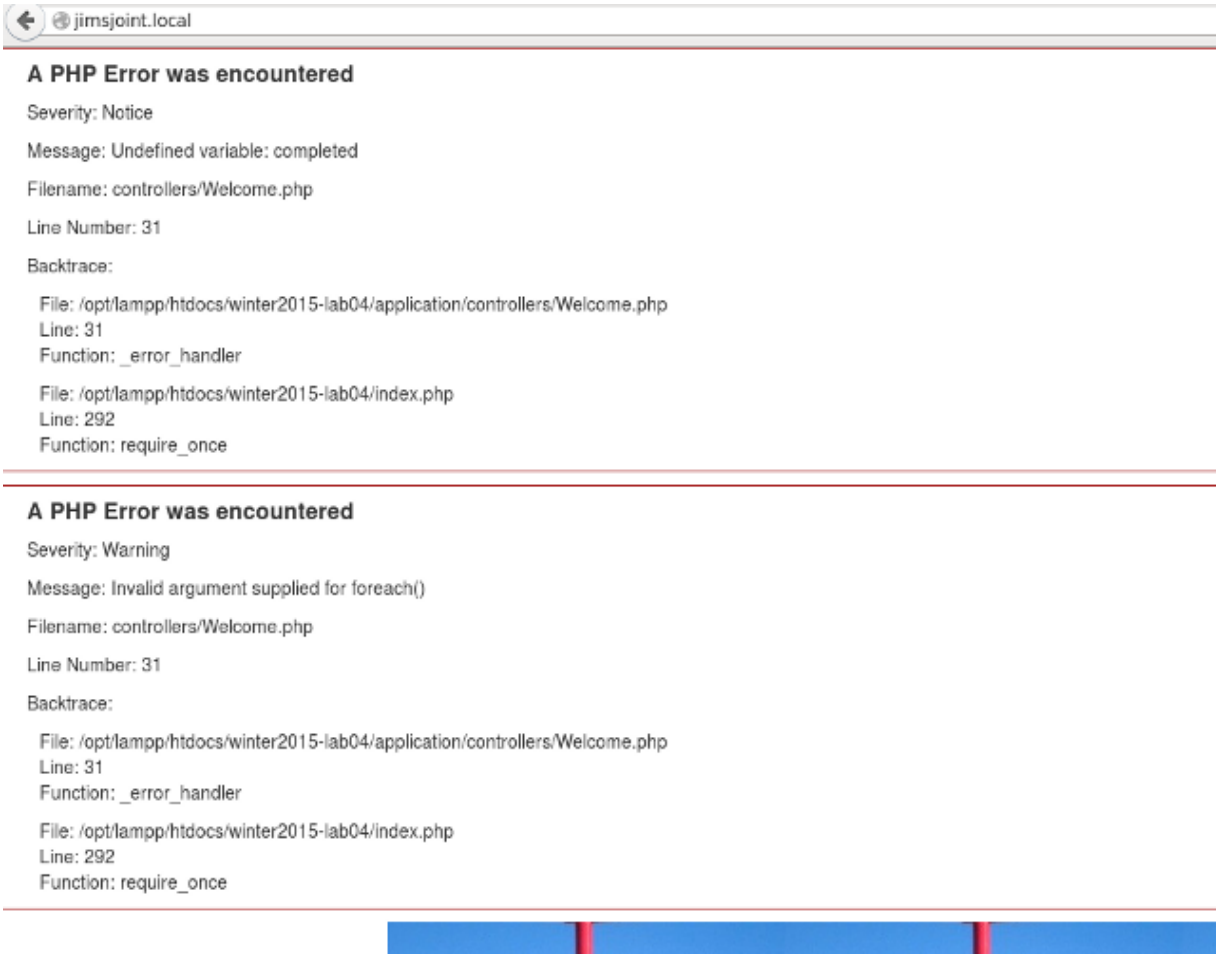
What Needs Fixing?

There are seven steps to complete, the way I have broken the problem down. Each is described on following slides.

1. Configuration
2. Homepage
3. Handle a new order
4. Handle order display
5. Handle order additions
6. Handle checkout
7. Handle completion

The Starting Point

The webapp is broken when you start, looking like this...



1. CONFIGURATION

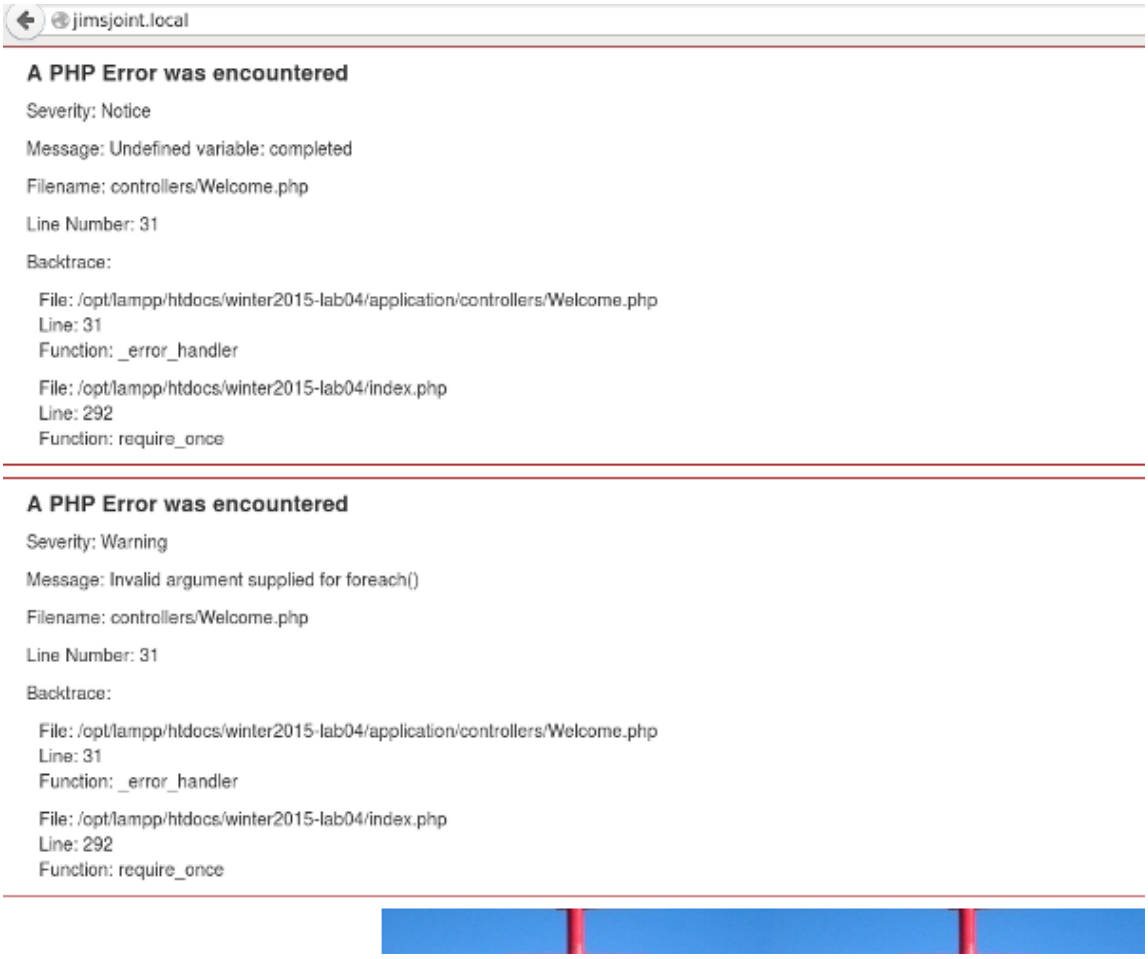
Fix the `config/autoload` and `config/database` files.

`config/autoload.php` needs to load the database library. You can also load your three models here, or you can load them in the constructors of any controllers that need them.

`config/database.php` needs to reference the appropriate database name, and MySQL username/password to work with them. If you are using this at home, or elsewhere, with a different username/password, then add a configuration subfolder with your settings, and "git ignore" it so it is not part of your repository. That would technically make your config `config/development/database.php`

Post Configuration

There is no apparent difference after fixing your configuration...



2. HOMEPAGE

Fix the default controller. It needs to get completed order data from somewhere.

`controllers/Welcome.php` ... the loop at line 31 expects a variable `$completed` to contain the order data, as an associative array. Completed orders can be distinguished by their status being 'c'.

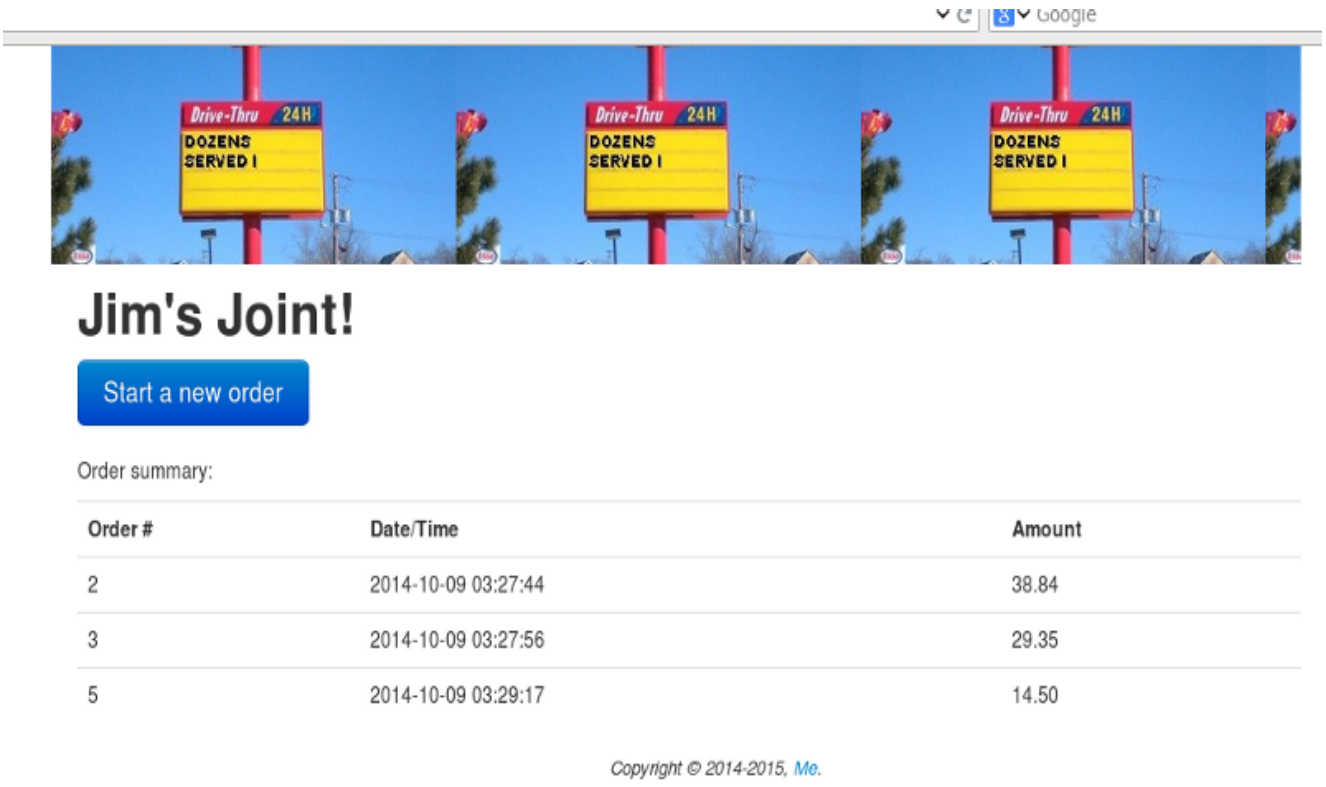
Fix the Homepage

Put this together, and the "fix" is to assign `$this->orders->some('status','c')` to `$completed`, if you are using the provided base models. I determined this by inspecting the `Active_record` interface at the top of `core/MY_Model.php`.

```
function index() {
    $this->data['title'] = 'Jim\'s Joint!';
    $this->data['pagebody'] = 'welcome';

    // Get all the completed orders
    $completed = $this->orders->some('status','c');

    // Build a multi-dimensional array for reporting
    $orders = array();
```

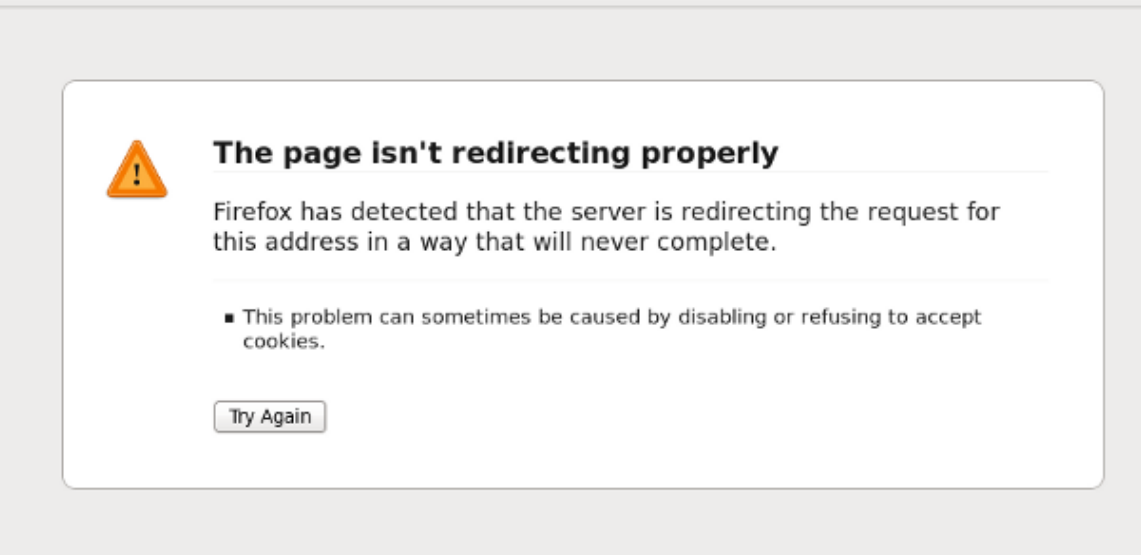
Post Step 2

Your homepage should now look a bit different, showing any orders. You might not have any orders, if you are just getting underway.



Pre Step 3

If you try the next logical thing, "Start a new order", you will be presented with a nasty browser error page. This happens becuase we need to create a new order object before we can start wirking with it.



3. HANDLE A NEW ORDER

You need to fix `controllers/Order::neworder()`, creating a new order record with an order number one higher than the last used.

`Active_record::highest()` returns the highest key used in a model/table.
`$this->orders->highest()` gives the last order # used.
I suggest setting `$order_num` to that plus 1.

`Active_record::create()` creates a new record.
`$this->orders->create()` hence creates a new object, with all the fields from the Orders table, initialized to blank.
Set the order properties properly (number, current date, status), then save the new order object (add it to the orders model).

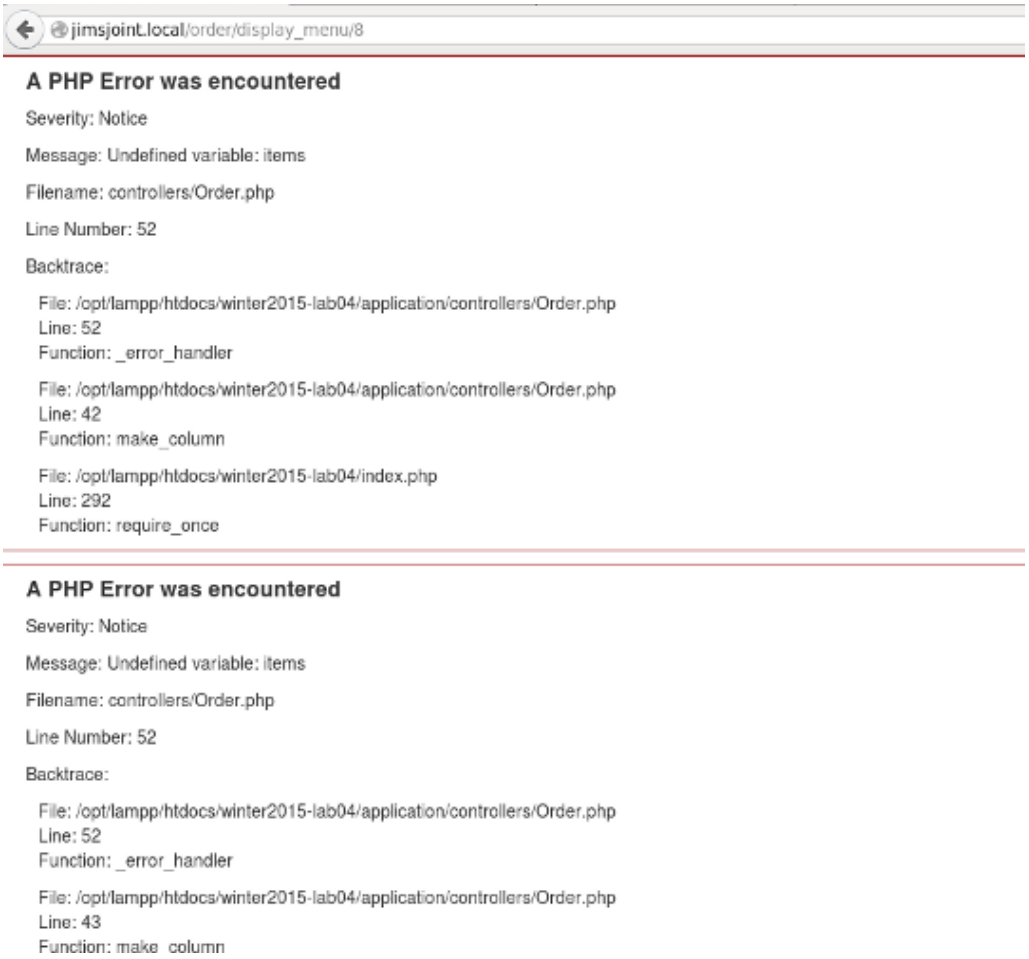
Fix neworder()

`Active_record::create()` creates a new record. `$this->orders->create()` hence creates a new object, with all the fields from the Orders table, initialized to blank.
Set the order properties properly (number, current date, status), then save the new order object (add it to the orders model).

```
// start a new order
function neworder() {
    $order_num = $this->orders->highest() + 1;

    $neworder = $this->orders->create();
    $neworder->num = $order_num;
    $neworder->date = date();
    $neworder->status = 'a';
    $neworder->total = 0;
    $this->orders->add($neworder);

     redirect('/order/display_menu/' . $order_num);
}
```

Post Step 3

That solved the redirection problem, but the order display (for our new order) has other issues - an undefined variable "items" :(



4. HANDLE ORDER DISPLAY

There are two pieces here – building the title for the page (order # and total), and building the graphical menu display.

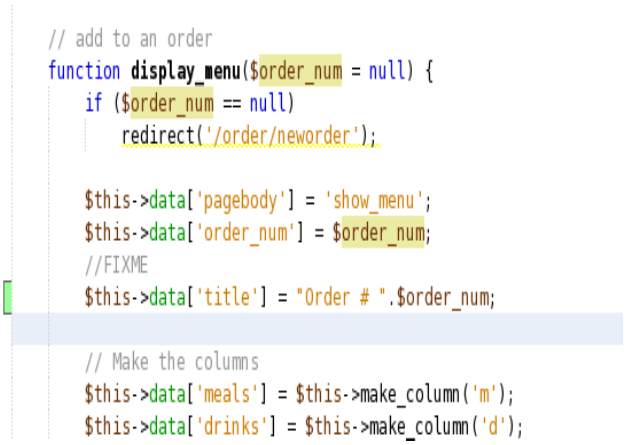
Fix `controllers/order:display_menu()`. It needs to get order data from somewhere. It also needs to get the column data from somewhere.

Fix the Title

You are given the order # as a parameter. Retrieve the order record from the orders table, for instance `$order = $this->orders->get($order_num)`. A starting point for the title would then be `$order->num` or `$order_num`. This is the first part of the FIXME at line 32.

You might end up with something like...

```
$this->data['title'] = "Order # " .
$order_num .
' (' .
number_format($this->orders->total($order_nu
2) . ')';
```

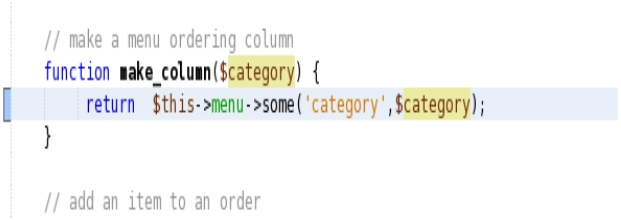


```
// add to an order
function display_menu($order_num = null) {
    if ($order_num == null)
        redirect('/order/neworder');

    $this->data['pagebody'] = 'show_menu';
    $this->data['order_num'] = $order_num;
    //FIXME
    $this->data['title'] = "Order # ".$order_num;

    // Make the columns
    $this->data['meals'] = $this->make_column('m');
    $this->data['drinks'] = $this->make_column('d');
```

Order Display - Column Data

Inspecting `views/show_menu`, the data for each column comes from an array of Menu records. The `make_column` method in `controllers/Order` looks ready for that, and it is even passed the value of the category to use for relevant menu items.

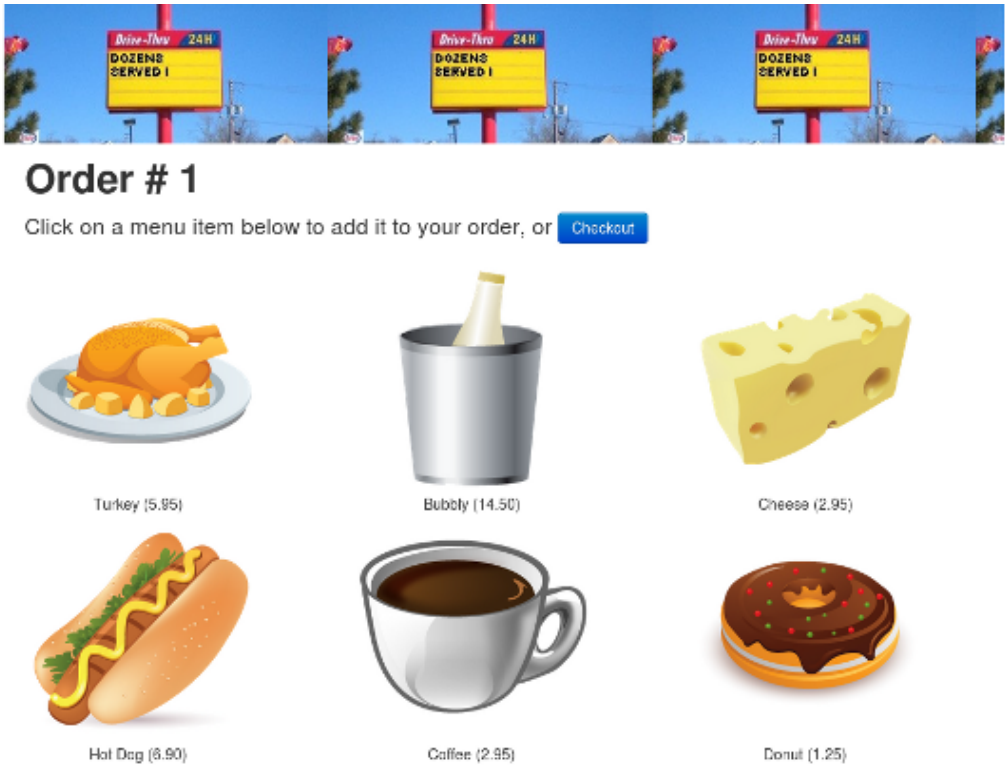
Sounds like the body of that method (FIXME on line 44) will be very similar to the fix we applied to the Welcome controller... `return $this->menu->some('category',$category)`



```
// make a menu ordering column
function make_column($category) {
    return  $this->menu->some('category',$category);
}

// add an item to an order
```

Now We can See

Yay - we can now see the ordering display :)



Order Display - Order Total

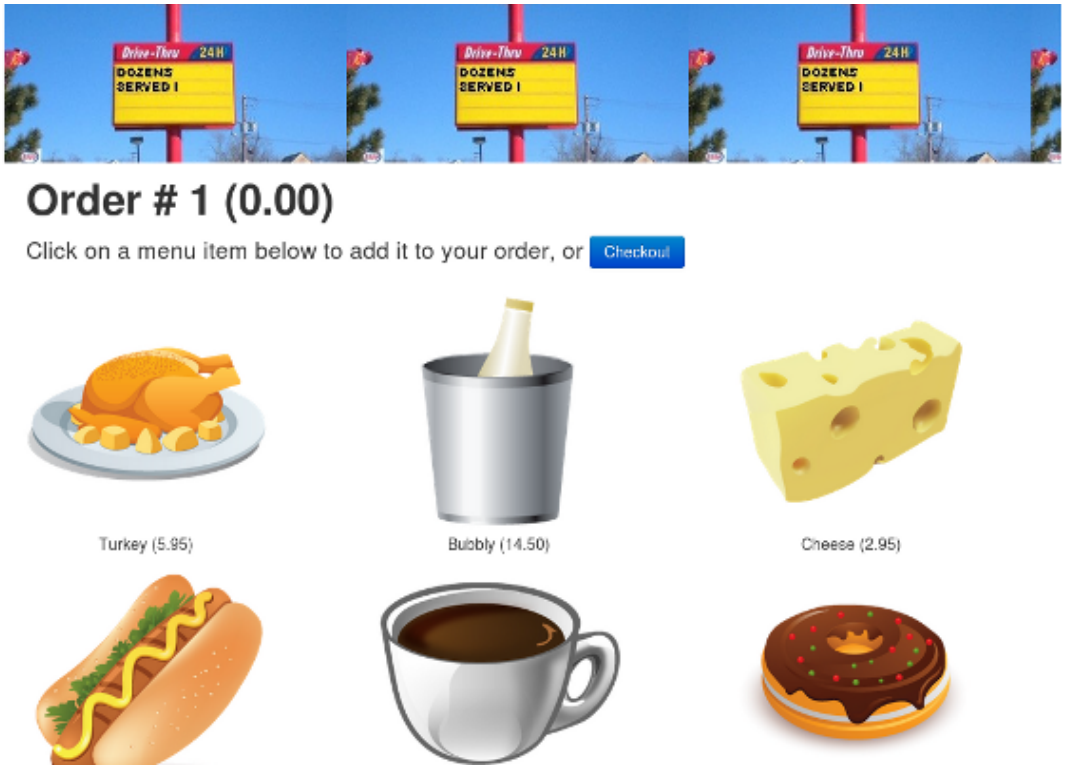
Fix `models/Orders::total()`. It needs to calculate the current total of an order. It will need to get all of the items that make up that order.

The last part of the menu display is showing the order total in the title. The `models/Orders::total()` method (lines 20+) is meant to handle that. In order to calculate the total for an order, iterate over the items in an order. For each, retrieve its corresponding menu item. Add the orderitem quantity times the menu price to the order total.

```php
// calculate the total for an order
function total($num)
{
    $CI = & get_instance();
    $items = $CI->orderitems->group($num);
    $result = 0;
    if (count($items) > 0)
        foreach ($items as $item)
        {
            $menu = $CI->menu->get($item->item);
            $result += $item->quantity * $menu->price;
        }
    return $result;
}
```

Menu Display Looking Good :)

Our menu display looks better now, with the current order total displayed as part of the page header...



Order Model Needs Updating Too

The order total is also a property in the orders table. The writeup says it only has to be saved/accurate when an order is completed. You could make a design decision to update the order total whenever an item was added to an order, in which case this step could be satisfied by getting that property from the order. Regardless of your design decision, you will need to complete the `Order::total()` method at some point.

However you calculate or get the order total, it needs to be appended to the page title, inside parentheses. It would be a good idea to format it nicely and consistently. Any of the `money_format`, `number_format` or `sprintf` functions, built-in to PHP , could do the trick.

5. HANDLE ORDER ADDITIONS

Fix `controllers/Order:add()`. It will need to use `models/Orders::add_item()` to do useful stuff.

This method is invoked when a menu picture is clicked on. You can see that by mousing over any of the menu item images and observing the target link in the bottom left of your browser window.

If all goes well, clicking on an item will add it to the order and redisplay the menu. The only evidence of this will be that the order total is updated.

At this point, with no logic behind the handling method, clicking on an item appears to do nothing, which is quite correct!

Let's Start to Fix the Handling

This method is invoked when a menu picture is clicked on. You can see that by mousing over any of the menu item images and observing the target link in the bottom left of your browser window.

`Order::add` needs to properly update the `orderitems` table to reflect the request. In theory, the logic to do this could be in a controller (interpreting it as business logic), or in a model (interpreting it as model logic). Given the "model adapter" strategy that PHP frameworks favor, it makes most sense to deal with the logic inside the model, reducing the coupling between the controller and model layers.

Order Additions - Facade

`Order::add(num,item)` then becomes just a facade for calling the related model method, `models/Orders::add_item(...)`. These have similar names to reinforce the connection between them.

So, the controller fix (line 50 fixme) is simply `$this->orders->add_item($order_num,$item)`.

```
// calculate the total for an order
function total($num)
{
    $CI = & get_instance();
    $items = $CI->orderitems->group($num);
    $result = 0;
    if (count($items) > 0)
        foreach ($items as $item)
        {
            $menu = $CI->menu->get($item->item);
            $result += $item->quantity * $menu->price;
        }
    return $result;
}
```

Order Additions - Orderitems?

The add_item method in the orders model now needs to be completed. There, you need to see if that item is part of the order already, in which case retrieve its record, increment the quantity and then update the table. If it isn't already there, you will need to make an empty orderitem record, and populate its fields appropriately (including setting the quantity to 1), before adding that record to the table.

The `Orderitems` model is not referenced inside any controller. I did this on purpose, hoping that you would conclude that such references belong in the Orders model. In the Orders model, you will need to get a handle to the CodeIgniter instance, in order to reference the Orderitems model, because of O-O scoping. Even if autoloaded, Orderitems would be a property of the controller object, and out of scope inside a model object.

Order Additions - Orderitems!

The idea, inside `models/Orders`, is shown to the right.

If you made the earlier design decision to keep an order's total continuously updated, then you would have that method here. Otherwise, you are done.

```
// add an item to an order
function add_item($num, $code)
{
    $CI = & get_instance();
    if ($CI->orderitems->exists($num, $code))
    {
        $record = $CI->orderitems->get($num, $code);
        $record->quantity++;
        $CI->orderitems->update($record);
    } else
    {
        $record = $CI->orderitems->create();
        $record->order = $num;
        $record->item = $code;
        $record->quantity = 1;
        $CI->orderitems->add($record);
    }
}
```

Order Additions - Ideal Treatment?

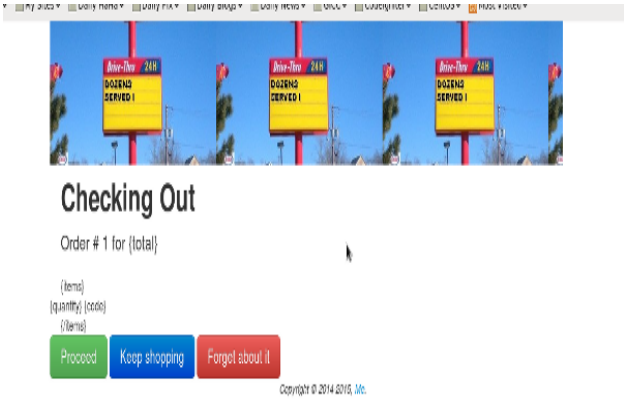
Order additions should now work, with the order total updating as you click on items to add to an order.

An ideal implementation would have some domain/entity classes, specifically a `domain/Order` to deal with the logic here that might feel awkward in a controller or in a conventional orders model, which is part of the data access layer and not an entity encapsulation.

6. HANDLE CHECKOUT

Fix `controllers/Order::checkout()`. Where do the order details come from?

`controllers/order::check_out()` displays the `show_order` view. You need to pass view parameters to this, or we will get a funny looking checkout screen, shown right.



Checkout View Parameters

`order_num` and `total` come from the `order` object. You know how to get this.

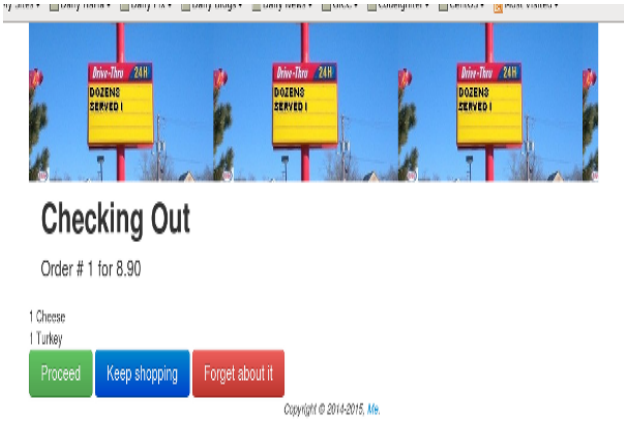
Here is an implementation for the 'total' and 'items' view parameters:

```php
// checkout
function checkout($order_num)
{
    $this->data['title'] = 'Checking Out';
    $this->data['pagebody'] = 'show_order';
    $this->data['order_num'] = $order_num;

    $this->data['total'] = number_format($this->orders->total($order_num), 2);

    $items = $this->orderitems->group($order_num);
    foreach ($items as $item)
    {
        $menuitem = $this->menu->get($item->item);
        $item->code = $menuitem->name;
    }
    $this->data['items'] = $items;

    $this->render();
}
```

Checkout Is Starting to Look Real

Checkout is looking better (see right).

The intent is that the "Proceed" button be enabled only if the order is valid.We'll fix that next.



Checkout - Order Validation

Validate the order before displaying the checkout page. To be considered "valid", it must include at least one item from each menu category.

`models/Orders` has a `validate()` method. Implement this, and then the view parameter becomes easy ...

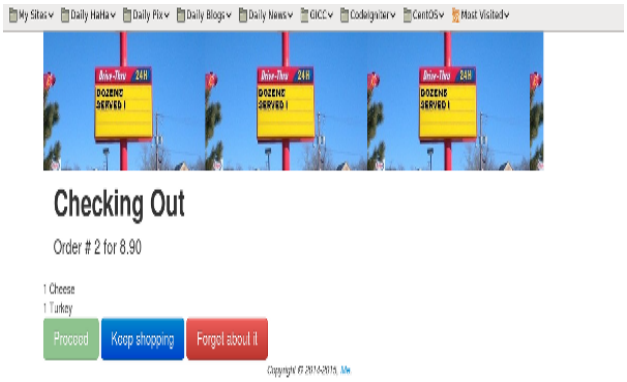
```
$this->data['okornot'] =
$this->orders->validate($num);
```

```
// validate an order
// it must have at least one item from each category
function validate($num)
{
    $CI = & get_instance();
    $items = $CI->orderitems->group($num);
    $gotem = array();
    if (count($items) > 0)
        foreach ($items as $item)
        {
            $menu = $CI->menu->get($item->item);
            $gotem[$menu->category] = 1;
        }
    return isset($gotem['m']) && isset($gotem['d']) && isset($gotem['s']);
}

}
```

Checkout - Using Validation

We can reference `Orders::validate` from our `checkout()` method ...
`$this->data['okornot'] = $this->orders->validate($num);`

The checkout view should now show the Proceed button disabled.



7. HANDLE COMPLETION

Fix `controllers/Order::commit()` ? This will only be invokable if the Proceed button is enabled, i.e. the order is valid.

`controllers/Order::commit()` needs to update the order status, to 'c', and to make sure the date/time and the total are properly set too.

```
// proceed with checkout
function commit($order_num)
{
    if (!$this->orders->validate($order_num))
        redirect('/order/display_menu/' . $order_num);
    $record = $this->orders->get($order_num);
    $record->date = date(DATE_ATOM);
    $record->status = 'c';
    $record->total = $this->orders->total($order_num);
    $this->orders->update($record);
    redirect('/');
}
```

Completion, Really

`controllers/Order::cancel()` needs to update the order status to 'x' (for cancelled), after deleting any related orderitems records. To maintain cohesion, there is a `flush(num)` method in the `models/Orders` class, for you to implement.

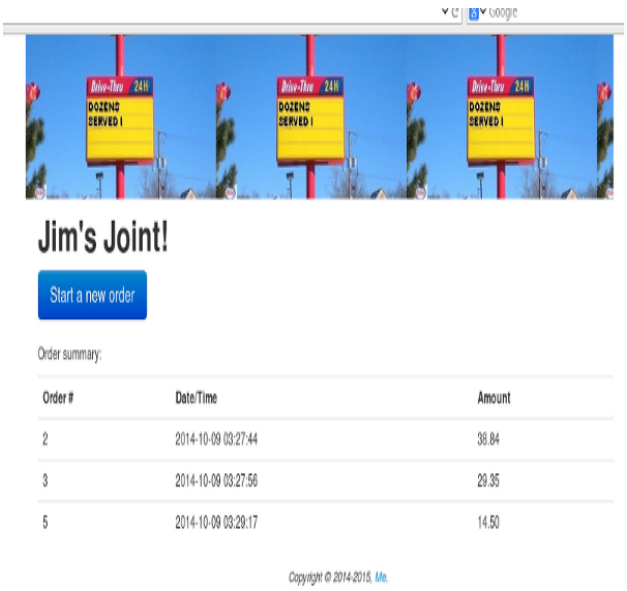
It should also retrieve the orderitems for an order, and then delete them. That would be done by the `flush()` method inside our Orders model, but I think we have done enough!

```
// cancel the order
function cancel($order_num)
{
    $this->orderitems->delete_some($order_num);
    $record = $this->orders->get($order_num);
    $record->status = 'x';
    $this->orders->update($record);
    redirect('/');
}
```

Are We Done Yet?

Make sure the homepage displays completed orders, with correct totals!

This is more of a quality control step, making sure that the expected completed orders are shown :)



Hint!

I warned you to skim the whole slideshow before beginning!

Your controllers only ever need to deal with the menu and orders models. Your orders model is the only place you need to deal with the orderitems model.

Congratulations!

You have completed tutorial #tutorial04: Working With CodeIgniter Models

If you would take a minute to provide some feedback, we would appreciate it!

The next activity in sequence is: lab04 Models 2015.02.11 17:30

You can use your browser's back button to return to the page you were on before starting this activity, or you can jump directly to the course homepage, organizer, or reference page.