Lab
MVC

Antoine Pigeau*

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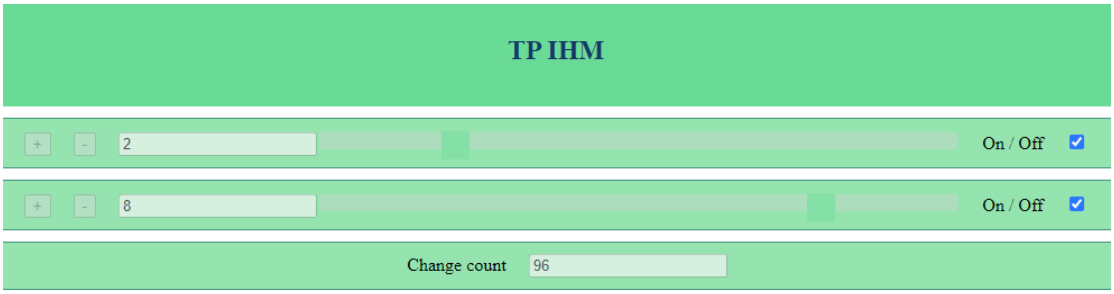
MVC modelling

Goals

The goal is to implement an application that manages a constraint integer with a MVC architecture. The implementation will be carried out in JS.



Few rules to respect:

- the code is divided in different files, one for the view, one for the model and one for the controller (as presented in the lecture)
- classes, variables, methods are correctly named
- Java convention is followed, check here for the Java convention

1 Model and observer

Here is the requirements of our application: the goal is to manage the value of an integer comprised in the interval $[0, 10]$. The model object is in charge of its value and must not accept any values outside this interval.

The first goal is to understand and implement the observer pattern, base of the MVC architecture. Read all the questions first.

*from a subject by Nicolas Normand

1. create an abstract class `Observable` that contains a list of `Observer` objects, a boolean `state`, a method `boolean addObserver(Observer o)` and a method `void notifyObservers(object)` (these two methods must be implemented). An `Observer` object is notified by calling its `update(observable, object)` method. Observers are notified only if the state of the `Observable` object is changed;
2. implement an `Observer` interface with a `public void update(Observable o, object)` method;
3. implement two classes `ModelInteger` and `PrintConsole` that inherit respectively from `Observable` and `Observer`.

   The class `ModelInteger` contains an integer i et two methods `void plus()` et `void minus()` to increment/decrement i. For an instance of `PrintConsole`, if i is changed, its state is changed and the observers are notified.
   An instance of `PrintConsole` observes the `ModelInteger` instance. It only displays on the console the value of the integer observed;
4. implement a test of your observer pattern

2 Code organization

Retrieve the resource for the lab on Madoc, and be sure to organize your code as follow:

- `utils.js` : it contains the classes `Observable` and `Observer`
- `model.js` : it contains the class `ModelInteger`
- `controler.js`: it contains the classes `PrintConsole` and `Controller`
- `main.js` : it instanciates the model and the controller. The controller takes the model as parameter

To execute your code :

1. open the index.html file with your browser
2. right click on the page, inspect it and open the console tab

3 GUI

The interface is composed:

1. a "plus" button to increment the integer;
2. a "minus" button to decrement the integer;
3. a text field to display and change the integer.

Question(s):

1. build your html page (without style for the moment)
2. follow the tutorial on Flexbox:
   http://flexboxfroggy.com/
3. create a "css" directory and implement your style.css to position your widgets

4. create a view class in the file js/view.js
5. in the class View, create an attribute for each component (the ones that interact with the controller), and initialize them
6. create a class Controller in the file js/controller.js, that takes your model as parameter and that creates an instance of your class View
7. in the class Controller, add the actions on the buttons
8. in the class Controller, add an observer on the model to update the text field
9. in the class Controller, add an action to change the integer directly in the text field (by taping the value - a value outside of the interval $[1, 10]$ will the integer with the respective max or min value)
10. each button is activated / deactivated when the integer value reaches a boundary of the interval $[1, 10]$. Add or change an observer **on your model** to manage this task (observers of the view must not update the view - this task is the responsibility of the model observers)

For the following:

- the class Controller contains all the instance of observers/actions and their attachments
- the class View contains all the access to the widgets (all the attributes associated to the widgets)

4 Extension

Here, we add a second model that will be synchronized with the first one: if the first is incremented, the second is decremented (and inversely). Another extension is the possibility to deactivate the GUI of a view. Finally, extra widgets are added to manage an integer.

4.1 Second model with synchronization

Our app will now use a second integer, synchronized with the first one: the sum of both integer is always equal to 10. Each model will have its own view.

Question(s):

1. create a superController.js file
2. in this file, create a SuperController class that instantiates your previous controller two times
3. in this file, create your UpdateSynchronize observer to synchronize your models
4. instantiate your UpdateSynchronize observer in the SuperController constructor and make your links between your observer and the integer model(s)
5. update your main file to now create a SuperController instance
6. add your superController.js in the html file
7. did you carry out a copy/paste of your previous code ? of your model ? your view ? of your observers/actions ? (if you have at least one "yes", call a teacher to review your code)

4.2 Activation/deactivation

Our app must now contain a checkbox to activate/deactivate the possibility to change an integer (one checkbox for each view, and so for each model). When the activation is set to False, all the widgets that provide a way to change the associated integer are deactivated.

Question(s):

1. add a label Activation and a checkbox in your View class
2. add a new model ModelActivation

   Warning: a Javascript class is different from a Java class - in inheritance, if the same name is used in the parent class and the child class, then only one attribute is created - do not use the same variable name between Observable and ModelActivation
3. add actions / observers in your architecture
4. if your activation / deactivation of widgets are dispersed in different classes, use the Mediator pattern to centralize the update of the view

4.3 GUI extension

Question(s):

1. add new widgets:
   - a menu that contains plus and minus actions on each model (two possibilities here, one menu on each view, or a main menu for the window)
   - a slider to change the value of the integer (Slider)
   - a contextual menu (a right click on your panel displays a menu with plus and minus button)
2. add tool tips on your actions

5 I18n

All the cultural properties of your app must be set at the loading phase of your app.

The i18n aspect will be managed with the jQuery.i18n library.

Question(s):

1. identify all the strings to localize
2. define a key for each string (key used in our dictionaries to save the different values (different translations) of our strings)
3. provide the json dictionaries key → translation. If you use a server, it is possible to write theses dictionaries in json files
4. load the strings in your main.js file
5. add the today date on your html page
6. use a Format object to display the date
7. test your app in French and English

6 Component

In this part, the goal is to update our controller to create a component in the React / Angular way.

Question(s):

1. add a new parameter to your controller: the `parentView`. This parameter is the parent element of your component
2. update your code to use this parentView parameter
3. update your view class to use now *Embedding javascript* (String surrounded with backticks ‘Hello, ${name}‘ - use the innerHTML to set your content - no need to use the document.createElement function anymore)

The skeleton of your view should look like this:

```
class View {

  constructor(parentView){
    this.div = document.createElement('div');
    this.div.id = '...';
    this.div.classList.add('...');

    let innerHtml = `
                ...create here your html content
                 <button id="buttonPlus" title="increase of 1" class="button">+</button>
    `;

    this.div.innerHTML = innerHtml;

    this.buttonPlus = this.div.querySelector(`#buttonPlus${View.count}`);

    parentView.appendChild(this.div);
  }
}
```

And now, with this updated architecture, we can create new component. For instance, a component to count the number of change applied on an integer model.

Question(s):

1. create the files componentCount.js, viewComponentCount.js and import them in the index.html file
2. implement your view with a class in viewComponentCount.js
3. implement your component in componentCount.js, with a controller class, with a constructor (model, parentView)
4. instantiate your component in the main file