**Universal Point of Sale (POS)**

Ian Prince, Justin Hawkins, Michael Franklin, Austin Williamon

Course Requirement CS321

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Copyright 2017 AUTHORS: Ian Prince, Justin Hawkins, Michael Franklin, Austin Williamon

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**1.0 Project Description:**

Our Group is doing a cash register program whereby the user can customize and determine items for a preset cash register. Which during operation mode lists the items chosen for that transaction, calculates relevant tax, and presents a total to the user based on items selected. Users should have some control over the look of the cash register as well as the state tax rates used in calculations. User choices should be savable in some form or fashion.

This project consists of two applications, an editor to configure the template for the cash register, and an emulator for the user to interact with the register. The editor can customize the buttons and their corresponding parameters within a predetermined preset of buttons. They would also be able to change the name, price, font, and color of each button. Presets will be saved to an xml file, and the user would be able to edit a previous register.

The emulator would run use this preset to build a functioning register. During operation mode, the register would be able to list the items for a given transaction, calculate the total based on relevant tax, and calculate change based on an amount of received cash.

**2.0 Project Management:**

**History:**

Initially we started with a cash register simulation of sorts. As time went on this devolved into a customizable point of sale setup. Initially the user could customize every aspect of the register and emulate the function of the register. As more time passed various features were removed and processes streamlined. What was left was a simple yet still customizable interface where the user could customize various buttons with a name, price, stock quantity, and stock item photo. They will also be able to set the tax rate that corresponds with their region as well as font and color.

**Personnel:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Members** | **Educational Background** | **Relevant Experience** | **Project Roles** |
| Justin Hawkins | Bachelors of Science Business Administration  Bachelors of Science Computer Science (in progress) | CS221 Data Structures  CS 121 Programing C++  CS102 Intro to C  CS 103 Intro to Java  Retail Experience working with a POS | MVC implementation  Documentation |
| Ian Prince | Bachelors of Science Computer Science (in progress) | CS221 Data Structures  CS 121 Programing C++  CS102 Intro to C  Retail Experience working with a POS | Code Model  MVC implementation  XML Reader/Writer |
| Austin Williamon | Bachelors of Science Computer Science (in progress) | CS221 Data Structures  CS 121 Programing C++  CS102 Intro to C  Retail Experience working with a POS | Graphics and Animation  Text Formatting |
| Michael Franklin | Bachelors of Science Computer Science (in progress) | CS221 Data Structures  CS102 Intro to C  CS 121 Programing C++  Retail Experience working with a POS | GUI Design  GUI Programing and Implementation |

**Effort:**

|  |  |  |
| --- | --- | --- |
| **Meeting** | **Time** | **Running Time Total** |
| Project subject selected: Universal Cash Register | 2hrs | 2hrs |
| Outlined specific programmable features we want to include | 3hrs | 5hrs |
| Use cases and CRC cards made | 3.5hrs | 8.5hrs |
| Formal graphics for CRC and use cases | 2.7hrs | 11.2hrs |
| Google slides made for presentation 1 | 2hrs | 13.2hrs |
| Design and implementation for the model | 5hrs | 18.2hrs |
| Design and implementation for the view | 4.5hrs | 22.7hrs |
| GUI layout and design | 4hrs | 26.7hrs |
| Google slides made for presentation 2 | 3hrs | 29.7hrs |
| Overarching coding meeting | 6hrs | 35.7hrs |
| Overarching coding meeting | 3.5hrs | 39.2hrs |
| Coding for the controller | 5.0hrs | 44.2hrs |
| Completion of editor coding | 5.0hrs | 49.2hrs |
| Coding of emulator | 4.5hrs | 53.7hrs |
| Coding of emulator | 3.5hrs | 57.2hrs |
| Debugging and testing | 3.5hrs | 60.7hrs |
| Debugging and testing | 3hrs | 63.7hrs |

**3.0 Use Cases:**

Our goal is to provide a simple, customizable, and flexible point of sale that can be used for various types of business.

**Examples:** Grocery Stores, Restaurants, Specialty Retail, General Merchandise

This could be extremely useful for upcoming businesses that want full customization over their point of sale system. Additionally, as well as businesses who want to do a full re haul of their current point of sale systems.

**4.0 Requirements:**

**Functional Requirements:**

* The program is expected to allow the user to configure a custom POS and test it with an emulator.

**User Interface Requirements:**

* From a visual standpoint our program will display a template the user can edit and provide the inputs shown below.
* User will input a string for the item name as well as a price and quantity. They will also set the tax rate that corresponds with their region. If the user inputs an invalid entry a dialogue box will pop up saying invalid entry and ask them to reenter specifically a string, real number or integer.
* The users template selections will be written to an XML file which will be loaded from later when using the emulator. Users can choose from a multitude of created XML files to load the specific one for emulation.

**Future Modification and Extension:**

For future modifications we will allow a more ground up personalization and customization of our program. Specifically, the ability to add button objects to the register as well as add the users own image instead of choosing from a preselected set of images. Additionally, we would like to add another trackable attribute to the buttons that would track individual sales for the item. Another feature would be the ability of the user to apply discounts or sales to specific items to overall sales like a buy two get one free.

**Summary:**

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| --- | --- |
| **Requirement** | **Satisfies Requirement** |
| Allow users to edit their custom template through editor. | Satisfied by:   * Editor\_Visual.java * Color\_Text\_Dialog.java * Edit\_Button\_Dialog.java |
| Reflect users selections in editor model | Satisfied by:   * Button.java * Template.java |
| Update editor model view to reflect changes | Satisfied by:   * UserInfoBus.java |
| Save user selections in XML format | Satisfied by:   * XMLManager.java |
| Loads user selections for emulation from XML file | Satisfied by:   * XMLManager.java |
| Reflect user selections in emulator model | Satisfied by:   * XMLManager.java * Template.java |
| Update emulator model view to reflect changes | Satisfied by:   * Emulator\_Visual.java (using observer pattern) |
| Allow users to interact with POS emulator | Satisfied by:   * Emulator\_Visual.java * Template.Java |

**Associated Tests:**

|  |  |
| --- | --- |
| **Requirement** | **Test** |
| Allow users to edit their custom template through editor gui | **Used GUI to change preferences on a program, then saved them. We then reloaded on startup to verify that the changes to the button color change animation remained unchanged.** |
| Reflect users selections in editor model | **Used System.out statements to check that the model value for any given attribute corresponded to the one displayed in our GUI** |
| Update editor model view to reflect changes | **Same as above.** |
| Save user selections in XML format | **Saved and loaded various files in various configurations across both the editor and the emulator.** |
| Loads user selections for emulation from XML file | **See above.** |
| Reflect user selections in emulator model | **Verified that upon load the user preferences for button color and font were preserved, and could be dynamically changed during operation of Editor.** |
| Update emulator model view to reflect changes | **See above.** |
| Allow users to interact with POS emulator | **Ran use case in which we set up a model in the Editor, saved a model, cleared that model, and reloaded that model in the editor. We then opened this same template file in the emulator and tested a few example transactions.** |

**5.0 Design:**

**CRC Cards:**

**Package: Editor\_Gui**

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| **Color\_Text\_Dialog** | |
| * Visual representation of color and font selection portion of the gui | * Editor Visual * Template |

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| --- | --- |
| **Edit\_Button\_Dialog** | |
| * Visual representation of the button edit portion of the gui | * Editor Visual * Template |

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| --- | --- |
| **Editor\_Visual** | |
| * Visual representation of the base template editor | * Controller |

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| **ImagePanel** | |
| * Necessary for editor package to function |  |

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| **UserInfoBus** | |
| * Acts as a go between or controller for the editor view and editor model |  |

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| **XMLManager** | |
| * Writes data to be saved from template | * **Template** |

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| **setPic** | |
| * Takes an int and turns it into what the user wants it to be. | * **Template** |

**Package: Editor\_Model**

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| --- | --- |
| **Button** | |
| * Set price * Set name | * **Template** |

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| --- | --- |
| **Template** | |
| * Store button values * Change tax rate * Change appearance preferences. | * **Button** |

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| --- | --- |
| **XMLManager** | |
| * Writes data to be saved from template | * **Template** |

**Package: Emulator\_Controller**

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| **Controller** | |
| * **Instantiates our running model** * **Instantiates our view** | * **Template** * **Emulator\_Visual** |

**Package: Emulator\_Gui**

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| **Emulator\_Visual** | |
| * Displays the visuals for the emulator | * Edit\_Button\_Dialog |

**Package: Emulator\_Model**

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| **Button** | |
| * Stores individual button attributes * Sets individual button attributes | * picSetter |

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| --- | --- |
| **Calculator** | |
| * Keeps track of subtotal of items added to transaction * Applies tax and displays total with sales tax |  |

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| --- | --- |
| **Template** | |
| * Contains data to be fed into XMLManager * Contains and adjusts user preferences | * **XMLManager** |

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| --- | --- |
| **XMLManager** | |
| * Reads data in to be emulated | * **Template** |

**Model Design:**

Our program implements two separate yet identical models. We have an editor model and an emulator model. The model for the editor contains the Button code, Template, and the XMLManager. When the user edits values using our GUI, these attributes are changed. These attributes are also savable via an XML manager included within the package, allowing the users template and settings to be saved by the editor, and loaded by the emulator during operation.

The model is completely separate from the way it is displayed, as is demonstrated by the emulators separate use of this same model.

**View Design:**

Our editor’s view begins with a default template. As the user makes decisions/choices through various dialog boxes and text fields. This information is passed by reference and stored into the model located in our controller. Using the observer pattern the view is then updated in turn to display these changes.

Our emulator is similar, however when the user presses a button, it merely adds the items name and price to a Jlist, and adds the price to a running total of buttons.

**Control Design:**

Our controller simply instantiates model and the view, passing a reference to this model into the view. It is this class which is instantiated in order to run the program. It merely creates these two elements of the program and sets them to visible.

**Communication Design:**

Our communication is two way. On one hand, our view communicates with our model by being passed a reference to the model which is located in the controller. The view then edits this model via this reference. On the other hand, our model communicates with our view by implementing an observer pattern and alerting our view to changes in the model.

**6.0 Implementation:**

**Packages and Classes:**

* **Editor\_Controller Package**
  + Controller
  + POS\_Editor
* **Editor\_Gui Package**
  + Color\_Text\_Dialog.java
  + Edit\_Button\_Dialog.java
  + Editor\_Visual.java
  + ImagePanel.java
  + UserInfoBus.java
  + XMLManager.java
* **Editor\_Model Package**
  + Button.java
  + ButtonBeanInfo.java
  + ImagePanel.java
  + Template.java
  + XmlManager.java
* **Emulator\_Controller Package**
  + Controller.java
  + POS\_Emulator.java
* **Emulator\_Gui Package**
  + Emulator\_visual.java
  + Template\_Emulator.java
* **Emulator\_Model Package**
  + Button.java
  + Calculator.java
  + DataHolder.java
  + Template.java
  + XMLManager.java

**Utility Classes and Packages:**

Mostly internal convenience classes. We have setPic in order to parse int selections to allow our program to save user image choices. We also use UserInfoBus in order to give us an easy vehicle to pass into our model.

**Test Plan:**

Tested Functionality: Editor Model, Emulator Model, Editor View, Emulator View, Editor Controller, Emulator Controller.

We tested the model using various System.outs and by calling the methods to verify that the model changed correctly.

The views were tested by implementing an observer pattern, and telling the model to change its display patterns according to the user button.

Both controllers were tested by removing the main code in our views, and running the program using the controller as instantiation point for both our model and our view.

**Untested Functionality:**

**7.0 Discussion:**

Had we more time, we would like to have implemented a Bank class in order to establish how much cash was in the “register” at startup. We also would have added more images and perhaps allowed the user to input an image themselves to be used, although we hadn’t time to implement these changes. However, the project rather successfully allows us to set up and run a register template, and allow the user to adjust it’s price, name and appearance.