Paul Tho - Project Portfolio

PROJECT: Dukemon

Link to Reposense code: Reposense

Link to Github Repo: Dukemon

Overview

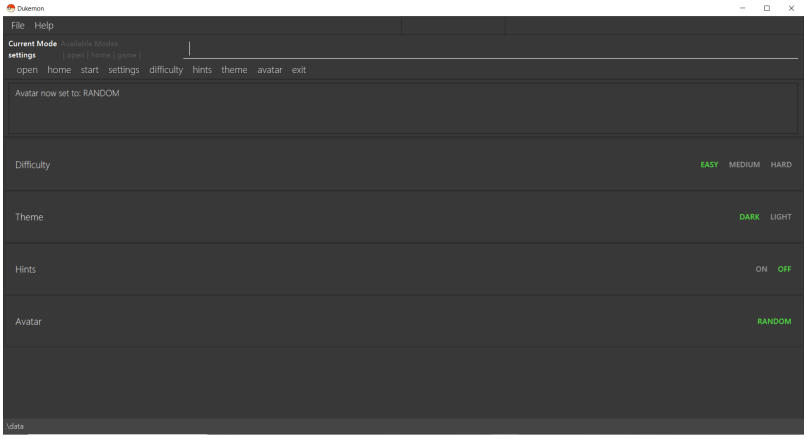
Dukemon is a desktop flashcard application used for memorising material in a fun and engaging way. The user operates the application through a CLI and runs on Java and the JavaFX framework. My main contribution to the team was the implementation of settings and the settings screen.

I realise that our application was going to be UI heavy as the way we planned our application involved a lot of screens. I took it upon myself to learn how the JavaFX framework worked and made a platform for the rest of my fellow developers to build their UI components on.

Summary of contributions

- **Major enhancement**: added **a settings page to the application**.

Settings Page



- *What it does*:
  - Allows the user to change specific settings about the application. Difficulty level, colour theme, hints and avatar are the features that are implemented in settings so far.
    - **Difficulty**: Allows the user to change the difficulty of the game in the application to one of three settings: Easy, Medium and Hard.
    - **Theme**: Allows the user to change to one of two themes: Dark and Light.
    - **Hints**: Allows the user to either enable hints to help them in the game or to disable them.
    - **Avatar**: Allows the user to set the avatar in the home screen based on the provided avatars' id number.

- *Justification*:
  - This feature improves the product significantly because it provides options for the user to personalise their experience when using our application.
  - For example, weaker students may use the settings to set the difficulty to easy or medium.
  - Furthermore, some students might not want hints so as to practise what they have learnt. They can do that in the settings as well.
- *Highlights*:
  - This enhancement creates a platform for other developers to add their own user settings into the application, allowing for increased extendability.
  - The process had to encroach on storage, logic as well as model and I learnt a lot integrating all the parts together.
- *Credits*:
  - Yi Da for implementing difficulty and hints and for integrating his logic to my settings. Jason for providing the avatars to use for my settings.
  - JavaFX 11 for GUI.
  - TestFX and JUnit5 for testing.
- **Minor enhancement**:
  - Added a modular display to change screens depending on what mode the application is in.
  - This was a necessary enhancement due to how UI-heavy our application is. We needed multiple screens to handle multiple tasks and this was the solution I proposed and implemented.
- **Code contributed**: [Functional code] [Test code]
- **Other contributions**:
- Project management:
  - Managed releases `v1.2` - `v1.4` (3 releases) on GitHub
- Enhancements to existing features:
  - Updated the GUI color scheme (Pull request #84)
  - Wrote additional tests for existing features to increase coverage from 40% to 41% (Pull requests #124, #134)
- Documentation:
  - Added diagrams to the implementation of settings in Developer's Guide: #134
- Community:
  - The label highlighting feature that I used for my settings page was also used by other classmates(1).

Contributions to the User Guide

Given below are sections I contributed to the User Guide. They showcase my ability to write documentation targeting end-users.

Settings Commands ⚙

(Available in Settings mode)

Goes into the settings menu.
Format: `settings`

Changing the theme: `theme`

Changes the theme of the UI.
Format: `theme dark/light`

Examples:

- `theme dark`
  Changes the UI theme to dark.

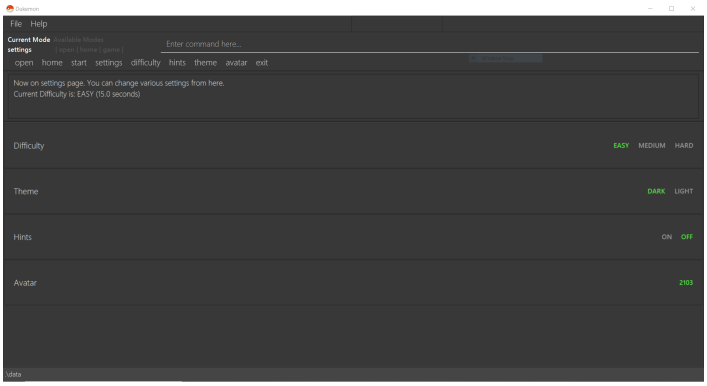


Figure 1. Dark Theme

- `theme light`
  Changes the UI theme to light.

Figure 2. Light Theme

Turning hints on/off: `hints`

Turns hints on or off.
Format: `hints on/off`

Examples:

- `hints on`
  Turns hints on.

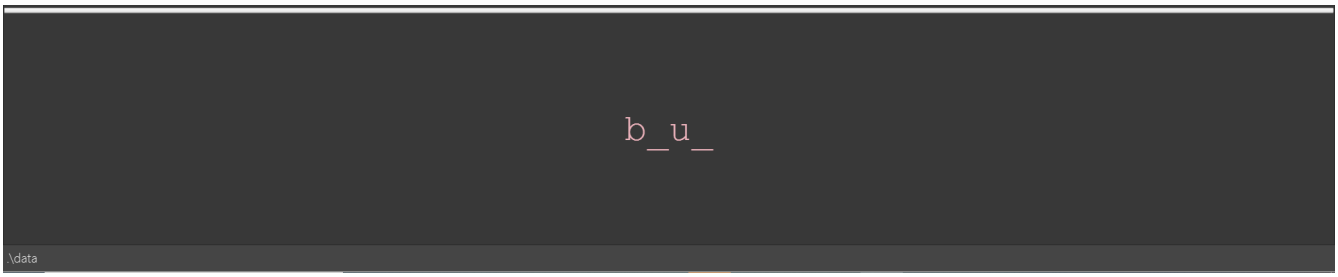


Figure 3. Hints on

- `hints off`
  Turns hints off.

Figure 4. Hints off

Changing difficulty: `difficulty`

Changes the difficulty of the game.
Format: `difficulty easy/medium/hard`

Examples:

- `difficulty easy`
  Changes the difficulty to easy. (Timer = 15 seconds)

Figure 5. Easy difficulty (15 seconds)

- `difficulty medium`
  Changes the difficulty to medium. (Timer = 10 seconds)

Figure 6. Medium difficulty (10 seconds)

- `difficulty hard`
  Changes the difficulty to hard. (Timer = 5 seconds)

Figure 7. Hard difficulty (5 seconds)

Changing Avatar : `avatar`

Changes the avatar in the home screen. The avatar is one of the 151 original pokemon, so pick and choose! (There is a secret avatar as well. See if you can find it!)
Format: `avatar [0 - 151]`
`avatar 0` sets the avatars to random.

Examples:

- `avatar 0`
  Changes the avatar to a random one everytime a new command is called.
- `avatar 1`
  Changes the avatar to 001 in the original Pokedex, which is Bulbasaur.

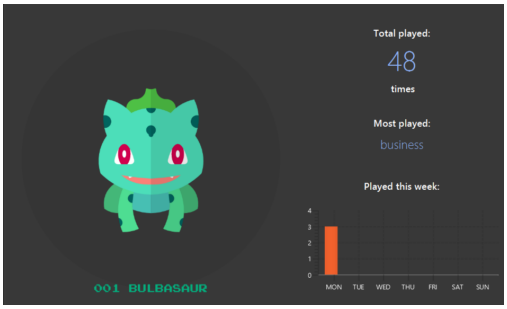


Figure 8. Avatar number 1, in this case, Bulbasaur.

- `avatar 151`
  Changes the avatar to 151 in the original Pokedex, which is Mew.

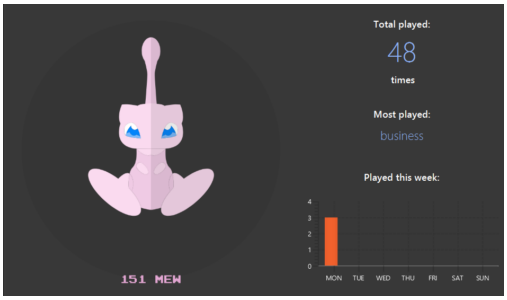


Figure 9. Avatar number 151, in this case, Mew.

Contributions to the Developer Guide

Given below are sections I contributed to the Developer Guide. They showcase my ability to write technical documentation and the technical depth of my contributions to the project.

Settings Feature

Implementation

`AppSettings` is a class that was created to be integrated into the `Model` of the app. It currently contains these functionalities:

- `difficulty [EASY/MEDIUM/HARD]` to change the difficulty of the game.
- `hints [ON/OFF]` to turn hints on or off.
- `theme [DARK/LIGHT]` to change the theme of the app. Currently only supporting dark and light themes.

This feature provides the user an interface to make their own changes to the state of the machine. The settings set by the user will also be saved to a `.json` file under `data/appsettings.json`.

The activity diagram below summarizes what happens in the execution of a settings command:

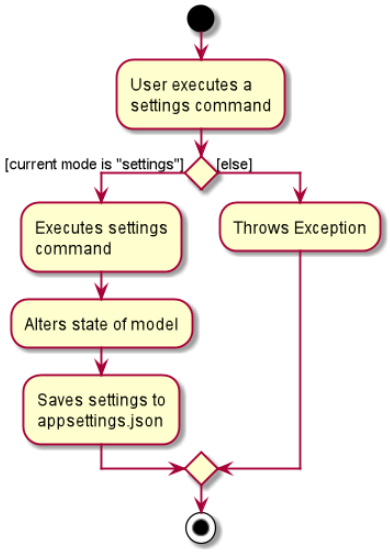


Figure 10. Activity diagram of the execution of a settings command.

NOTE	Take note that "mode" as defined in our project is the state in which the application is able to take commands specific to that mode.

Given below is a step by step walk-through of what happens when a user executes a difficulty command while in settings mode:

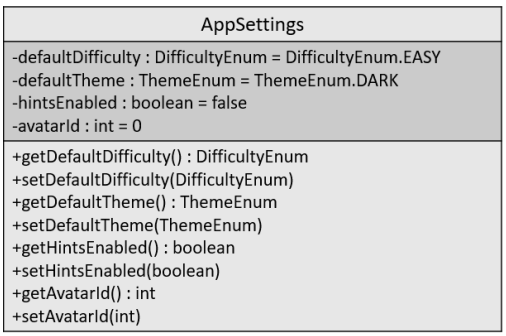


Figure 11. Before state of application.

Step 1:
Let us assume that the current difficulty of the application is "EASY". The object diagram above shows the current state of `AppSettings`.

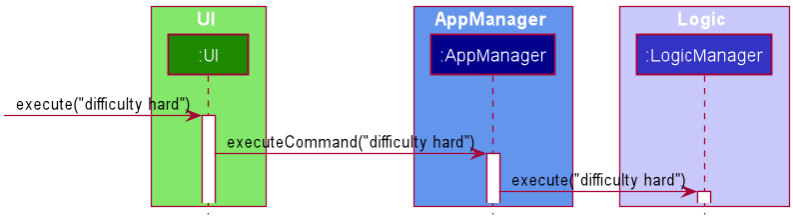


Figure 12. Sequence diagram of Step 2.

Step 2:
When the user enters `difficulty hard`, the command gets passed into Ui first, which executes `AppManager#execute()`, which passes straight to `LogicManager#execute()` without any logic conditions to determine its execution path.

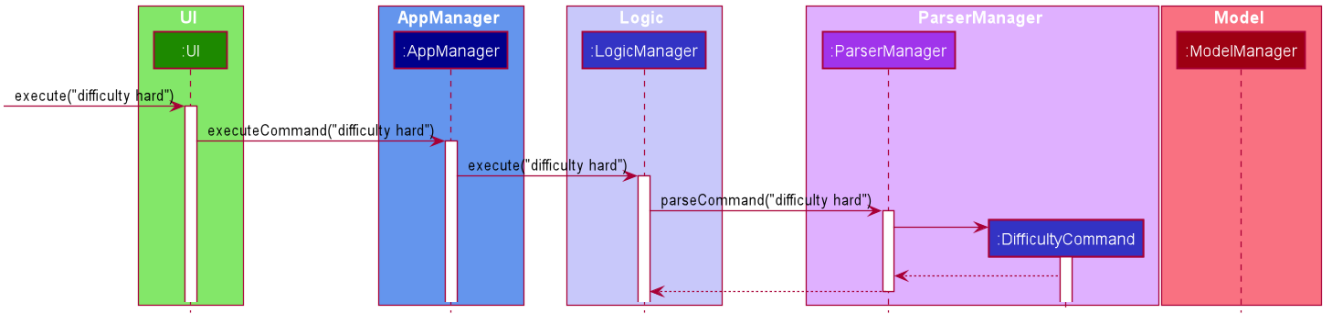


Figure 13. Sequence diagram of Step 3.

Step 3:
At `LogicManager#execute()` however, the command gets passed into a parser manager which filters out the `DifficultyCommand` as a non-switch command and it creates a `DifficultyCommand` to be executed.

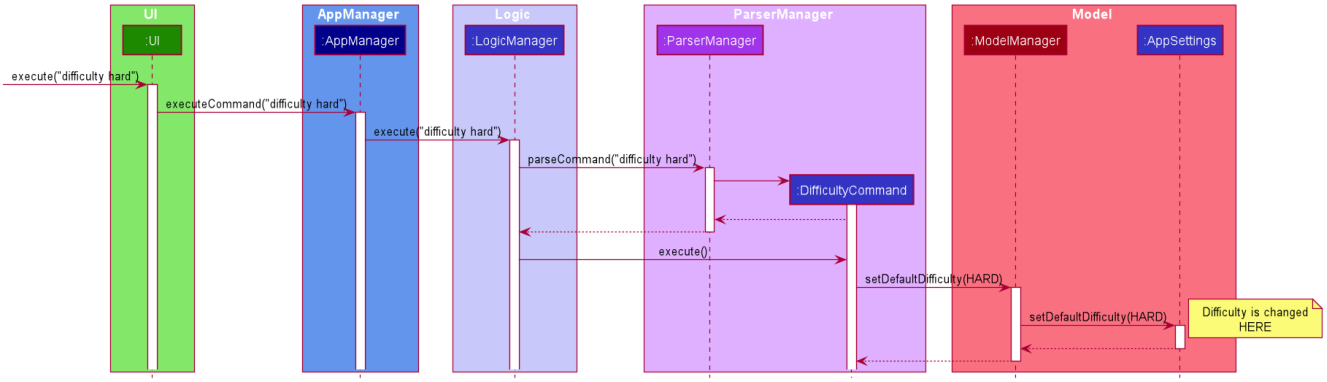


Figure 14. Sequence diagram of Step 4.

Step 4:
Upon execution of the `DifficultyCommand`, the state of the model is changed such that the `DifficultyEnum` in `AppSettings` is now set to `HARD`.

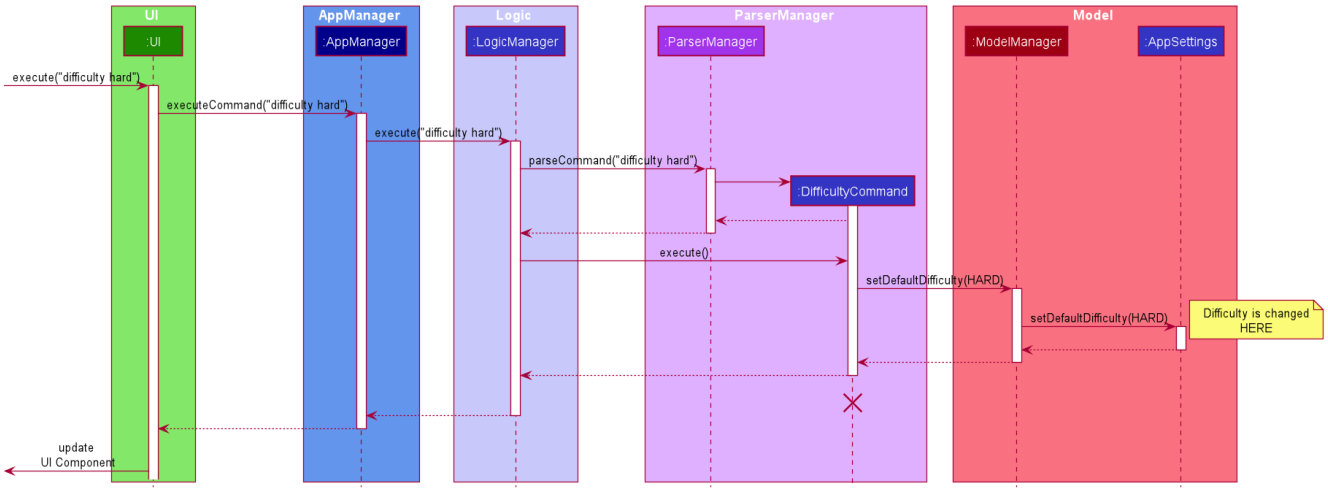


Figure 15. Sequence diagram of Step 5.

Step 5:
Since the main function of the `difficulty` command is accomplished and all that is left is to update the ui, the `CommandResult` that is produced by the execution of the command goes back to `Ui` without much problem.

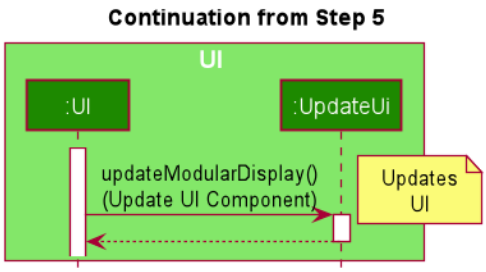


Figure 16. Sequence diagram of Step 6.

Step 6:
Assuming that there were no errors thrown during the execution of the `difficulty` command, the execution calls `updateModularDisplay` in `UpdateUi`. In here, the `ModeEnum.SETTINGS` is registered and it updates the settings display to properly reflect the change in difficulty.

The state of appSettings is then as follows:

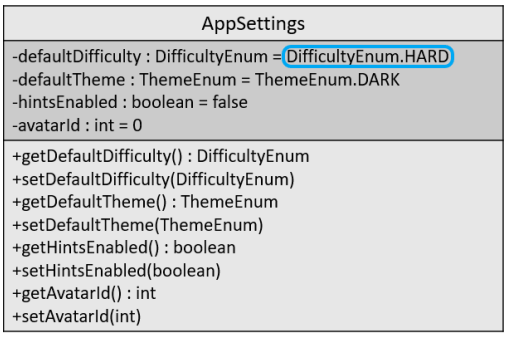


Figure 17. After state of application

Design Considerations

There were a few considerations for implementing an interface that essentially allows users to touch a lot of parts of the application through settings and some of these methods break software design principles. These are the considerations we came across:

	Alternative 1	**Alternative 2**
Aspect 1: Where to effect change when a setting is changed by the user	**Effecting the change inside the `execute()` command of the settings commands**: *Pros:* Since the Command is taking care of all the execution, there is no need to worry about extra implementation of the settings' effects in their classes. *Cons:* However, there are certain situations that will break software design principles, such as the **Single Responsibility Principle** by doing the job of already existing classes.	**Effecting the change in the part of the architecture that the setting is affecting. E.g, Changing the theme inside Ui or changing the difficulty inside model** *Pros:* This method practises good software engineering principles and it abides by the architecture diagram shown above as to where the changes of the settings are being effected. *Cons:* This method however requires that the reader gets familiar with the whole architecture diagram as they need to know where to implement the actual change in settings as opposed to creating a new class that performs the same functionality of an existing class.
Why did we choose Alternative 2: We believe that software design principles exist for a reason. Furthermore, while alternative 1 may seem a lot simpler, Alternative 2 allows for extension just by adding new methods and refrains the user from having to extensively rework the structure of the application in order to add a new setting.		

Aspect 2: How to store information regarding the different settings	**Storing it inside the enumerations that make up the choices for the settings** *Pros:* Having the information stored inside the enum allows for immutablilty, such that no other class can change the properties of the enums. Only the developer can change the values of the enums and it will subsequently affect all the methods and functionality that relies on said enum. *Cons:* In the case that the user wants to customise certain continuous settings such as time limit, they are unable to as those settings are already defined by the developer to be discrete options.	**Storing it inside the classes that implement the settings** *Pros* The information is easily accessible from within the class itself and there is no need for extra import classes to handle the enums in alternative 1. *Cons* Unlike Alternative 1, the developer can create an extension to the class implementing the setting to allow the user to customise their settings even further, allowing for continuous values to be used rather than discrete values.
Why did we choose Alternative 1: The considerations for this aspect was mainly down to how much customisability we wanted to grant our users. While having more customisability is better in some cases, in this one, we do not think the added functionality of allowing the user to extensively customise their experience with our application to be particularly impactful not necessary. Moreover, alternative 2 makes for a less organised code base and we wanted to avoid that as much as possible.		