WordUp - Developer Guide

By: `AY1920S1-CS2113T-T14-3` Since: `Aug 2019`

1. Setting up

1.1. Prerequisites

1. **JDK** `11` or above
2. **IntelliJ** IDE

> **NOTE** IntelliJ by default has Gradle and JavaFx plugins installed.
> Do not disable them. If you have disabled them, go to `File` > `Settings` > `Plugins` to re-enable them.

1.2. Setting up the project in your computer

1. Fork this repo, and clone the fork to your computer
2. Open IntelliJ (if you are not in the welcome screen, click `File` > `Close Project` to close the existing project dialog first)
3. Set up the correct JDK version for Gradle
   a. Click `Configure` > `Project Defaults` > `Project Structure`
   b. Click `New…` and find the directory of the JDK
4. Click `Import Project`
5. Locate the `build.gradle` file and select it. Click `OK`
6. Click `Open as Project`
7. Click `OK` to accept the default settings
8. Open a console and run the command `gradlew processResources` (Mac/Linux: `./gradlew processResources`). It should finish with the `BUILD SUCCESSFUL` message.
   This will generate all resources required by the application and tests.

1.3. Verifying the setup

1. Run the `Launcher` class and try a few commands
2. Run the tests under `src/test` to ensure they all pass. To run all tests, right-click on the `test` folder and select `Run 'All Tests'`.

1.4. Configurations to do before writing code

1.4.1. Configuring the coding style

This project follows oss-generic coding standards. IntelliJ's default style is mostly compliant with ours but it uses a different import order from ours. To rectify,

1. Go to `File` > `Settings…` (Windows/Linux), or `IntelliJ IDEA` > `Preferences…` (macOS)

2. Select Editor > Code Style > Java
3. Click on the Imports tab to set the order
   - For Class count to use import with '*' and Names count to use static import with '*': Set to 999 to prevent IntelliJ from contracting the import statements
   - For Import Layout: The order is import static all other imports, import java.*, import javax.*, import org.*, import com.*, import all other imports. Add a <blank line> between each import

1.4.2. Updating documentation to match your fork

After forking the repo, the documentation will still have the AY1920S1-CS2113-T14-3 branding and refer to the AY1920S1-CS2113-T14-3/main repo.

If you plan to develop this fork as a separate product (i.e. instead of contributing to AY1920S1-CS2113-T14-3/main), you should do the following:

1. Configure the site-wide documentation settings in build.gradle, such as the site-name, to suit your own project.
2. Replace the URL in the attribute repoURL in DeveloperGuide.adoc and UserGuide.adoc with the URL of your fork.

1.4.3. Setting up CI

Set up Travis to perform Continuous Integration (CI) for your fork.

After setting up Travis, you can optionally set up coverage reporting for your team fork.

NOTE Coverage reporting could be useful for a team repository that hosts the final version but it is not that useful for your personal fork.

Optionally, you can set up AppVeyor as a second CI.

NOTE Having both Travis and AppVeyor ensures your App works on both Unix-based platforms and Windows-based platforms (Travis is Unix-based and AppVeyor is Windows-based)

1.4.4. Getting started with coding

When you are ready to start coding, we recommend that you get some sense of the overall design by reading about WordUp’s architecture.

2. Design

2.1. Architecture

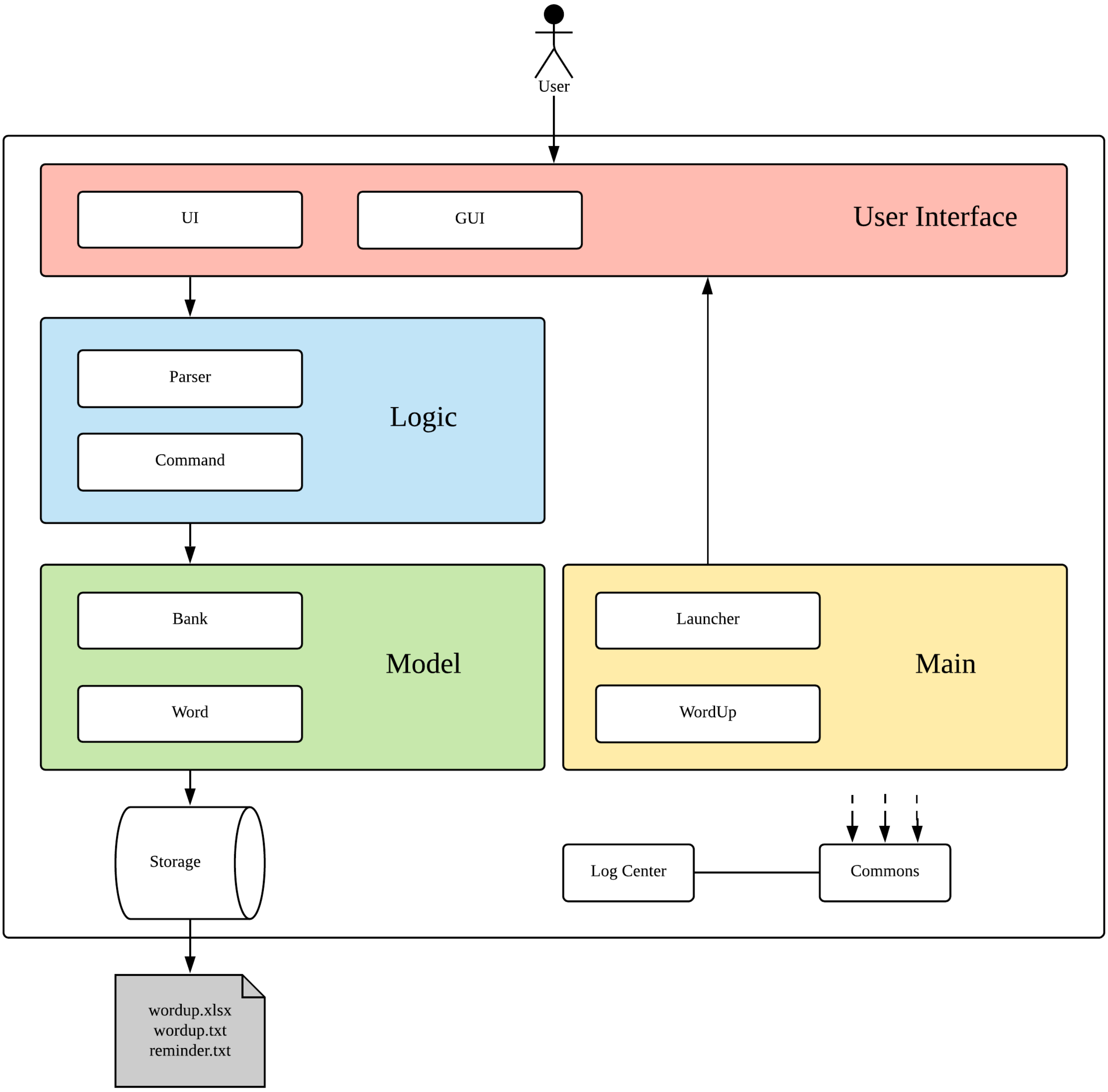


Figure 1. Architecture Diagram

The ***Architecture diagram*** above gives a high-level overview of the design of the WordUp application. The app adopts an n-tier style architecture diagram, where higher layers make use of services provided by lower layers. The following is a quick overview of each component.

`Main` has two classes called `WordUp` and `Launcher`. It is responsible for,

- At app launch: Initialises the application components in the correct sequence, and connects them up with each other. During this process the GUI is also setup and then launched as a JavaFX application.
- At shut down: Shuts down the components and invokes cleanup method where necessary.

`Commons` represents a collection of classes used by multiple other components. The following class plays an important role at the architecture level:

- `LogsCenter` : Used by many classes to write log messages that will be stored in the application's log file. Allows developers to trace any errors and have a clearer overview of the system flow during run for easier maintenance of the application.

The rest of the App consists of four components.

- **`User Interface`**: The UI of the App.
- **`Commons`**: A collection of classes used by multiple other components.
- **`Logic`**: The main controller of the entire application.
- **`Model`**: Holds the data of the application in-memory.
- **`Storage`**: Reads from and writes data to the hard disk, via text files and excel files.

The sections below give more details of each component.

2.2. UI component

API : `Ui.java`

The UI consists of a `Ui` that consists of different ui messages to be shown to the user. The `GUI` is is created with the use of `MainScene` This is inherited from `NewScene` and sets up the window dimensions.

The `UI` component,

- Executes user commands using the `Logic` component.
- Listens for changes to `Model` data so that the UI can be updated with the modified data.

2.3. Logic component

API : `Command.java` `Parser.java`

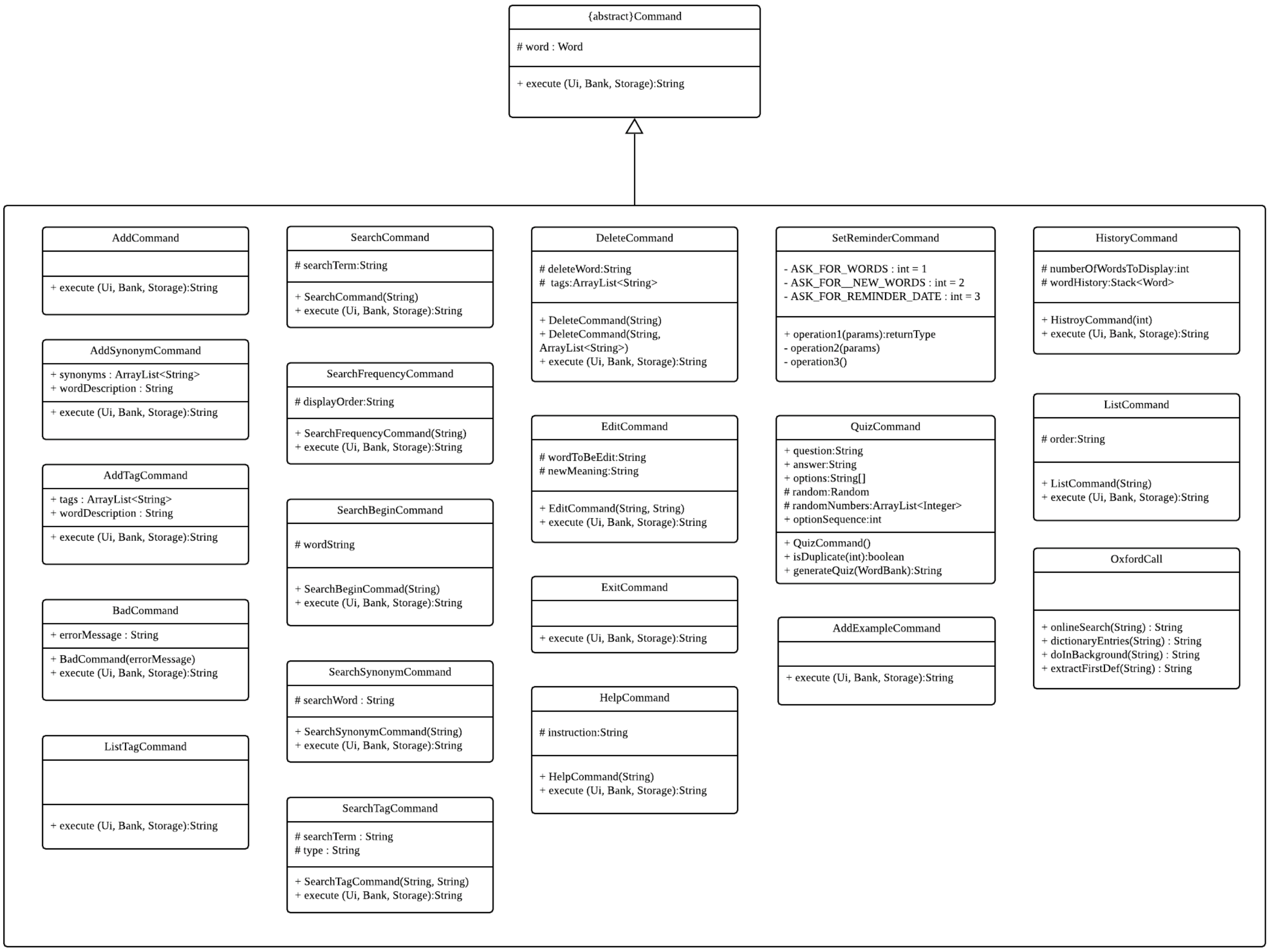

{abstract}Command
# word : Word
+ execute (Ui, Bank, Storage):String
AddCommand
+ execute (Ui, Bank, Storage):String
AddSynonymCommand
+ synonyms : ArrayList<String>
+ wordDescription : String
+ execute (Ui, Bank, Storage):String
AddTagCommand
+ tags : ArrayList<String>
+ wordDescription : String
+ execute (Ui, Bank, Storage):String
BadCommand
+ errorMessage : String
+ BadCommand(errorMessage)
+ execute (Ui, Bank, Storage):String
ListTagCommand
+ execute (Ui, Bank, Storage):String
SearchCommand
# searchTerm:String
+ SearchCommand(String)
+ execute (Ui, Bank, Storage):String
SearchFrequencyCommand
# displayOrder:String
+ SearchFrequencyCommand(String)
+ execute (Ui, Bank, Storage):String
SearchBeginCommand
# wordString
+ SearchBeginCommad(String)
+ execute (Ui, Bank, Storage):String
SearchSynonymCommand
# searchWord : String
+ SearchSynonymCommand(String)
+ execute (Ui, Bank, Storage):String
SearchTagCommand
# searchTerm : String
# type : String
+ SearchTagCommand(String, String)
+ execute (Ui, Bank, Storage):String
DeleteCommand
# deleteWord:String
# tags:ArrayList<String>
+ DeleteCommand(String)
+ DeleteCommand(String, ArrayList<String>)
+ execute (Ui, Bank, Storage):String
EditCommand
# wordToBeEdit:String
# newMeaning:String
+ EditCommand(String, String)
+ execute (Ui, Bank, Storage):String
ExitCommand
+ execute (Ui, Bank, Storage):String
HelpCommand
# instruction:String
+ HelpCommand(String)
+ execute (Ui, Bank, Storage):String
SetReminderCommand
- ASK_FOR_WORDS : int = 1
- ASK_FOR__NEW_WORDS : int = 2
- ASK_FOR_REMINDER_DATE : int = 3
+ operation1(params):returnType
- operation2(params)
- operation3()
QuizCommand
+ question:String
+ answer:String
+ options:String[]
# random:Random
# randomNumbers:ArrayList<Integer>
+ optionSequence:int
+ QuizCommand()
+ isDuplicate(int):boolean
+ generateQuiz(WordBank):String
AddExampleCommand
+ execute (Ui, Bank, Storage):String
HistoryCommand
# numberOfWordsToDisplay:int
# wordHistory:Stack<Word>
+ HistroyCommand(int)
+ execute (Ui, Bank, Storage):String
ListCommand
# order:String
+ ListCommand(String)
+ execute (Ui, Bank, Storage):String
OxfordCall
+ onlineSearch(String) : String
+ dictionaryEntries(String) : String
+ doInBackground(String) : String
+ extractFirstDef(String) : String

Figure 2. Structure of the Command Class

1. The `Parser` class is used to parse the user command.
2. This results in a `Command` object which is executed by the `MainScene`.
3. The command execution can affect the `Model` (e.g. adding a word).
4. The result of the command execution is encapsulated as a `String` which is passed back to the `MainScene` and displayed to the user in the GUI.

Given below is the Sequence Diagram for interactions within the `Logic` component for the `execute("delete 1")` API call.

[DeleteSequenceDiagram] | *DeleteSequenceDiagram.png*

Figure 3. Interactions Inside the Logic Component for the `delete 1` Command

2.4. Model component

API : `Bank.java` `Word.java`

The `Model`,

- contains a Bank and Word component.
- models the structure for a word bank (using TreeMap) and word, which contains the word itself tied to its meaning.

- Bank stores the data of the words in the word bank.
- Word stores the word and its meaning.

2.5. Storage component

API : `Storage.java`

The `Storage` component,

- can save `Word` objects into the text files and excel files and read it back.
- can save reminder information into the text files and read it back.

2.6. Common classes

Classes used by multiple components will be in the `commons` package. The current version does not implement this class, but will do so in future versions.

3. Implementation

This section describes some noteworthy details on how certain features are implemented.

3.1. Word Search feature

Search word feature allows user to look for the word that they have added to the word bank. There are 2 types of searches in our WordUp: Search using the whole word using “search w/[WORD]”, or search using the beginning substring of the word using “search w/[BEGIN_SUBSTRING]”. These 2 methods are facilitated by WordBank.

3.1.1. Search for Meaning

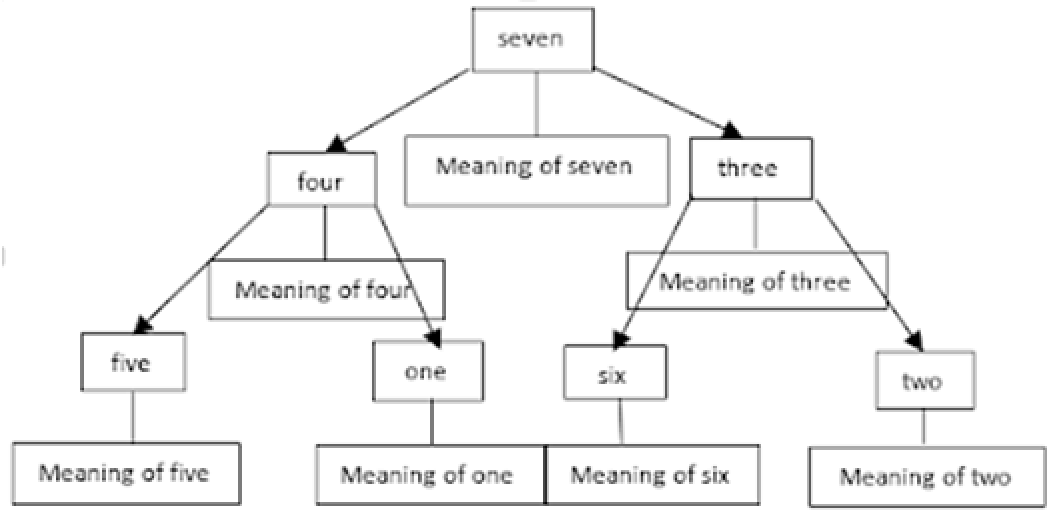
This allows the user to look for the meaning of a specific word that he/she has added to the bank. It is implemented as its own individual class SearchCommand, which extends class Command.

It contains an attribute searchTerm: string representing the word that user is looking for.

Given below is an example of usage scenario for Search Word feature:

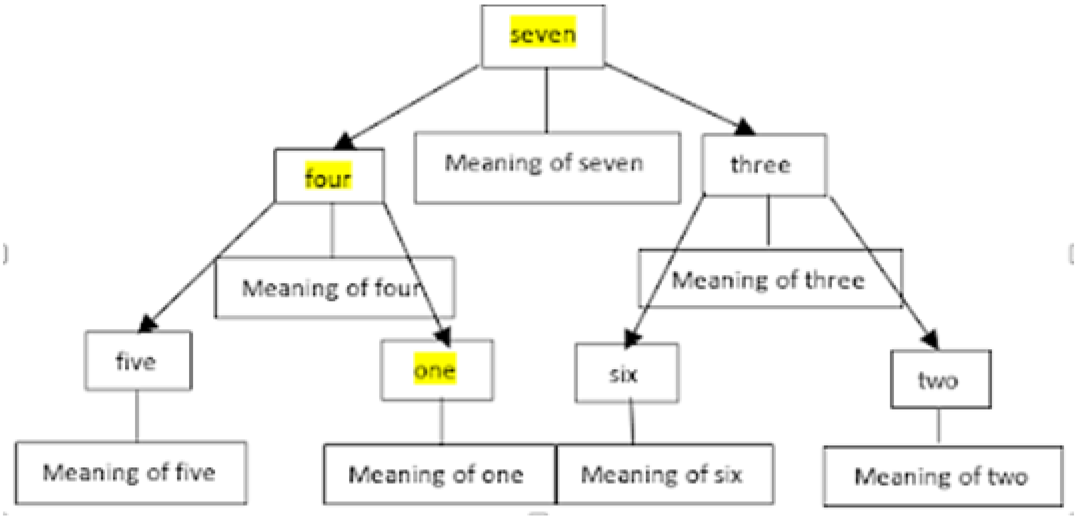
Step 1. Search from WordBank

Step 1-1: User have already added a few words as below. Our word bank use a data structure to store all words as a binary tree.



Step 1-2:

User wants to search for a word, e.g. “one”. It first goes to the word “seven”. We see that “one” appears before “seven”, so it searches on the left subtree of “seven”. Then it reaches “four”, and see that “one” appears after “four”, so it searches to the right. Then it reaches “one” and return it. The words appeared in searching are marked as yellow.



Step 1-3:

(If the word doesn’t appear in the bank): When search pointer reaches the lowest level but still cannot find the word, it will look for the “near” words. A “near” word is defined as the ratio between the edit distance between 2 words and the length of the compared word is less than 50%.

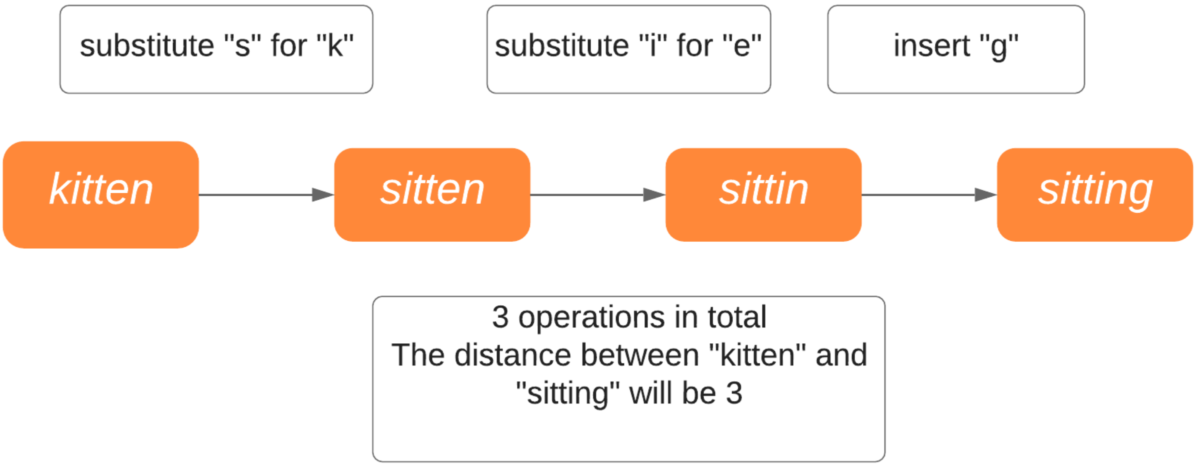
Step 2. Search from Oxford Dictionary

If the word doesn’t exist in wordbank, the search command calls OxfordCall.onlineSearch(). It’s an api which searches online Oxford dictionary and returns the meaning of the word. If the network is disconnected or the word does not exist in Oxford dictionary, an exception will be raised.

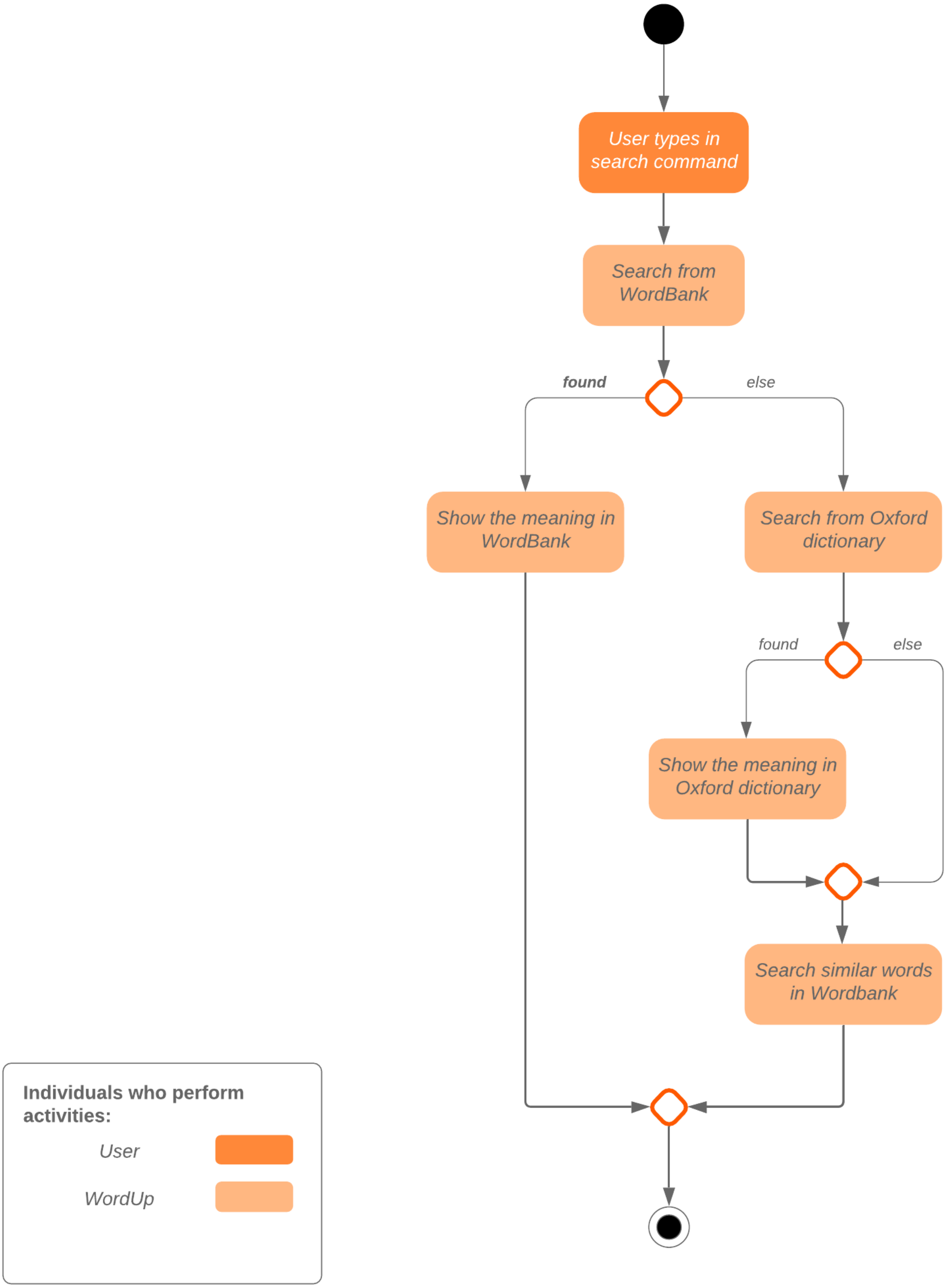
Step3. Search similar words in WordBank

Whether we find the meaning of the word from Oxford dictionary or not, we match the word to every word in WordBank to see if there are any similar words. Levenshtein Distance is the method we use to calculate differences between words and is implemented by using dynamic programming. Given the searched word, for each word in the WordBank, we get the set of all combinations of the word with maximum 1 swap between any 2 characters. From the given set, we allow 3 changes: insert, remove or replace 1 character. For every character changed, we count it as 1 change. Similarity between 2 words is defined as number of changes made. The threshold of similarity will be half of the length of the word in WordBank.

Example of calculating Levenshtein Distance



Activity diagram of search command

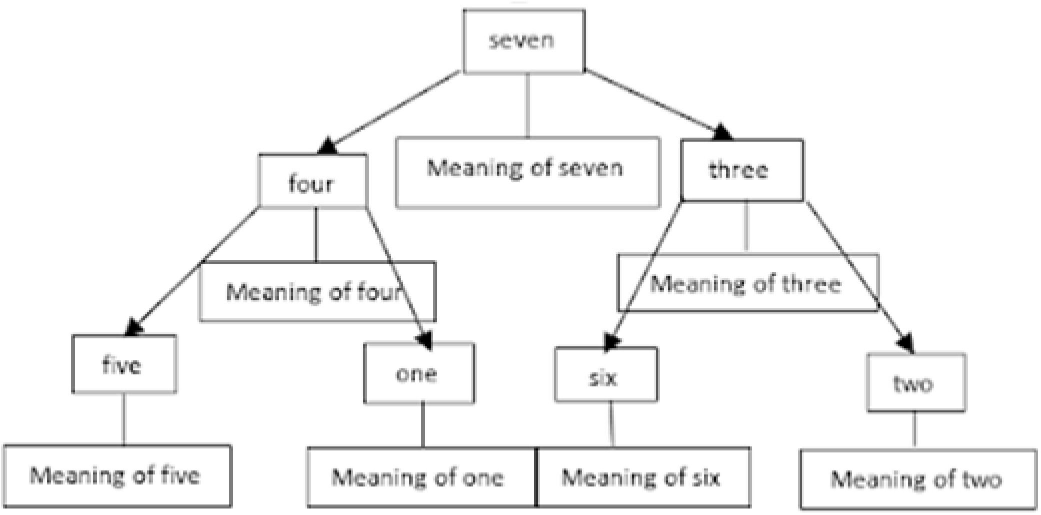

User types in search command
Search from WordBank
found
else
Show the meaning in WordBank
Search from Oxford dictionary
found
else
Show the meaning in Oxford dictionary
Search similar words in Wordbank
Individuals who perform activities:
User
WordUp

3.1.2. Search with Beginning Substring

This allows the user to look for the word that has a specific start. It is implemented as its own individual class SearchBeginCommand, which extends class Command.

Step 1: Similar to Search Word, word bank loads all of the words in a binary search tree.

Step 2: SearchBeginCommand will look to the first word in the dictionary that starts with a specific substring.



In the diagram above, if the user inputs “f”, it will searches in the sequence “seven” → “four” → “five”, and get “five” as the first word starts with “f”. If user inputs “s”, it will searches “seven”. It will see that the predecessor of “seven” is “one”, which doesn’t start with “s”, so it stops searching and get the word “seven”.

Step 3: From that word, continuously look for its successor to find the word that starts with the specific substring. When it reaches a word that doesn’t start with that substring, it terminates and returns all the found words.

Design Consideration

- **Pros**:
  - This design makes searching faster since it doesn’t require looping through the whole word bank.
  - This design makes the word sorted in ascending order; therefore, it is easier to find words using `list` command.
  - Storing in a binary search tree also helps find the lower bound / upper bound of a word, which allows users to look for a word by searching with prefix.
- **Cons**:
  - This design doesn’t allow user to look for the adding history; therefore, we have to create a text file to store the insertion order, and whenever users use `history` command, it will take reads through that file.

3.1.3. Recently Added

The Recently Added feature allows the user to quickly check back on the words he had recently added to the application. It is facilitated by the `RecentlyAddedCommand`, which extends the `Command` class.

It contains the following attributes:

- numberOfWordsToDisplay: int - This represents the number of words the user has requested to be displayed.
- wordHistory: Stack<Word> - The Word objects in the word bank will be stored in a first-in first-out data-structure of a stack so that the words can be retrieved quickly and in chronological order of addition to the word bank.

It implements the following operations:

- RecentlyAddedCommand(int) - Assigns the value of words requested to the numberOfWordsToDisplay attribute on the construction of the command object.
- execute(Ui, WordBank, Storage, WordCount) - Creates the wordHistory stack and calls Ui to display the recently added words accordingly.

The following is an example usage scenario for the Recently Added feature.

Step 1: The user enters history 5 command to see the last 5 words he has added to the word bank. The history command instantiates a RecentlyAddedCommand, which creates the wordHistory Stack. This is done by Storage calling the loadHistoryFromFile() method. A wordHistory stack containing the list of words in order of addition to the word bank is then created.

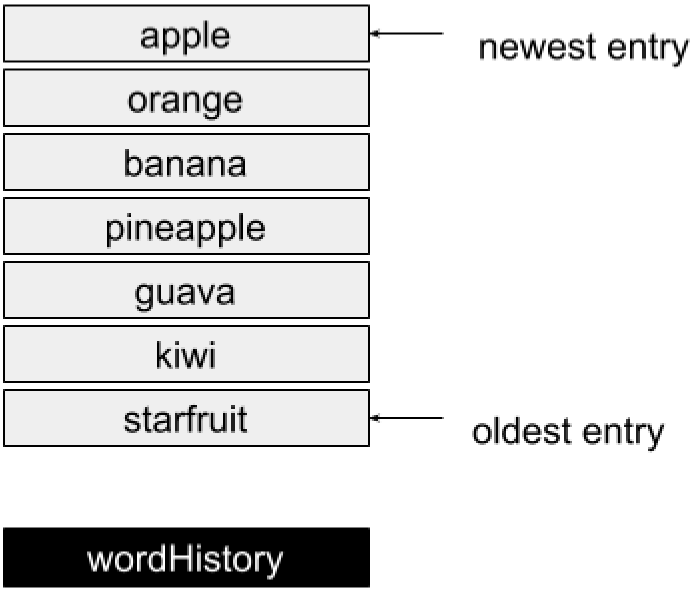


Figure 4. Sample stack containing list of words

Step 2: Ui is then called to display the numberOfWordsToDisplay, which in this case is 5, on the screen to the user as requested. In this case, the words displayed to the user are the top 5 in the wordHistory stack as shown:

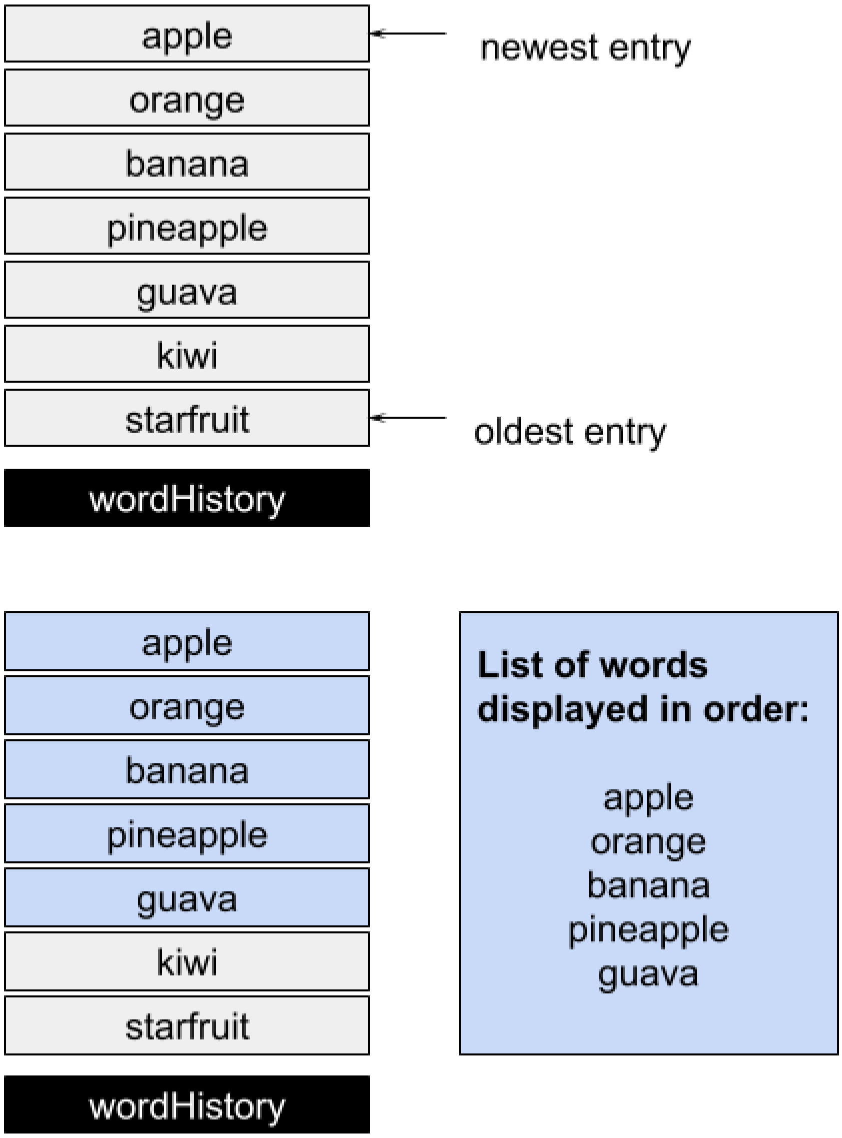
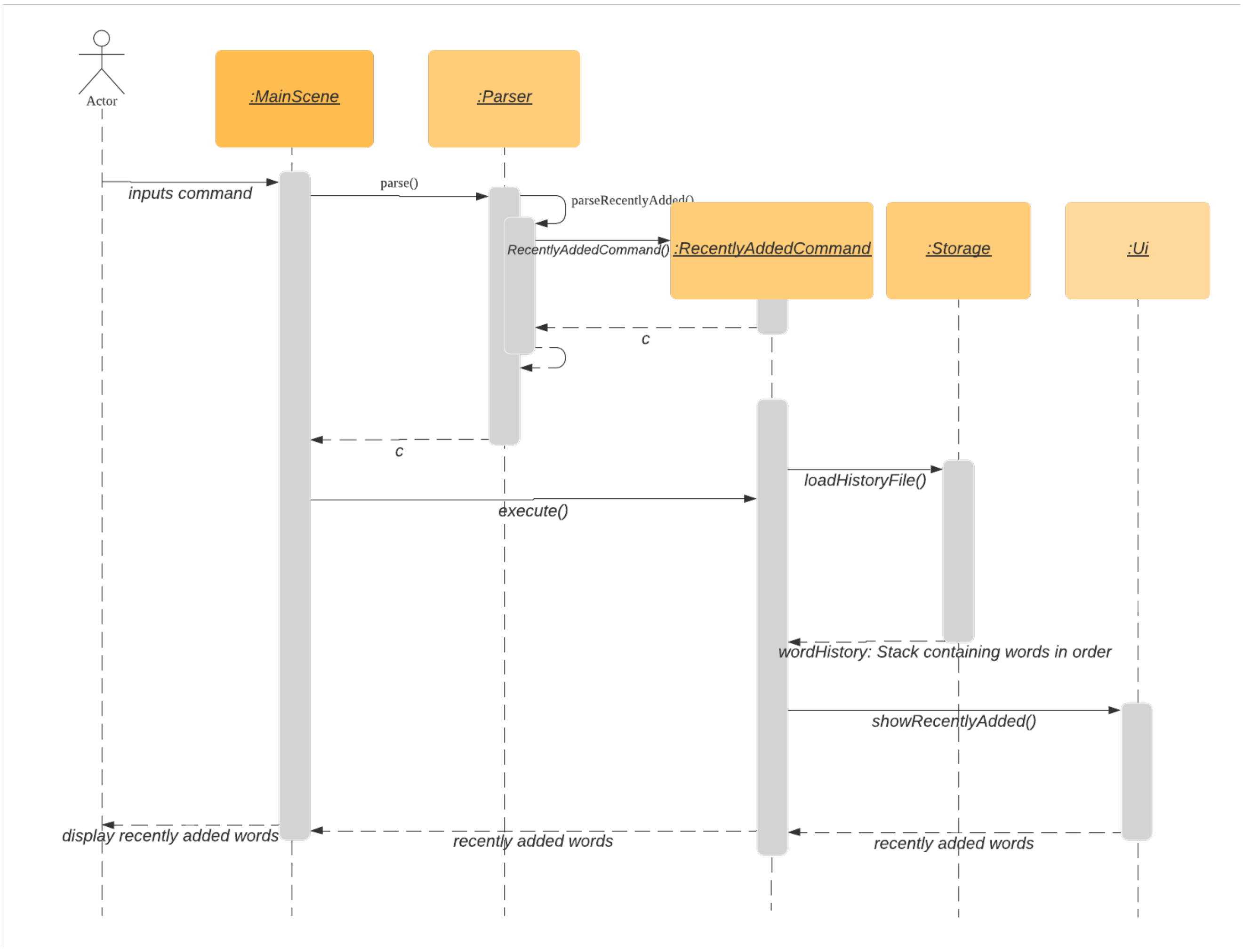


Figure 5. Stack content and corresponding words shown to user

If the wordBank currently contains less than 5 entries, an exception will not be thrown. Instead, the Ui will display the full current list of words (less than 5) on the screen for the user. This is to account for the fact that a user may not recall precisely the number of words in his wordBank.

The following sequence diagram shows how the RecentlyAdded feature works:



Design Considerations

Aspect: Data structure to support the recently added command

- **Alternative 1 (current choice):** Use a stack structure to store the word adding history in the word bank.
  - Pros: The data can be directly read and stored into a stack without any additional code to change the order the words were stored in. It is also very easy to list the word history since storing it into the stack automatically reverses the order of the words, such that the top-most entry in the stack is the latest added word.
  - Cons: Words have to be stored in order of being added for maximum efficiency. This just means that the file writer can only use append methods when adding instead of writing directly from the TreeMap structure which holds the word bank, but is not a problem in the overall code implementation.
- **Alternative 2:** Use a list to store the word adding history in the word bank.
  - Pros: Easy to implement since it is one of the most widely used `collections` data structure.
  - Cons: Requires a loop to iterate through the items, and extra code to first sort the word in reverse order.

3.2. Search Frequency

The Search Frequency feature allows the user to see the words with the highest/lowest search counts as a reflection of which words he was most unfamiliar with and therefore had to repeatedly search its meaning for. It is facilitated by the SearchFrequencyCommand, which extends the Command class, and the SearchCommand.

SearchFrequencyCommand contains the following attributes:

- order : String This represents the order the list displayed should be in (i.e. highest search count first or lowest search count first).

It implements the following operations:

- SearchFrequencyCommand(int) - Assigns the value of the display order to the displayOrder attribute on the construction of the command object.
- execute(Ui, WordBank, Storage, WordCount) - Calls Ui to display the words from wordCount to the user

SearchCommand contains the following attributes:

- searchTerm : String - This represents the word being queried.

It implements the following operations:

- SearchCommand(String) - Assigns the value of the word being queried to the searchTerm attribute on construction of the command object.
- execute(Ui, WordBank, Storage, WordCount) - Obtains the meaning of the word from wordBank and increases the search count in wordCount

The following is an example usage scenario for the Search Frequency feature:

Step 1: The user enters search w/happy to check the meaning of the word ‘happy’. Through the SearchCommand, the meaning of the word is retrieved by the wordBank and wordCount calls the increaseSearchCount method to increase the search count. Ui is called to display the meaning of the word to the user.

Step 2: After a few searches of different words, which is carried out following the process described in Step 1, the user enters the command freq o/desc. SearchFrequencyCommand then tells Ui the displayOrder to display the word and their word counts in.

3.3. Schedule Reminders feature

The schedule reminders feature allows the user to schedule words for revision notifications at the date and time set. It is facilitated by `SetReminderCommand` and classes in the `reminders` package.

The following is a sample usage case:

Step 1: Assume that the current date is 01/01/2019 and the word ‘happy’ and its meaning is stored in the wordBank.

Step 2: The user enters schedule w/happy by/01/02/2019. The system should store the reminder deadline onto permanent storage. It calculates the number of days to the deadline, and schedules the recurring reminder for every 3 days until the deadline.

Step 3: On each reminder date, there will be a notification showing the word and its meaning for the user to revise, thereby automating his learning process.

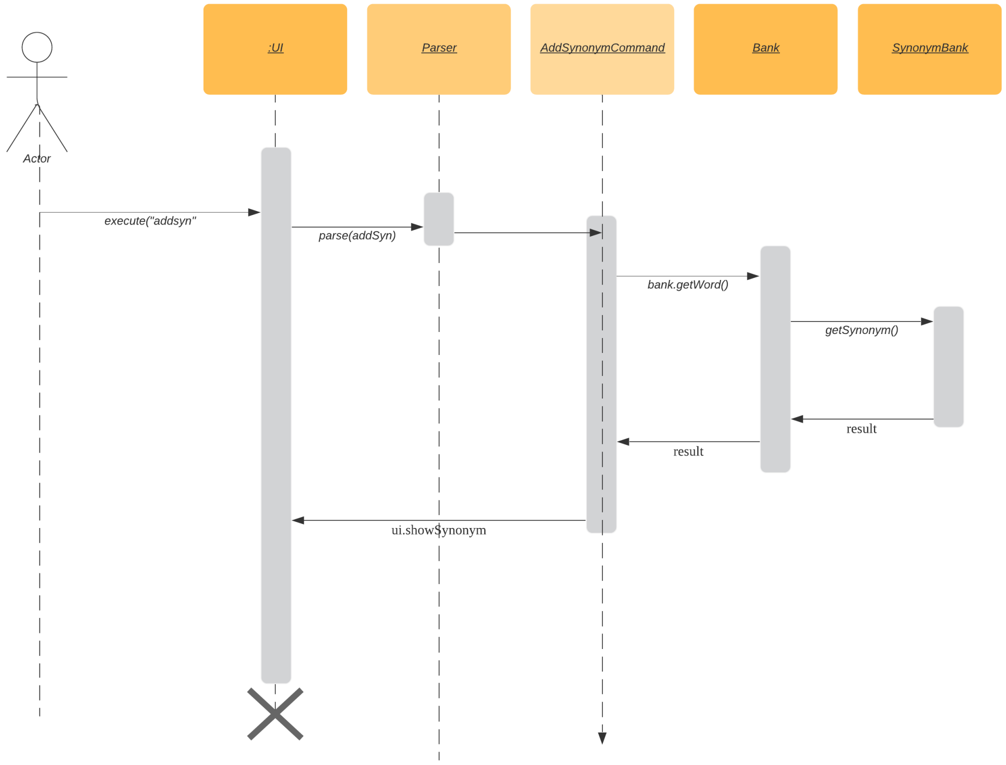
Design Considerations

Aspect: Where to show the reminder

- **Alternative 1 (current choice):** Use a popup window when the reminder is to be shown.
    - Pros: Allows users to get the reminder without disrupting their work flow, since they can continue using and referring to the app screen as is. Users can minimise this window and refer to the words to be revised later on.
    - Cons: Leads to extra javafx code to be implemented since a new window is needed.
- **Alternative 2:** Show the reminder on the same main screen as the app.
    - Pros: More straightforward implementation.
    - Cons: Users might be working on something and the reminder popup may cause the view window to scroll past the line which they were referring to before the reminder. They may also easily miss the reminder when adding more commands.

3.4. Word Synonyms feature

3.4.1. Adding Synonym



The synonym feature allows words or phrases that means exactly or nearly the same as the current word to be added and referenced.

When searched for, all the synonyms belonging to the searched word will be reflected and user is free to replace the searched word with any of the synonyms for personal use.

The synonym function implements the following operations:

- AddSynonym(String) - Inserts the synonyms into the HashSet of the main word. The function can only be used when we have the main word in our dictionary. User is expected to learn a word and meaning before being able to add synonyms to the word.
- execute(Ui, WordBank, Storage, WordCount) - Overwrites the storage file and WordBank while the program is running to append synonyms into their respective data structure.

The synonyms are structured using a Union Find algorithm to group the words together. When word A and word B are synonyms to each other, adding a word C to synonym of word B will automatically classify all three words together as synonyms. They are stored in the same cell within the Excel File under the StorageBank Sheet. You may view the excel file to see storage structure of the words.

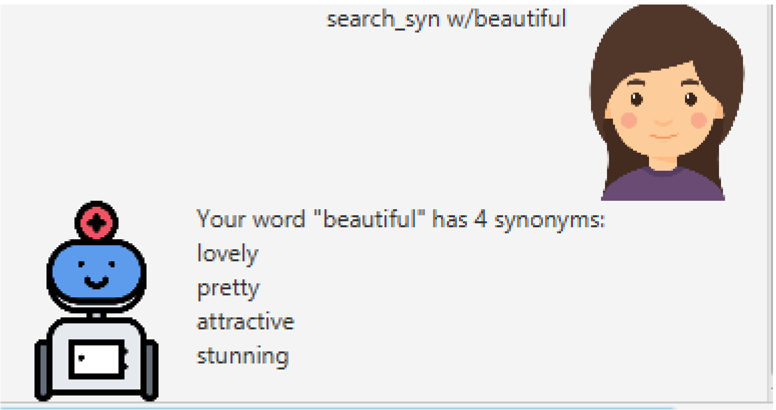
The following is a sample usage case:

Step 1: Assume that the word “lovely” and its meaning has already been saved into the word bank by the functions supported above.

Step 2: User decides to add "beautiful", "pretty", "attractive" and "stunning" to "lovely"'s synonym.

Step 3: In doing so, the union find algorithm will group the words together and store them within the same cell. Note that the four new words does not need to be saved into the dictionary before adding as a synonym to a main word ("lovely"). However the main word "lovely” must be added to the dictionary before the usage of this feature.

3.4.2. Searching of synonyms



search_syn w/beautiful

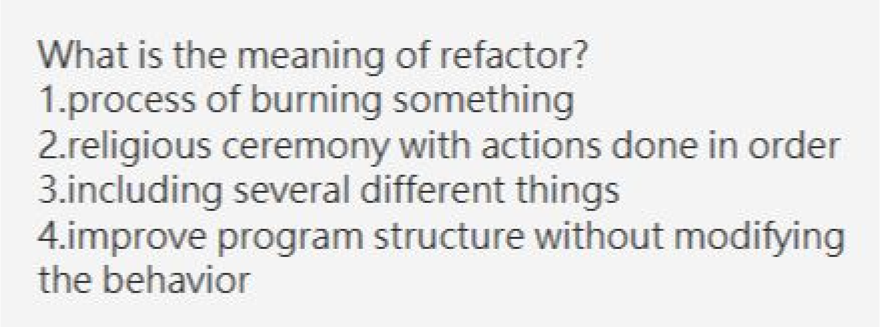
Your word "beautiful" has 4 synonyms:
lovely
pretty
attractive
stunning

Since the synonyms are chained together using a Union Find algorithm, words are inherently grouped together. When we look for synonyms of a word, the tree structure essentially returns every node that is reachable from our main word node. This allow us to lookup synonyms in a quick manner.

3.5. Quiz feature

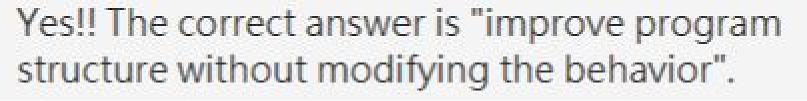
- Generate quizzes to test the user’s understanding of a word, with a score at the end of the quiz. Wrongly answered words will be shown at the end of a quiz. The quizzes are in the form of 4-option MCQs,4 in a row. (See QuizScene.java and QuizCommand.java for details.)
- The generateQuiz() function in QuizCommand.java generates a quiz if there is at least 4 word object saved into the word bank. It selects 1 word object and retrieve the vocabulary and meaning for the expected answer. It then randomly select 3 other word objects and retrieve their meanings for options of the MCQ.
- The scene (GUI) will change form MainScene to QuizScene when user inputs “quiz” the QuizScene will then interacts between user and QuizCommand, generating MCQs for 4 in a row.
- The quiz will output a word, and the 4 choices of meanings. Prompting the user to enter between “1 to 4” similar to MCQ picking before informing the user if they have gotten the quiz question correct.

In the following example (Figure 11), if the user inputs “1”, WordUp will response the correctness (Figure 12), and at the end of the quiz it will show wrongly answered words so the user can review the words (Figure 13).



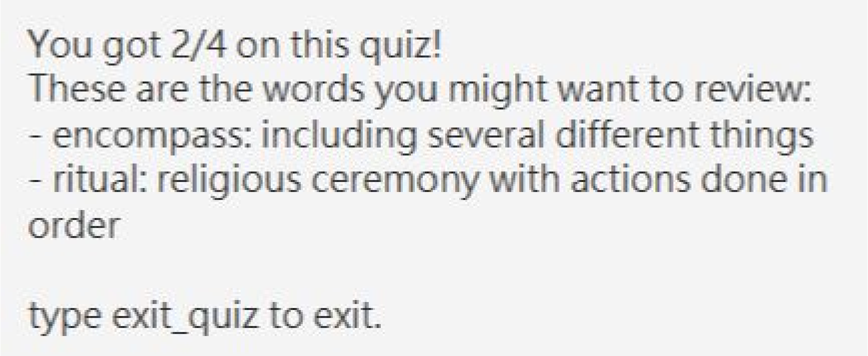
```
What is the meaning of refactor?
1.process of burning something
2.religious ceremony with actions done in order
3.including several different things
4.improve program structure without modifying
the behavior
```

Figure 6. 4-option MCQ



```
Yes!! The correct answer is "improve program
structure without modifying the behavior".
```

Figure 7. Answering response



```
You got 2/4 on this quiz!
These are the words you might want to review:
- encompass: including several different things
- ritual: religious ceremony with actions done in
order

type exit_quiz to exit.
```

Figure 8. Review words

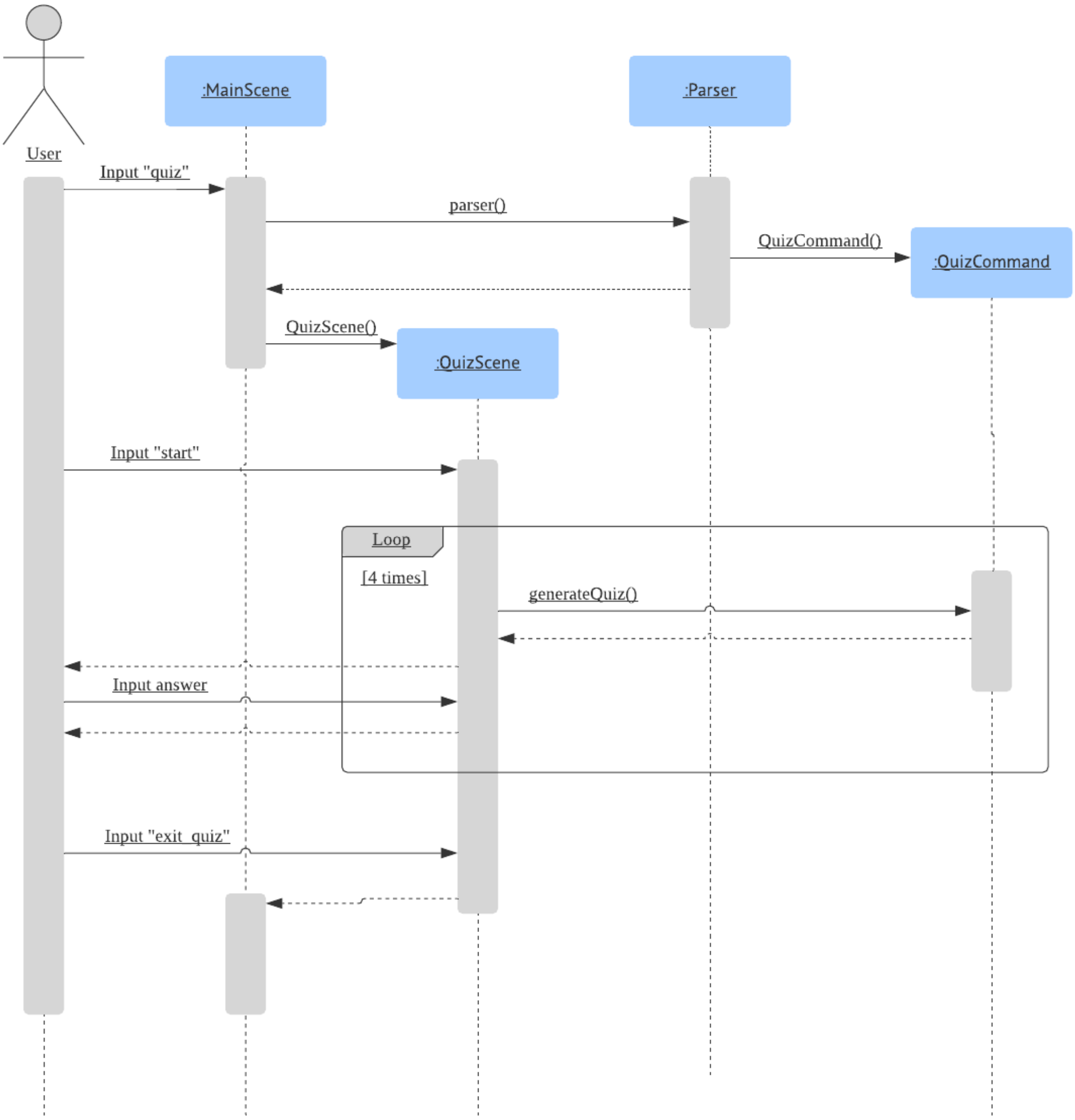


Figure 9. Sequence Diagram of a quiz

3.6. Logging

We are using `java.util.logging` package for logging. The `LogsCenter` class is used to manage the logging levels and logging destinations.

- The logging level can be controlled using the `logLevel` setting in the configuration file (See Section 3.7, “Configuration”)
- The `Logger` for a class can be obtained using `LogsCenter.getLogger(Class)` which will log messages according to the specified logging level
- Currently log messages are output through: `Console` and to a `.log` file.

Logging Levels

- `SEVERE` : Critical problem detected which may possibly cause the termination of the application

- `WARNING` : Can continue, but with caution
- `INFO` : Information showing the noteworthy actions by the App
- `FINE` : Details that is not usually noteworthy but may be useful in debugging e.g. print the actual list instead of just its size

3.7. Configuration

Certain properties of the application can be controlled (e.g user prefs file location, logging level) through the configuration file (default: `config.json`).

Appendix A: Product Scope

Target user profile: Tech-savvy english language students

- Learns many new words consistently over an extended duration
- Needs a space-efficient way of storing their words
- Prefers digital recording of words instead of writing by hand in notebooks
- Wants to practice spelling and typing words
- Needs to catalog words according to their meaning and/or alphabetical order for better future referencing

Value proposition: manage vocabulary collection, revision and searching faster than a typical handwritten/GUI driven app

Product rationale: Language students usually have a list of vocabulary to learn and master with each chapter of material taught. It is sometimes difficult to track all the words learnt, and even less easy to sort and categorise them by handwritten or analog means.

Our app aims to allow these students to easily store and collate new words learnt easily through a CLI. With a CLI, the word storage process may be much faster compared to handwriting notes for a user who types quickly, especially since the new students may be still unfamiliar with hand-writing the characters in the English alphabet. In addition to recording words, the app also aims to assist students in revising the words in an interactive and automated manner, which is a feature lacking in traditional analog recording methods. This app is developed with the aim of providing a simple, fast and value-adding service for English language students.

Appendix B: User Stories

Priorities: High (must have) - `* * *`, Medium (nice to have) - `* *`, Low (unlikely to have) - `*`

Priority	As a …	I want to …	So that I can…
* * *	English learner	store new words I have learnt in one place	refer back to it to refresh my memory
* * *	English learner who prefers interactive learning methods	have vocabulary quizzes	practice how well I can remember the new words
* * *	time-conscious English learner	record the meaning of the word on keying in just the word	do not have to copy and paste it from the net manually
* * *	English learner	categorise the words I have learnt into different subgroups	conveniently find a group of words I need to use (e.g. a subgroup can be all the words from a particular lesson/chapter)
* *	English learner who likes to pace my learning	schedule words for revision and get reminders for them	effectively revise selected words before a test/custom deadline
* *	statistically oriented English learner	view my search history	check which words I keep needing to review on and put in more effort to learn those words
* *	English learner	enter letter to display words starting with it	type a word correctly even if I am unfamiliar with how to spell it

Priority	As a …	I want to …	So that I can…
* *	English learner	see how much I have searched for a word	track the most “forgotten” words and target those words specifically in my learning
*	English learner	export my wordbank to word or pdf	print them out and read them on the go during revision for any tests/just for my own ease of learning

{More to be added}

Appendix C: Use Cases

(For all use cases below: System is defined to be WordUp and User is an English language learner for all following use cases:)

Use case: Adding a word to the word bank

MSS

1. User enters command to add a word.
2. System adds the word and its meaning to the word bank.
3. System displays the added word and its meaning.

   Use case ends.

C.1. Use case: Finding the meaning of a word

MSS

1. User enters command to add a word.
2. System adds the word and its meaning to the word bank.
3. System displays the added word and its meaning.

   Use case ends.

Extensions

5a. There is no such word in the word bank.

- 5a.1. System throws an error to inform user that the word is not in word bank.

  Use case ends.

C.2. Use case: Making quizzes

MSS

1. User enters command to start a quiz.
2. System searches for recorded word and meanings.
3. System generates a question from the search.
4. User answers the question.
5. Repeat step 2 to 5 until all questions are done.

   Use case ends.

Extensions

4a. There is no such word in the word bank.

- 4a.1. System throws an error to inform user that the word is not in word bank.
- 4a.2. System displays the correct meaning.

  Use case ends.

C.3. Use case: Checking recently added words

MSS

1. User enters command to ask for recent words he has added.
2. System checks the wordHistory containing the words in the order they were added in.
3. System displays the words in order of latest added words to the oldest added word.

   Use case ends.

Extensions

1a. There were no words added before the command.

- 1a.1. System throws an error to inform user that the wordbank is empty.
- 1a.2. System suggests user to enter new words first and exits the command.

  Use case ends.

C.4. Use case: Scheduling reminders

MSS

1. User enters command to start a schedule reminder.
2. User enters a list of words to be scheduled.
3. System prompts user for the reminder date and time.
4. User enters the reminder date and time.
5. System shows the summary of the reminder details.

   Use case ends.

Appendix D: Non Functional Requirements

1. Should work on any mainstream OS as long as it has Java 11 or above installed.
2. Should be able to hold up to 1000 words without a noticeable sluggishness in performance for typical usage.
3. Users should be able to accomplish each task without typing more than 10 words in a user input line.

Appendix E: Glossary

Mainstream OS

Windows, Linux, Unix, OS-X

MSS

Main Success Scenario

Word Bank

A collection of words the user has added into our program, stored on user’s hard disk

Appendix F: Instructions for Manual Testing

Given below are instructions to test the app manually.

NOTE These instructions only provide a starting point for testers to work on; testers are expected to do more *exploratory* testing.

F.1. Launch and Shutdown

1. Initial launch
   a. Download the jar file and copy into an empty folder

   b. Double-click the jar file
   Expected: Shows the GUI with a set of sample contacts. The window size may not be optimum.

2. Saving window preferences

   a. Resize the window to an optimum size. Move the window to a different location. Close the window.

   b. Re-launch the app by double-clicking the jar file.
   Expected: The most recent window size and location is retained.

F.2. Deleting a word

1. Deleting a word while all words are listed

   a. Prerequisites: List all words using the `list` command.

   b. Test case: `delete w/WORD`
   Expected: The word will be deleted from wordBank, it will however stay in synonymBank (if applicable) since banks are separated.

   c. Test case: `delete w/ABCDEFG`
   Expected: No word is deleted. Error details shown in the status message.

   d. Other incorrect delete commands to try: `delete`, `delete w/NON-EXISTENCE-WORD` {give more}_
   Expected: Similar to previous.

F.3. Adding a word

1. Adding a new word to the word bank.

   a. Test case: `add w/WORD m/MEANING`
   Expected: The word will be added to the word bank. To verify, enter `list` to see the new list of words.

   b. Test case: `add w/WORD`
   Expected: The word will not be added. Instead, an error message that the user needs to input the meaning as well will be shown.