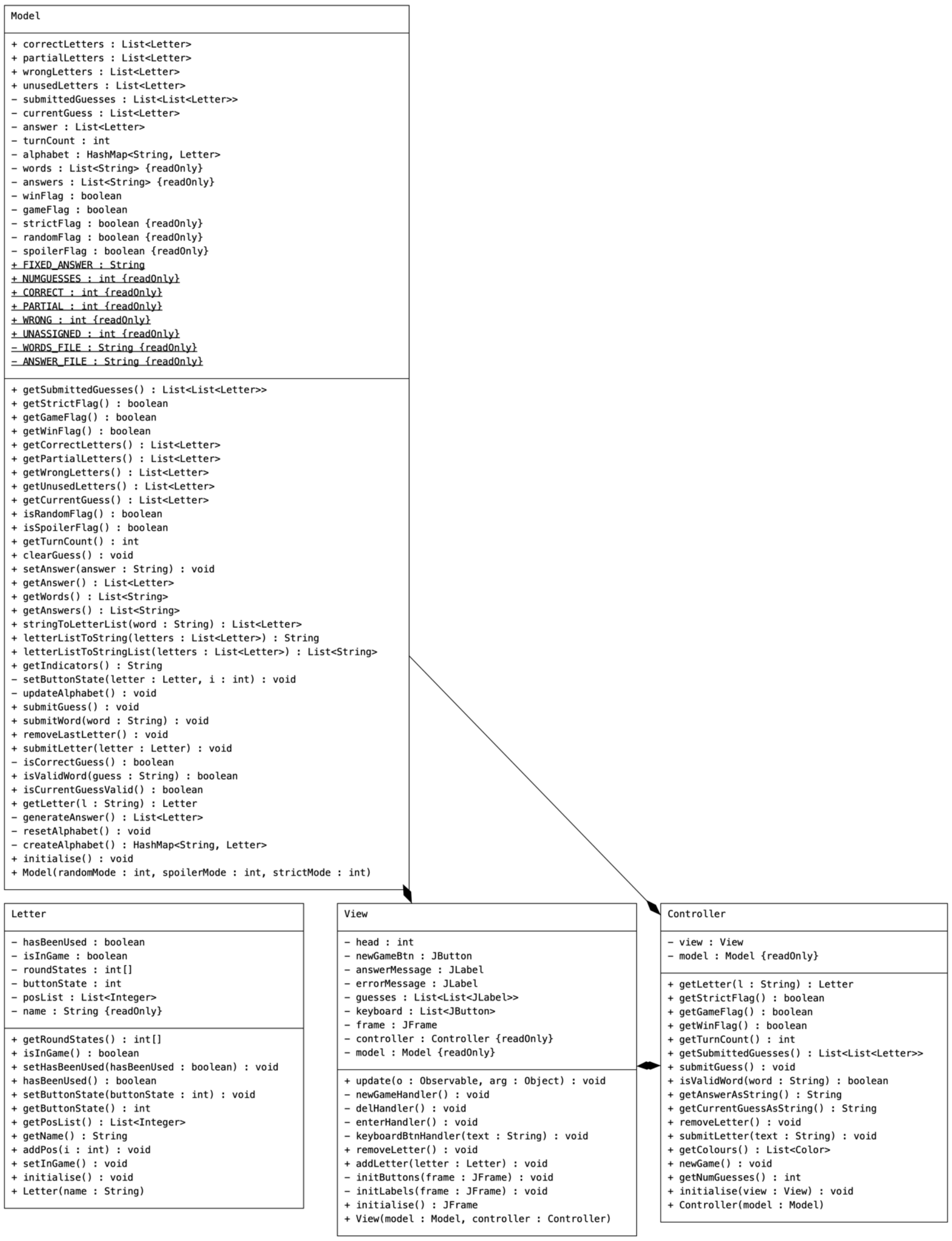
17065838

Wordle Report

UML Diagram



Model
+ correctLetters : List<Letter>
+ partialLetters : List<Letter>
+ wrongLetters : List<Letter>
+ unusedLetters : List<Letter>
- submittedGuesses : List<List<Letter>>
- currentGuess : List<Letter>
- answer : List<Letter>
- turnCount : int
- alphabet : HashMap<String, Letter>
- words : List<String> {readOnly}
- answers : List<String> {readOnly}
- winFlag : boolean
- gameFlag : boolean
- strictFlag : boolean {readOnly}
- randomFlag : boolean {readOnly}
- spoilerFlag : boolean {readOnly}
+ FIXED_ANSWER : String
+ NUMGUESSES : int {readOnly}
+ CORRECT : int {readOnly}
+ PARTIAL : int {readOnly}
+ WRONG : int {readOnly}
+ UNASSIGNED : int {readOnly}
- WORDS_FILE : String {readOnly}
- ANSWER_FILE : String {readOnly}
+ getSubmittedGuesses() : List<List<Letter>>
+ getStrictFlag() : boolean
+ getGameFlag() : boolean
+ getWinFlag() : boolean
+ getCorrectLetters() : List<Letter>
+ getPartialLetters() : List<Letter>
+ getWrongLetters() : List<Letter>
+ getUnusedLetters() : List<Letter>
+ getCurrentGuess() : List<Letter>
+ isRandomFlag() : boolean
+ isSpoilerFlag() : boolean
+ getTurnCount() : int
+ clearGuess() : void
+ setAnswer(answer : String) : void
+ getAnswer() : List<Letter>
+ getWords() : List<String>
+ getAnswers() : List<String>
+ stringToLetterList(word : String) : List<Letter>
+ letterListToString(letters : List<Letter>) : String
+ letterListToStringList(letters : List<Letter>) : List<String>
+ getIndicators() : String
- setButtonState(letter : Letter, i : int) : void
- updateAlphabet() : void
+ submitGuess() : void
+ submitWord(word : String) : void
+ removeLastLetter() : void
+ submitLetter(letter : Letter) : void
- isCorrectGuess() : boolean
+ isValidWord(guess : String) : boolean
+ isCurrentGuessValid() : boolean
+ getLetter(l : String) : Letter
- generateAnswer() : List<Letter>
- resetAlphabet() : void
- createAlphabet() : HashMap<String, Letter>
+ initialise() : void
+ Model(randomMode : int, spoilerMode : int, strictMode : int)
Letter
- hasBeenUsed : boolean
- isInGame : boolean
- roundStates : int[]
- buttonState : int
- posList : List<Integer>
- name : String {readOnly}
+ getRoundStates() : int[]
+ isInGame() : boolean
+ setHasBeenUsed(hasBeenUsed : boolean) : void
+ hasBeenUsed() : boolean
+ setButtonState(buttonState : int) : void
+ getButtonState() : int
+ getPosList() : List<Integer>
+ getName() : String
+ addPos(i : int) : void
+ setInGame() : void
+ initialise() : void
+ Letter(name : String)
View
- head : int
- newGameBtn : JButton
- answerMessage : JLabel
- errorMessage : JLabel
- guesses : List<List<JLabel>>
- keyboard : List<JButton>
- frame : JFrame
- controller : Controller {readOnly}
- model : Model {readOnly}
+ update(o : Observable, arg : Object) : void
- newGameHandler() : void
- delHandler() : void
- enterHandler() : void
- keyboardBtnHandler(text : String) : void
+ removeLetter() : void
+ addLetter(letter : Letter) : void
- initButtons(frame : JFrame) : void
- initLabels(frame : JFrame) : void
+ initialise() : JFrame
+ View(model : Model, controller : Controller)
Controller
- view : View
- model : Model {readOnly}
+ getLetter(l : String) : Letter
+ getStrictFlag() : boolean
+ getGameFlag() : boolean
+ getWinFlag() : boolean
+ getTurnCount() : int
+ getSubmittedGuesses() : List<List<Letter>>
+ submitGuess() : void
+ isValidWord(word : String) : boolean
+ getAnswerAsString() : String
+ getCurrentGuessAsString() : String
+ removeLetter() : void
+ submitLetter(text : String) : void
+ getColours() : List<Color>
+ newGame() : void
+ getNumGuesses() : int
+ initialise(view : View) : void
+ Controller(model : Model)

Code

CLIWordle.java

```
import java.io.IOException;
import java.util.Scanner;

public class CLIWordle {

    public static void main(String[] args) throws IOException {
        Scanner scanner = new Scanner(System.in);
        int randomMode, spoilerMode, strictMode;

        // Choose various game modes to play
        do {
            System.out.println("Press 1 for a random word or 2 for a fixed
word");
            randomMode = scanner.nextInt();
        } while (randomMode != 1 && randomMode != 2);
        do {
            System.out.println("Press 1 for spoiler mode or 2 for secret
mode");
            spoilerMode = scanner.nextInt();
        } while (spoilerMode != 1 && spoilerMode != 2);
        do {
            System.out.println("Press 1 for strict mode or 2 for loose
mode");
            strictMode = scanner.nextInt();
        } while (strictMode != 1 && strictMode != 2);
        Model model = new Model(randomMode, spoilerMode, strictMode);

        gameLoop(model, scanner);
    }

    public static void gameLoop(Model model, Scanner scanner) {
        String guess;
        int i;
        if (model.isSpoilerFlag()) System.out.println("The answer is " +
model.letterListToString(model.getAnswer()));
        while (model.getGameFlag()) {
            // Enter guess
            System.out.println("Enter guess number " +
(model.getTurnCount()+1));
            guess = scanner.next();
            while (!model.isValidWord(guess)) {
                System.out.println("Not a valid guess. Try again!");
                guess = scanner.next();
            }

            model.submitWord(guess);
            String indicators = model.getIndicators();
            model.submitGuess();
            System.out.println("");

            // Print out results
            if (model.getWinFlag()) {
                System.out.println("Correct! You won!");
                return;
            }
            else {
                System.out.println(indicators);
                System.out.println(guess);
                System.out.println("");
                System.out.println("Correct letters: " +
model.letterListToStringList(model.getCorrectLetters()));
                System.out.println("Partial letters: " +
model.letterListToStringList(model.getPartialLetters()));
                System.out.println("Wrong letters: " +
model.letterListToStringList(model.getWrongLetters()));
                System.out.println("Unused letters: " +
model.letterListToStringList(model.getUnusedLetters()));
                System.out.println("");
            }
        }
        System.out.println("No more guesses allowed. Better luck next
time!");
    }
}
```

GUIWordle.java

```
import java.io.IOException;
import java.util.Scanner;

public class GUIWordle {

    public static void main(String[] args) throws IOException {
        Scanner scanner = new Scanner(System.in);
        int randomMode, spoilerMode, strictMode;

        // Choose various game modes to play
        do {
            System.out.println("Press 1 for a random word or 2 for a fixed
word");
            randomMode = scanner.nextInt();
        } while (randomMode != 1 && randomMode != 2);
        do {
            System.out.println("Press 1 for spoiler mode or 2 for secret
mode");
            spoilerMode = scanner.nextInt();
        } while (spoilerMode != 1 && spoilerMode != 2);
        do {
            System.out.println("Press 1 for strict mode or 2 for loose
mode");
            strictMode = scanner.nextInt();
        } while (strictMode != 1 && strictMode != 2);

        Model model = new Model(randomMode, spoilerMode, strictMode);
        if (model.isSpoilerFlag()) System.out.println("The answer is \"" +
model.letterListToString(model.getAnswer()) + "\"");
        Controller controller = new Controller(model);
        View view = new View(model, controller);
    }
}
```

View.java

```
import javax.swing.*;
import java.awt.*;
import java.awt.event.ActionEvent;
import java.util.*;
import java.util.List;

public class View implements Observer {
    private final Model model;
    private final Controller controller;
    private JFrame frame;
    private List<JButton> keyboard;
    private List<List<JLabel>> guesses;
    private JLabel errorMessage;
    private JLabel answerMessage;
    private JButton newGameBtn;
    private int head;


    public View(Model model, Controller controller) {
        this.model = model;
        this.controller = controller;
        List<Color> colours = controller.getColours();
        model.addObserver(this);
        this.frame = initialise();
        this.controller.initialise(this);
    }

    public JFrame initialise() { // General function to initialise the view
for a new game
        this.head = 0;
        JFrame frame = new JFrame("Wordle Game");
        try{

UIManager.setLookAndFeel(UIManager.getCrossPlatformLookAndFeelClassName());
        }catch(Exception e){
            e.printStackTrace();
        }
        frame.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
        initLabels(frame);
        initButtons(frame);
        frame.setSize(500, controller.getNumGuesses()*50 + 250);
        frame.setLayout(null); //using no layout managers
        frame.setVisible(true);
        return frame;
    }

    private void initLabels(JFrame frame) { // Loads in the labels used to
show user input letters
        this.guesses = new ArrayList<>();
        int y = 25;
        for (int i = 0; i < controller.getNumGuesses(); i++) {
            List<JLabel> row = new ArrayList<>();
            this.guesses.add(row);
            int x = 70;
            for (int j = 0; j < 5; j++) {
                JLabel label = new JLabel();
                label.setBounds(x,y,50,50);
                label.setOpaque(true);
                label.setHorizontalAlignment(SwingConstants.CENTER);
                label.setVerticalAlignment(SwingConstants.CENTER);
                label.setBackground(Color.lightGray);
                frame.add(label);
                this.guesses.get(i).add(label);
                x += 60;
            }
            y += 60;
        }

        this.errorMessage = new JLabel("<html>"+ "Invalid Word!"
+"</html>");
        this.answerMessage = new JLabel("<html>"+ "The answer was " +
controller.getAnswerAsString() +"</html>");
        this.errorMessage.setForeground(Color.red);
        this.answerMessage.setForeground(Color.red);
        this.errorMessage.setBounds(420, 10, 70, 200);
        this.answerMessage.setBounds(420, 100, 70, 200);
        this.errorMessage.setVisible(false);
        this.answerMessage.setVisible(false);
        frame.add(this.errorMessage);
        frame.add(this.answerMessage);
    }

    private void initButtons(JFrame frame) { // Loads all the buttons
        // Load in the keyboard
        this.keyboard = new ArrayList<>();
        int keyboardHeightConst = controller.getNumGuesses()*50 + 100;
        int x = 20;
        int y = keyboardHeightConst;
        String[] qwerty = "qwertyuiopasdfghjklzxcvbnm".split("");
        for (int i = 0; i < qwerty.length; i++) {
            JButton btn = new JButton(qwerty[i]);
            btn.setBounds(x,y,30,30);
            btn.setMargin(new Insets(0, 0, 0, 0));
            btn.addActionListener((ActionEvent e) ->
{keyboardBtnHandler(btn.getText());});
            btn.setFont(new Font("Arial", Font.PLAIN, 10));
            btn.setBackground(Color.lightGray);
            this.keyboard.add(btn);
            frame.add(this.keyboard.get(i));
            if (qwerty[i].equals("p") || qwerty[i].equals("l")) {
                if (qwerty[i].equals("p")) x = 35;
                else x = 60;
                y += 40;
            } else x += 40;
        }
        // Load in enter and delete buttons
        JButton enter = new JButton("ENT");
        JButton del = new JButton("DEL");
        enter.setBounds(425, keyboardHeightConst+ 65, 60, 40);
        del.setBounds(425, keyboardHeightConst+ 15, 60, 40);
        enter.setFont(new Font("Arial", Font.BOLD, 10));
        del.setFont(new Font("Arial", Font.BOLD, 10));
        enter.addActionListener((ActionEvent e) -> {enterHandler();});
        del.addActionListener((ActionEvent e) -> {delHandler();});
        frame.add(enter);
        frame.add(del);

        // Load in new game button
        this.newGameBtn = new JButton("New Game");
        this.newGameBtn.setBounds(385, keyboardHeightConst-70, 100, 40);
        this.newGameBtn.addActionListener((ActionEvent e) ->
{newGameHandler();});
        this.newGameBtn.setVisible(false);
        frame.add(this.newGameBtn);
    }

    public void addLetter(Letter letter) { // Letter pressed by user is 
shown in corresponding label
        JLabel label = 
this.guesses.get(controller.getTurnCount()).get(head);
        label.setText(letter.getName());
        if (head < 5) head++;
        this.frame.repaint();
    }

    public void removeLetter() { // Make last updated label blank
        if (head > 0) head--;
        JLabel label = 
this.guesses.get(controller.getTurnCount()).get(head);
        label.setText(null);
        this.frame.repaint();
    }

    private void keyboardBtnHandler(String text) { // Event handler for 
when the letters of the keyboard are pressed
        if (controller.getGameFlag()) controller.submitLetter(text);
    }

    private void enterHandler() { // Event handler for when the enter key 
is pressed
        if (controller.getGameFlag()) {
            
this.errorMessage.setVisible(!controller.isValidWord(controller.getCurrentG
uessAsString())
                    && controller.getStrictFlag());
            controller.submitGuess();
        }
    }

    private void delHandler() { // Enter handle for when the delete key is 
pressed
        if (controller.getGameFlag()) controller.removeLetter();
    }

    private void newGameHandler() {
        controller.newGame();

        for (List<JLabel> row : this.guesses)
            for (JLabel label : row) {
                label.setText(null);
                label.setBackground(Color.lightGray);
                label.setForeground(Color.black);
            }

        for (JButton btn : this.keyboard) {
            btn.setBackground(Color.lightGray);
            btn.setForeground(Color.black);
        }

        this.newGameBtn.setVisible(false);
        this.answerMessage.setVisible(false);
    }

    @Override
    public void update(Observable o, Object arg) {
        // Update background of labels that have been used
        List<List<Letter>> submittedGuesses =
controller.getSubmittedGuesses();
        List<Color> colours = controller.getColours();
        this.head = 0;
        List<Letter> guess =
submittedGuesses.get(controller.getTurnCount()-1);
        for (int i = 0; i < guess.size(); i++) {
            JLabel label = this.guesses.get(controller.getTurnCount() -
1).get(i);
            Color colour = colours.get(guess.get(i).getRoundStates()[i]);
            label.setBackground(colour);
            if (guess.get(i).getRoundStates()[i] == Model.WRONG)
label.setForeground(Color.white);
        }

        // Update backgrounds of buttons
        for (JButton btn : this.keyboard) {
            Letter letter = controller.getLetter(btn.getText());
            if (letter.getButtonState() != Model.UNASSIGNED) {
                Color colour = colours.get(letter.getButtonState());
                btn.setBackground(colour);
                if (letter.getButtonState() == Model.WRONG)
btn.setForeground(Color.white);
            }
        }

        // Reveal new game button after first turn
        if (model.getTurnCount() == 1) this.newGameBtn.setVisible(true);
        // Reveal word if player runs out of turns
        if (!controller.getGameFlag() && !controller.getWinFlag())
answerMessage.setVisible(true);
    }


}
```

Controller.java

```
import java.awt.*;
import java.util.ArrayList;
import java.util.List;

public class Controller {
    private final Model model;
    private View view;

    public Controller(Model model) {
        this.model = model;
    }

    public void initialise(View view) {
        this.view = view;
    }

    public int getNumGuesses() {
        return Model.NUMGUESSES;
    }
    public void newGame() {
        model.initialise();
        if (model.isSpoilerFlag()) System.out.println("The answer is \"" +
model.letterListToString(model.getAnswer()) + "\"");
    }

    public List<Color> getColours() { // Get list of colours with indicies
matching letter state values
        List<Color> colours = new ArrayList<>();
        colours.add(Color.lightGray); // Model.UNASSIGNED
        colours.add(Color.darkGray); // Model.WRONG
        colours.add(Color.yellow); //  Model.PARTIAL
        colours.add(Color.green); // Model.CORRECT
        return colours;
    }

    public void submitLetter(String text) { // Submit letter to model and
call view to update label
        if (model.getCurrentGuess().size() < 5) {
            Letter letter = model.getLetter(text);
            model.submitLetter(letter);
            view.addLetter(letter);
        }
    }

    public void removeLetter() { // Remove letter in model and clear
corresponding label
        if (model.getCurrentGuess().size() > 0) {
            model.removeLastLetter();
            view.removeLetter();
        }
    }

    public String getCurrentGuessAsString() {
        return model.letterListToString(model.getCurrentGuess());
    }

    public String getAnswerAsString() {
        return model.letterListToString(model.getAnswer());
    }

    public boolean isValidWord(String word) {
        return model.isValidWord(word);
    }

    public void submitGuess() {
        if (model.getCurrentGuess().size() == 5 &&
model.isCurrentGuessValid()) {
            model.submitGuess();
        }
    }

    public List<List<Letter>> getSubmittedGuesses() {
        return model.getSubmittedGuesses();
    }

    public int getTurnCount() {
        return model.getTurnCount();
    }

    public boolean getWinFlag() {
        return model.getWinFlag();
    }

    public boolean getGameFlag() {
        return model.getGameFlag();
    }

    public boolean getStrictFlag() { return model.getStrictFlag(); }

    public Letter getLetter(String l) {
        return model.getLetter(l);
    }
}
```

Model.java

```
import java.io.*;
import java.util.*;

public class Model extends Observable {
    // Constants
    private static final String ANSWER_FILE = "src/assets/common.txt";
    private static final String WORDS_FILE = "src/assets/words.txt";
    public static final int UNASSIGNED = 0;
    public static final int WRONG = 1;
    public static final int PARTIAL = 2;
    public static final int CORRECT = 3;
    public static final int NUMGUESSES = 6;
    public static String FIXED_ANSWER = "undid";
    // Flags
    private final boolean spoilerFlag; // Sets whether the game will reveal
the answer to the user
    private final boolean randomFlag; // Sets whether the game generates an
answer or is provided an answer by user
    private final boolean strictFlag; // Sets whether the user can input
any five-letter words or not
    private boolean gameFlag; // When true, game is still in play
    private boolean winFlag; // When true, player has won the game
    // Game attributes
    private final List<String> answers; // List of valid answers
    private final List<String> words; // List of valid guesses
    private HashMap<String, Letter> alphabet; // List of Letter objects in
the game
    private int turnCount; // Which turn the game is on
    private List<Letter> answer; // The answer the user needs to guess to
win
    private List<Letter> currentGuess; // Most recent guess submitted by
user
    private List<List<Letter>> submittedGuesses; // List of all submitted
guesses
    public List<Letter> unusedLetters; // List of unused letters
    public List<Letter> wrongLetters; // List of incorrectly guessed
letters
    public List<Letter> partialLetters; // List of letters that are in the
answer but wrong position
    public List<Letter> correctLetters; // List of correctly guessed
letters

    public Model(int randomMode, int spoilerMode, int strictMode) throws
```

```
IOException {
        // Initialise answer list
        BufferedReader ar = new BufferedReader(new
FileReader(ANSWER_FILE));
        this.answers = new ArrayList<>();
        String line;
        while((line = ar.readLine()) != null) { this.answers.add(line); }
        ar.close();
        // Initialise words list
        BufferedReader wr = new BufferedReader(new FileReader(WORDS_FILE));
        this.words = new ArrayList<>();
        while((line = wr.readLine()) != null) { this.words.add(line); }
        this.words.addAll(this.answers);
        wr.close();
        // Set attributes
        this.randomFlag = randomMode == 1;
        this.spoilerFlag = spoilerMode == 1;
        this.strictFlag = strictMode == 1;
        initialise();
    }

    /**
     * Initialises the game attributes
     * @pre. Words and Answers have been successfully initialised
     * @post. this.answer is a five-letter Letter list
     */
    public void initialise() {
        assert !this.words.isEmpty() && !this.answers.isEmpty();
        this.winFlag = false;
        this.gameFlag = true;
        if (this.turnCount > 0) resetAlphabet();
        else this.alphabet = createAlphabet();
        this.unusedLetters = new ArrayList<>(this.alphabet.values());
        this.submittedGuesses = new ArrayList<>();
        this.wrongLetters = new ArrayList<>();
        this.partialLetters = new ArrayList<>();
        this.correctLetters = new ArrayList<>();
        this.currentGuess = new ArrayList<>();
        this.turnCount = 0;
        this.answer = generateAnswer();
        int i = 0;
        for (Letter l : this.answer) { // Update the letters in alphabet
            assert l != null;
            l.addPos(i);
            l.setInGame();
            i++;
        }
        assert this.answer.size() == 5;
    }


    private HashMap<String, Letter> createAlphabet() {
        String[] letters = "abcdefghijklmnopqrstuvwxyz".split("");
        HashMap<String, Letter> alphabet = new HashMap<>();
        for (String c : letters) alphabet.put(c, new Letter(c));
        return alphabet;
    }

    private void resetAlphabet() {
        String[] letters = "abcdefghijklmnopqrstuvwxyz".split("");
        for (String c : letters) {
            Letter l = getLetter(c);
            l.initialise();
        }
    }

    private List<Letter> generateAnswer() {
        String a;
        List<Letter> answer = new ArrayList<>();

        // If random mode is on, generate the answer by picking a random 
word from answer list
        if (this.randomFlag) {
            Random rand = new Random();
            a = this.answers.get(rand.nextInt(this.answers.size()));
            String[] sa = a.split("");
            for (String s : sa) answer.add(this.alphabet.get(s));
        }
        // Else, set the fixed word, check it's valid, and then set that as 
the answer
        else {
            a = FIXED_ANSWER;
            String[] sa = a.split("");
            for (String s : sa) answer.add(this.alphabet.get(s));
        }
        assert answer.size() == 5; // Answer was initialised with a 5-
letter word
        return answer;
    }

    /**
     * Get letter from alphabet
     * @pre. l is a single alphabetic letter
     * @post. None
     */
    public Letter getLetter(String l) {
        l = l.toLowerCase();
        assert l.length() == 1; // Key is length of 1
        assert l.matches("[a-z]"); // Key is an alphabetic value
        return this.alphabet.get(l);
    }

    /**
     * Returns a boolean corresponding to if currentGuess is valid
     * @pre. None
     * @post. None
     */
    public boolean isCurrentGuessValid() {
        return isValidWord(String.join("", 
letterListToStringList(this.currentGuess)));
    }

    /**
     * Checks input guess to see if it is valid
     * @pre. this.words contains all words from WORDS_FILE, this.strictFlag 
is set
     * @post. None
     */
    public boolean isValidWord(String guess) {
        if (!guess.matches("[a-z]+")) {
            System.out.println("Word is not alphabetic!");
            return false;
        }
        if (guess.length() != 5) {
            System.out.println("Word is not five characters!");
            return false;
        }
        if (this.strictFlag) if (!this.words.contains(guess)) { // If
strictFlag is false, no need to check guess list
            System.out.println("Word is not in the guess list");
            return false;
        }
        return true;
    }

    private boolean isCorrectGuess() {
        for (int i = 0; i < 5; i++) {
            if (this.currentGuess.get(i) != this.answer.get(i))
                return false;
        }
        return true;
    }

    /**
     * Appends an input Letter to currentGuess
     * @pre. letter is in the alphabet, this.currentGuess is less than size
5
     * @post. this.currentGuess contains at least one instance of letter
     */
    public void submitLetter(Letter letter) {
        assert alphabet.containsValue(letter);
        assert this.currentGuess.size() < 5;
        this.currentGuess.add(letter);
        assert this.currentGuess.contains(letter);
    }

    /**
     * Removes the last Letter from currentGuess
     * @pre. this.currentGuess is not size 0
     * @post. this.currentGuess won't be a complete word
     */
    public void removeLastLetter() {
        assert this.currentGuess.size() > 0;
        this.currentGuess.remove(this.currentGuess.size() - 1);
        assert this.currentGuess.size() < 5;
    }

    /**
     * Submits a five-letter word guess one letter at a time
     * @pre. word is a five-letter string
     * @post. this.currentGuess is a list containing five Letter elements
     */
    public void submitWord(String word) {
        assert word.length() == 5;
        clearGuess();
        String[] w = word.split("");
        for (String l : w) submitLetter(this.alphabet.get(l));
        assert this.currentGuess.size() == 5;
    }

    /**
     * Submits currentGuess as final guess for the turn
     * @pre. this.currentGuess is a valid five-letter guess,
     * @post. this.submittedGuesses has at least one element
     */
    public void submitGuess() {
        assert isCurrentGuessValid();
        this.submittedGuesses.add(this.currentGuess);
        updateAlphabet();
        this.turnCount++;
        this.winFlag = isCorrectGuess();
        if (this.turnCount >= NUMGUESSES) this.gameFlag = false;
        else if (this.winFlag) this.gameFlag = false;
        setChanged();
        notifyObservers();
        clearGuess();
        assert this.submittedGuesses.size() > 0;
    }

    private void updateAlphabet() {
        List<Letter> word = this.currentGuess;
        int i = 0;
        for (Letter l : word) {
            this.unusedLetters.remove(l);
            setButtonState(l,i);
            switch (l.getButtonState()) {
                case WRONG:
                    if (!this.wrongLetters.contains(l))
this.wrongLetters.add(l);
                    break;
                case PARTIAL:
                    if (!this.partialLetters.contains(l))
this.partialLetters.add(l);
                    break;
                case CORRECT:
                    if (!this.correctLetters.contains(l)) {
                        this.partialLetters.remove(l);
                        this.correctLetters.add(l);
                    } break;
                default:
                    this.unusedLetters.add(l);
                    break;
            }
            l.setHasBeenUsed(true);
            i++;
        }
    }

    private void setButtonState(Letter letter, int i) {
        if (!letter.hasBeenUsed()) {
            if (letter.isInGame()) {
                if (letter.getPosList().contains(i))
letter.setButtonState(CORRECT);
                else letter.setButtonState(PARTIAL);
            }
            else letter.setButtonState(WRONG);
        }
        else if (letter.getButtonState() == PARTIAL) {
            if (letter.getPosList().contains(i))
letter.setButtonState(CORRECT);
        }
    }

    /**
```

```
     * Create a string indicating whether each guess letter is correct,
partial, or wrong
     * @pre. this.currentGuess is a valid five-letter word
     * @post. indicators is the same length as this.currentGuess
     */
    public String getIndicators() {
        assert isCurrentGuessValid();
        StringBuilder indicators = new StringBuilder();
        for (int i = 0; i < this.currentGuess.size(); i++) {
            Letter l = this.currentGuess.get(i);
            if (l.getRoundStates()[i] == CORRECT) indicators.append("o");
            else if (l.getRoundStates()[i] == PARTIAL)
indicators.append("~");
            else if (l.getRoundStates()[i] == WRONG)
indicators.append("x");
        }
        assert indicators.length() == this.currentGuess.size();
        return indicators.toString();
    }

    /**
     * Converts a List<Letter> to a List<String>
     * @pre. None
     * @post. None
     */
    public List<String> letterListToStringList(List<Letter> letters) {
        List<String> stringList = new ArrayList<>();
        for (Letter l : letters) stringList.add(l.getName());
        return stringList;
    }

    /**
     * Converts a List<Letter> to a String
     * @pre. None
     * @post. None
     */
    public String letterListToString(List<Letter> letters) {
        return String.join("",letterListToStringList(letters));
    }

    /**
     * Converts a String to a List<Letter>
     * @pre. words contains only characters in the alphabet
     * @post. None
     */
    public List<Letter> stringToLetterList(String word) {
        assert word.matches("[a-zA-Z]+");
        word = word.toLowerCase();
        List<Letter> letters = new ArrayList<>();
        for (char c : word.toCharArray())
letters.add(this.alphabet.get(String.valueOf(c)));
        return letters;
    }

    // Getters and Setters
    public List<String> getAnswers() {
        return answers;
    }
    public List<String> getWords() {
        return words;
    }
    public List<Letter> getAnswer() {
        return answer;
    }
    public void setAnswer(String answer) {
        if (isValidWord(answer))
            this.answer = stringToLetterList(answer);
    }
    public void clearGuess() {
        this.currentGuess = new ArrayList<>();
    }
    public int getTurnCount() {
        return turnCount;
    }
    public boolean isSpoilerFlag() {
        return spoilerFlag;
    }
    public boolean isRandomFlag() {
        return randomFlag;
    }
    public List<Letter> getCurrentGuess() {
        return currentGuess;
    }
    public List<Letter> getUnusedLetters() {
        return unusedLetters;
    }
    public List<Letter> getWrongLetters() {
        return wrongLetters;
    }
    public List<Letter> getPartialLetters() {
        return partialLetters;
    }
    public List<Letter> getCorrectLetters() {
        return correctLetters;
    }
    public boolean getWinFlag() { return winFlag; }
    public boolean getGameFlag() { return gameFlag; }
    public boolean getStrictFlag() { return strictFlag; }
    public List<List<Letter>> getSubmittedGuesses() { return
submittedGuesses; }
}
```

Letter.java

```
import java.util.ArrayList;
import java.util.List;

public class Letter {
    private final String name;
    private List<Integer> posList; // Positions that the letter appears in
the answer
    private int buttonState;
    private int[] roundStates;
    private boolean isInGame;
    private boolean hasBeenUsed;

    public Letter(String name) {
        this.name = name;
        initialise();
    }
    public void initialise() {
        this.buttonState = Model.UNASSIGNED;
        this.hasBeenUsed = false;
        this.isInGame = false;
        this.posList = new ArrayList<>();
        this.roundStates = new int[]{Model.WRONG, Model.WRONG, Model.WRONG,
Model.WRONG, Model.WRONG};
    }

    public void setInGame() {
        this.isInGame = true;
        this.roundStates = new int[]{Model.PARTIAL, Model.PARTIAL,
Model.PARTIAL, Model.PARTIAL, Model.PARTIAL};
        for (int i : this.posList) this.roundStates[i] = Model.CORRECT;
    }

    public void addPos(int i) {
        this.posList.add(i);
    }

    public String getName() {
        return name;
    }

    public List<Integer> getPosList() {
        return posList;
    }

    public int getButtonState() {
        return buttonState;
    }

    public void setButtonState(int buttonState) {
        this.buttonState = buttonState;
    }

    public boolean hasBeenUsed() {
        return hasBeenUsed;
    }

    public void setHasBeenUsed(boolean hasBeenUsed) {
        this.hasBeenUsed = hasBeenUsed;
    }

    public boolean isInGame() {
        return isInGame;
    }

    public int[] getRoundStates() { return roundStates; }
}
```

Junit.java

```
import org.junit.jupiter.api.DisplayName;
import org.junit.jupiter.api.RepeatedTest;
import org.junit.jupiter.api.Test;

import java.io.IOException;
import static org.junit.jupiter.api.Assertions.*;

public class JUnit {
    Model model;

    boolean invariant(Model model) {
        return model.getTurnCount() <= Model.NUMGUESSES;
    }

    @Test
    @DisplayName("Turn Count Updates Properly")
    void test1() throws IOException {
        model = new Model(1,0,0);
        assertTrue(invariant(model));
        assertEquals(0, model.getTurnCount());
        model.submitWord("aaaaa");
        model.submitGuess();
        model.submitWord("bbbbb");
        model.submitGuess();
        assertEquals(2, model.getTurnCount());
        assertTrue(invariant(model));
    }

    @Test
    @DisplayName("Letter State Lists Update when Guess Submitted")
    void test2() throws IOException {
        Model.FIXED_ANSWER = "tires";
        model = new Model(0,0,0);
        assertTrue(invariant(model));
        model.submitWord("tried");
        model.submitGuess();
        assertEquals(21, model.getUnusedLetters().size());
        assertEquals(2, model.getCorrectLetters().size());
        assertEquals(1, model.getWrongLetters().size());
        assertEquals(2, model.getPartialLetters().size());
        assertTrue(invariant(model));
    }

    @Test
    @DisplayName("Game is Set as Over With No Win After NUMGUESSES is 
Passed")
    void test3() throws IOException {
        model = new Model(1, 0, 0);
        assertTrue(invariant(model));
        for (int i = 0; i < Model.NUMGUESSES; i++) {
            model.submitWord("aaaaa");
            model.submitGuess();
        }
        assertFalse(model.getGameFlag());
        assertFalse(model.getWinFlag());
        assertTrue(invariant(model));
    }
}
```