Assignment 2

Team number: CyberpunkHackingMinigame - Team 1
Team members

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Implemented features

ID	Short name	Description
F1	Timer	This game shall have a timer which limits the amount of time a player has to complete a stage.
F2	Buffer	The player shall be able to copy selected tiles from the matrix into the buffer.
F3	Code matrix	Code matrix is the central interactive object which shall contain tiles with values that the player should be able to collect and store inside the buffer.
F4	Goal sequence	The main goal of the game is to match tiles in the buffer to the given sequence.
F5	Tile selection	Each time the player selects a valid tile, the set of available tiles shall alternate between the vertical and horizontal lines containing the selected tile.
F6	Sequence completion	If a selected value is not a continuation of the given sequence, the progress of the sequence shall be temporarily stopped, until the player chooses the right value of the sequence. If the player completes the sequence, the game shall end.
F7	User-game interaction	A player shall be able to use their mouse to interact with the game (left click to select a tile).
F13	Quitting	The player shall be able to exit the game by clicking on the quit button.
F15	Set of Puzzles	When the game has launched, the application shall generate a random puzzle from the set of pre-made puzzles.

Used modeling tool: Draw.io.

Class diagram

Author(s): Ivan Ivanov, Man Chung Stephen Kwan

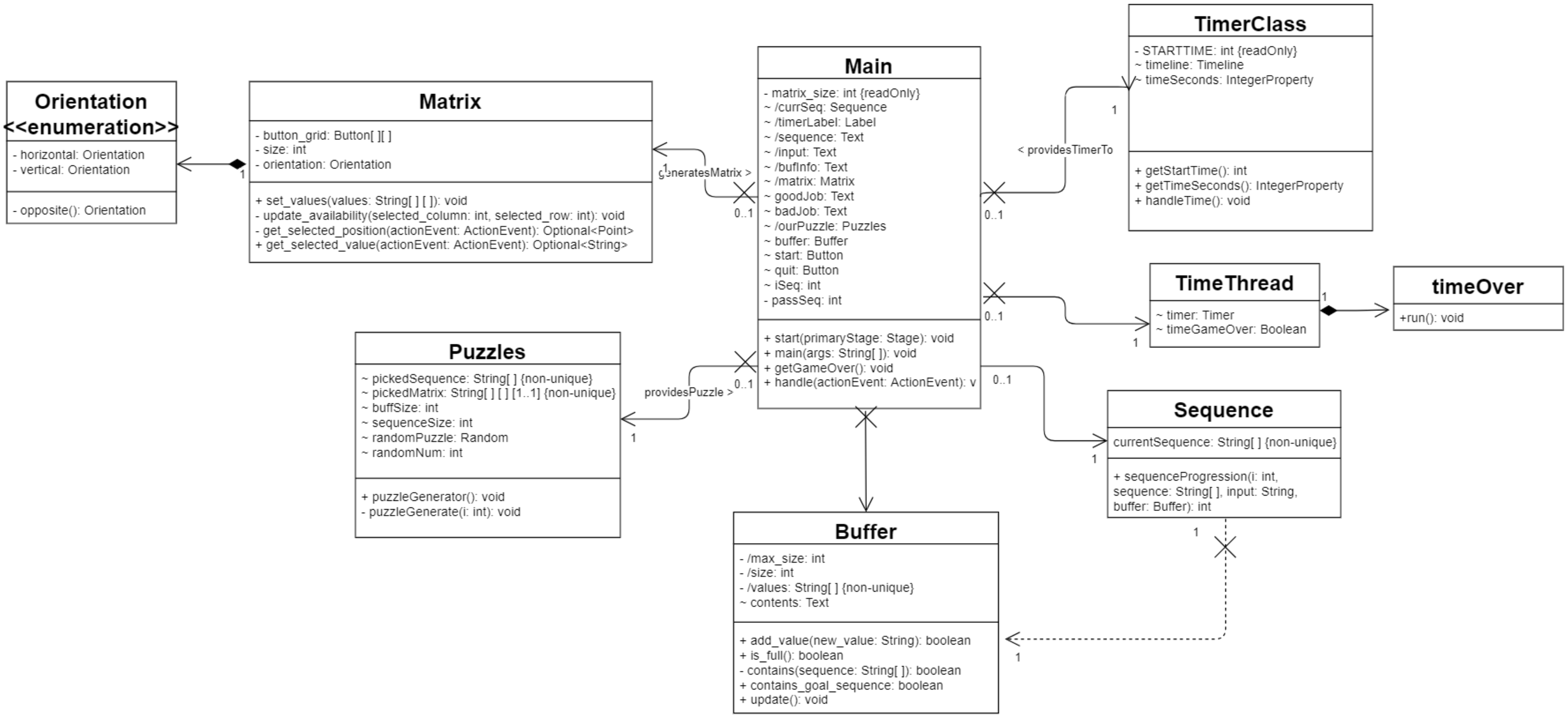
Features To Be Built (for Assignment 3)

F8	Highlighting	Every currently available tile to click in the Code Matrix should be highlighted. In addition, if the player hovers over an available tile it should be highlighted with a different color.
F9	Hint indicator	The player should be able to hover over a tile and if its value occurs in the code sequence, the corresponding value should be highlighted.
F10	"Sequence unreachable" indicator	If a sequence cannot be constructed due to the position of the currently selected tile, the sequence should have an indicator reflecting the issue.
F11	"Out of memory" indicator	If a sequence cannot be constructed due to the player not having enough free space in the buffer, the sequence should have an indicator reflecting the issue.
F12	Reward for speed	The player should receive an additional reward for completing the sequence faster.
F14	Loading a custom game	The user should have the option to load their own game in the form of a *.txt* file as the starting state.
F15	Set of Puzzles	When the game has launched, the application shall generate a random puzzle from the set of pre-made puzzles.

The above mentioned list of features will be implemented in Assignment 3. We will have only one extra class(to be used for *Loading a custom game*) and the rest of the features will be integrated in the already existing classes(for example the randomly generated puzzles will come from the Puzzles class as we don't need the pre-made ones anymore).

Design Decisions

We designed our system with the intent to have all the modules be as separate as possible. Each class covers up a specific part of the game. The Matrix class covers the creation and maintaining of the matrix, Puzzles simply provides pre-made puzzles and so on. These classes were also chosen because they mostly cover up the "parts" of our program, removing the need for creating many new classes. Another thing we did is we made sure to rely on hard coded variables as little as possible with the intent to make the system easier to scale up. Another benefit of that would be the time saved from redoing old code to meet the standards required by the new features.


Orientation
<<enumeration>>
- horizontal: Orientation
- vertical: Orientation
- opposite(): Orientation
1
Matrix
- button_grid: Button[ ][ ]
- size: int
- orientation: Orientation
+ set_values(values: String[ ] [ ]): void
- update_availability(selected_column: int, selected_row: int): void
- get_selected_position(actionEvent: ActionEvent): Optional<Point>
+ get_selected_value(actionEvent: ActionEvent): Optional<String>
1
generatesMatrix >
0..1
Main
- matrix_size: int {readOnly}
~ /currSeq: Sequence
~ /timerLabel: Label
~ /sequence: Text
~ /input: Text
~ /bufInfo: Text
~ /matrix: Matrix
~ goodJob: Text
~ badJob: Text
~ /ourPuzzle: Puzzles
~ buffer: Buffer
~ start: Button
~ quit: Button
~ iSeq: int
- passSeq: int
+ start(primaryStage: Stage): void
+ main(args: String[ ]): void
+ getGameOver(): void
+ handle(actionEvent: ActionEvent): v
< providesTimerTo
0..1
1
TimerClass
- STARTTIME: int {readOnly}
~ timeline: Timeline
~ timeSeconds: IntegerProperty
+ getStartTime(): int
+ getTimeSeconds(): IntegerProperty
+ handleTime(): void
0..1
1
TimeThread
~ timer: Timer
~ timeGameOver: Boolean
1
timeOver
+run(): void
Puzzles
~ pickedSequence: String[ ] {non-unique}
~ pickedMatrix: String[ ] [ ] [1..1] {non-unique}
~ buffSize: int
~ sequenceSize: int
~ randomPuzzle: Random
~ randomNum: int
+ puzzleGenerator(): void
- puzzleGenerate(i: int): void
providesPuzzle >
0..1
1
0..1
Sequence
currentSequence: String[ ] {non-unique}
+ sequenceProgression(i: int,
sequence: String[ ], input: String,
buffer: Buffer): int
1
1
Buffer
- /max_size: int
- /size: int
- /values: String[ ] {non-unique}
~ contents: Text
+ add_value(new_value: String): boolean
+ is_full(): boolean
- contains(sequence: String[ ]): boolean
+ contains_goal_sequence: boolean
+ update(): void
1

Main

The Main class is the heart of the system and it connects to all other classes in our project. It is the entry point to it.
Main is associated with the following classes:

1. Matrix - generates the Matrix, fills it out with values and updates a button's status to either enabled or disabled depending on the previous click.
2. Puzzles - contains a pre-made set of puzzles to be used within the game.
3. Buffer - generates the Buffer for the game, updates it and monitors its current status.
4. TimerClass - Handles the countdown Timer in the game along with the next class.
5. TimeThread - Handles the Timer along with TimerClass.
6. Sequence - does the logic for the Goal Sequence indicator.

This class contains the code that creates the visuals in our game(the Start and Quit buttons, the Matrix, Timer, Buffer and Goal Sequence) and also the code which determines whether the player has won or lost the game.

1. Attributes (check about some with ta)
    a) *matrix_size: int -* When booting up the game the player will see the main playing field - the Code Matrix. This attribute sets the size of it.
    b) *timerLabel: Label* - A simple JFX label which contains the Timer in it.
    c) *sequence: Text* - A text node which contains the Goal Sequence which the player must match.
    d) *input: Text* - This node shows to the player the value in the Matrix node the player has pressed.
    e) *buffInfo: Text* - Here we show the size of the buffer.
    f) *goodJob: Text* - A text node which contains the "You're a Winner!" text when the player wins the game.
    g) *badJob: Text* - A text node which contains the "Game Over!" text when the player loses the game.
    h) *start: Button* - A JFX Button control. Once it's been pressed the Timer gets started and the Code Matrix gets enabled.
    i) *quit: Button* - A simple button which lets the user quit the game.
    j) *iSeq: int* - Used for passing a value in sequenceProgression().
    k) *passSeq: int* - This int is used for storing the value that determines the outcome of our game(Win or Game Over).
2. Operations
    a) *start(primaryStage: Stage): void* - This method acts as the main entry point for JavaFX application. It is called when the JavaFX application is started. The primaryStage parameter of type Stage is where the visual elements of a JFX application are displayed. In our case some of those elements are the Code Matrix, Timer and Buffer.
    b) *main(args: String[ ]): void* - This is another method that's a part of JFX, it launches the application and can add command line parameters to it.
    c) *handle(actionEvent: ActionEvent): void* - This method handles some of the functionality in our game. It implements the JFX EventHandler interface. Its main function is to execute code which is associated with an event in our program(e.g. (add desc for 1 of them)).
3. Associations

a) *Matrix* - The *Main* class uses *Matrix* in order to get the playable *Code Matrix* upon booting the game.
b) *Puzzles* - *Main* uses *Puzzles* to snag a usable *Puzzle* and inserts it into *Matrix*.
c) *Buffer* - The buffer is necessary in order to have one of the end-game conditions working.
d) *TimerClass* - Used along with *TimeThread* to start a *Timer* and load it into the *timerLabel* attribute.
e) *TimeThread* - Used along with *TimerClass*.
f) *Sequence* - For the progress we've made in our sequence.

Matrix

This class's main function is to generate the *Code Matrix*. Additionally it also fills out the matrix with values from the *Puzzles* class, disables the buttons which the user isn't supposed to press at a given moment and provides the program with button coordinates and values.

1. Attributes
   a) *button_grid: Button[ ][ ]* - This makes a 2d Array of Buttons for the Matrix.
   b) *size: int* - Used for the size of the Matrix, value derived from Main.
   c) *orientation: Orientation* - Used for the orientation of the selectable tiles.(to remove?)
2. Operations
   a) *set_values(values: String[ ] [ ]): void* - This method adds the values to the Code Matrix buttons. The values themselves are pre-made and contained in the Puzzles class.
   b) *update_availability(selected_column: int, selected_row: int): void* - Disables buttons which are *not* the ones the user is supposed to press.
   c) *get_selected_position(actionEvent: ActionEvent): Optional<Point>* - Returns the x,y coordinates of the pressed button in the Code Matrix, the event itself is registered through JavaFX's ActionEvent interface.
   d) *get_selected_value(actionEvent: ActionEvent): Optional<String>* - Returns the values contained in the pressed buttons. Also through ActionEvent.
3. Associations
   a) *Orientation* - An enumerator that contains *vertical* and *horizontal,* used with *update_availability()* to have only the vertical or horizontal buttons near a previously chosen button be selectable for the next turn.

Puzzles

This class contains five handmade puzzles to be used in the game, handmade to not allow for any dead-end's to happen while playing the game.

1. Attributes
   a) *pickedSequence: String[ ]* - A string which passes the selected goal sequence.
   b) *pickedMatrix: String[ ] [ ]* - An attribute which passes the selected 2D array of values for the Code Matrix.
   c) *buffSize: int* - This attribute contains the pre-determined Buffer size for the selected puzzle.

    d) *sequenceSize: int* - Contains the size of the goal sequence.
    e) *randomPuzzle: Random* - Used for random selection of one of the puzzles, value is passed to puzzleGenerate().
    f) *randomNum: int* - Also used for the same function.
2. Operations
    a) *puzzleGenerator(): void* - This method generates a random number which is then passed as a parameter to puzzleGenerate() in order to select a puzzle.
    b) *puzzleGenerate(i: int): void* - This method provides the actual puzzle to the game.

Sequence

This class handles the logic behind our progress in the game's Goal Sequence and checks whether the buffer is full or the player can continue.

1. Attributes
    a) *currentSequence: String[ ]* - Holds the picked sequence from *Puzzles.*
2. Operations
    a) sequenceProgression(i: int, sequence: String[ ], input: String, buffer: Buffer): int - The method checks the user's input and its return value *pass* tells main if the user still has space in the buffer or not.
3. Associations
    a) Buffer - Checks if the buffer is full, triggers an end-game condition if it is.

Buffer

This class creates and handles the *Buffer* in the game. The *Buffer* acts as a limiter to the number of buttons the user can select in a game session.

1. Attributes
    a) *max_size: int* - Contains the maximum size of the buffer.
    b) *size: int* - Contains the current amount that the buffer can store at that moment.
    c) *values: String[ ]* - The values currently being stored in the buffer.
    d) *contents: Text* - The text our *Buffer* is showing.
2. Operations
    a) *add_value(new_value: String): boolean* - Adds at the end the latest value the user has selected.
    b) *is_full(): boolean* - Notifies when the buffer has filled up.
    c) *contains(sequence: String[ ]): boolean* - Parses a sequence and checks if it is contained in the buffer.
    d) *contains_goal_sequence: boolean* - Checks if the goal sequence is contained in the buffer.
    e) *update(): void* - Updates the buffer.

TimerClass

This class, together with TimeThread, handles the Timer in our game.

1. Attributes
    a) *STARTTIME: int* - The attribute contains the number of seconds the player will be limited to.
    b) *timeline: Timeline* - Used for animating the *Timer*.

   c) *timeSeconds: IntegerProperty* - Wraps the STARTTIME integer for use with the timeline.
2. Operations
   a) *getStartTime(): int* - Returns the time limit value.
   b) *getTimeSeconds(): IntegerProperty* - Returns the timeSeconds attribute. Main adds this value to the *Timer* label.
   c) *handleTime(): void* - Stops the timer when it reaches zero and generally updates the time in real time to the game with *getKeyFrames*.

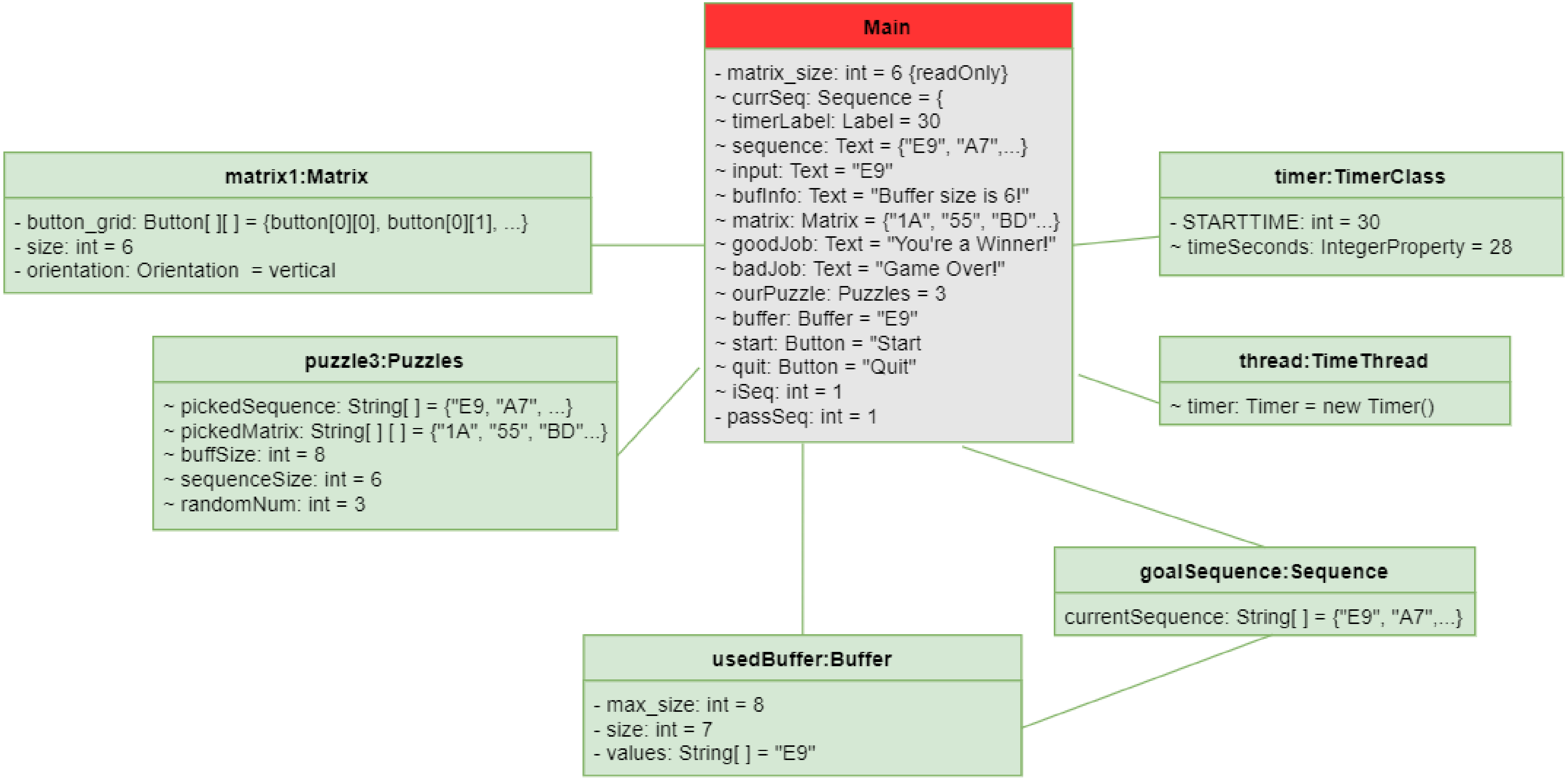
TimeThread

This class, together with TimerClass handles the Timer in our game.

1. Attributes
   a) timer: Timer - A *Timer* class object for creating the *Timer*.
2. Associations
   a) timeOver - A class that handles the cancelling of the timer thread.

Object diagram

Author(s): Ivan Ivanov



Main

- matrix_size: int = 6 {readOnly}
~ currSeq: Sequence = {
~ timerLabel: Label = 30
~ sequence: Text = {"E9", "A7",...}
~ input: Text = "E9"
~ bufInfo: Text = "Buffer size is 6!"
~ matrix: Matrix = {"1A", "55", "BD"...}
~ goodJob: Text = "You're a Winner!"
~ badJob: Text = "Game Over!"
~ ourPuzzle: Puzzles = 3
~ buffer: Buffer = "E9"
~ start: Button = "Start
~ quit: Button = "Quit"
~ iSeq: int = 1
- passSeq: int = 1

matrix1:Matrix

- button_grid: Button[ ][ ] = {button[0][0], button[0][1], ...}
- size: int = 6
- orientation: Orientation = vertical

puzzle3:Puzzles

~ pickedSequence: String[ ] = {"E9, "A7", ...}
~ pickedMatrix: String[ ] [ ] = {"1A", "55", "BD"...}
~ buffSize: int = 8
~ sequenceSize: int = 6
~ randomNum: int = 3

timer:TimerClass

- STARTTIME: int = 30
~ timeSeconds: IntegerProperty = 28

thread:TimeThread

~ timer: Timer = new Timer()

goalSequence:Sequence

currentSequence: String[ ] = {"E9", "A7",...}

usedBuffer:Buffer

- max_size: int = 8
- size: int = 7
- values: String[ ] = "E9"

This object diagram represents the classes in our class diagram in a state where a new game has been started successfully. In such a case the user has pressed the *Start* button and pressed on a button in the first row of the *Code Matrix*. Many(though not all) of the attributes and variables from the class diagram are represented here. In this state, only some of them would contain data or a value in them. The variables that could not be represented here(as they contain visuals) have been omitted.

Main is the main source of control for the game. It is responsible for starting the game, creating the required JavaFX objects in a JFX scene and launching the game window. The currently used Goal Sequence is kept in *sequence*, the Matrix in *Matrix*(and its size in *matrix_size*)*,* the textbox telling the user what the Buffer's current size is *buffInfo*.

Matrix has created a matrix and has filled it with values from *Puzzles*. Its attributes currently contain the following values - *button_grid* holds the JavaFX button controls, *size* passes the *Matrix* size from *Main* and the Orientation enumerator is currently set to *vertical* because the user has selected a button and the only selectable buttons are vertically in the row below it.

Puzzles has provided to *Main* a premade puzzle based on a randomly generated value. Currently the user is playing puzzle 3. *PickedSequence* and *PickedMatrix* contain the actual selected puzzle and its corresponding Goal Sequence. *BuffSize* and *SequenceSize* tell *Main* what the sizes of those two elements should be in the current game.

Buffer has provided some basic functionality to *Main,* like creating it, updating it, handling its capacity and checking if a sequence is contained in the buffer. In this state the buffer contains only one value, “E9” and it has 7 empty spaces left.

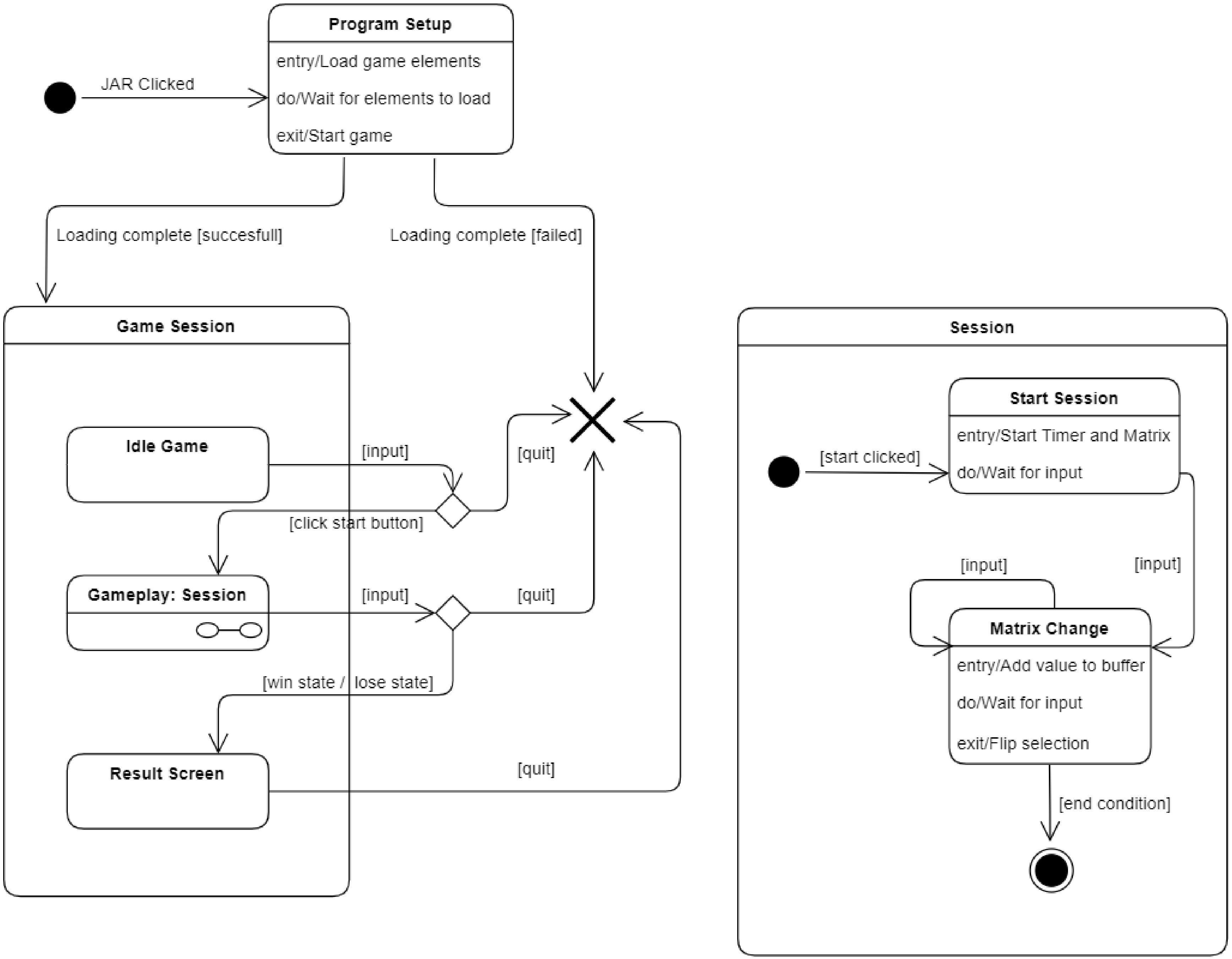
Sequence is monitoring the progress the user has made during gameplay. It tells *Main* if a Game Over/Win should be triggered or not.

TimeThread and *TimerClass* have started the timer that's set for 30 seconds and a couple have passed.

State machine diagrams

Author(s): Ivan Ivanov

Main

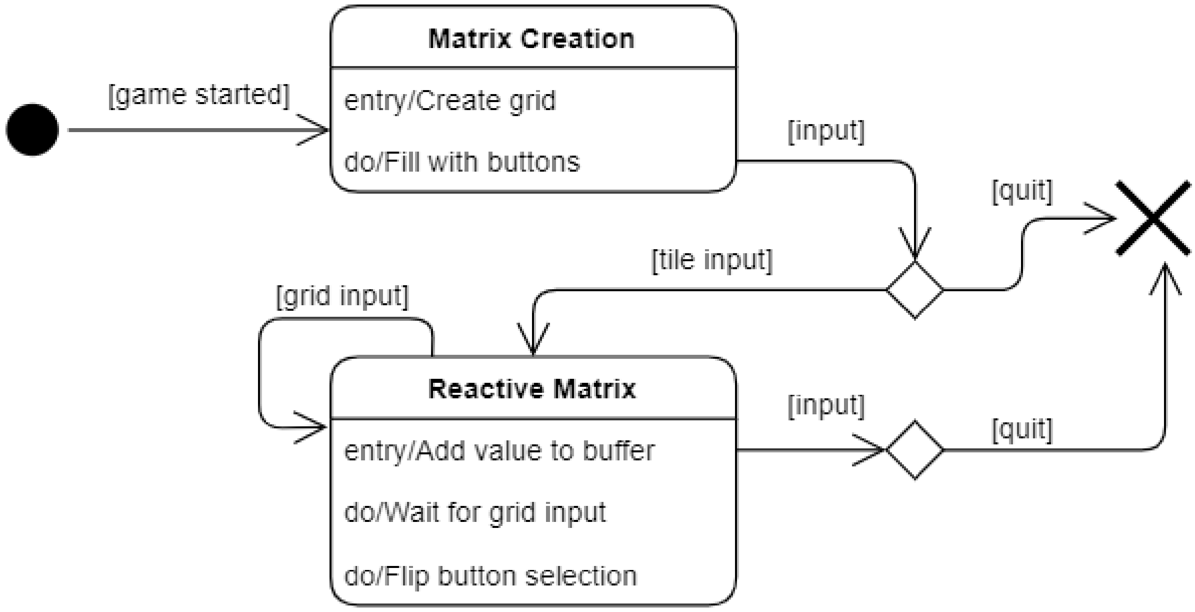

Program Setup
entry/Load game elements
do/Wait for elements to load
exit/Start game
JAR Clicked
Loading complete [succesfull]
Loading complete [failed]
Game Session
Idle Game
[input]
[quit]
[click start button]
Gameplay: Session
[input]
[quit]
[win state / lose state]
Result Screen
[quit]
Session
Start Session
entry/Start Timer and Matrix
do/Wait for input
[start clicked]
[input]
[input]
Matrix Change
entry/Add value to buffer
do/Wait for input
exit/Flip selection
[end condition]

Our Main class is the heart of our game and the center of control. When booting up, the game is in Program Setup state. In this case Main's start() method creates a JavaFX GridPane, which contains the visual elements of our game. Afterwards it makes the Timer, Start and Quit buttons, the Buffer and Sequence text boxes. After creation, Matrix fills up the GridPane with buttons and those buttons then with values like "E9", "7A" and so forth from the Puzzles class's random selection.

The game is now Idle and waiting for input from the user. After the user presses the Start button the Gameplay state commences. Here the Timer gets started and the user can select from any of the buttons on the first row of the Matrix, or he can simply press the Quit button to exit the game(present in all of the game's states post "Program Setup").

Here the gameplay loop continues with the user selecting a button from the available ones and the button's value then gets added to the buffer. This Gameplay state continues until either the Buffer gets filled up, the Timer reaches zero, the user selects the correct buttons or presses the Quit button. If he doesn't press Quit the game reaches the Ending Window state and depending on which of the three possible outcomes he reaches(full Buffer, Timer zero or correct selection) the user sees either a "You're a Winner!" or a "Game Over!" message show up.

Matrix



The Matrix class has a couple of simple but critical to the game functions.

After the game window gets created, Main utilizes Matrix's constructor, set_values(), update_availability(), get_selected_position() and get_selected_value().

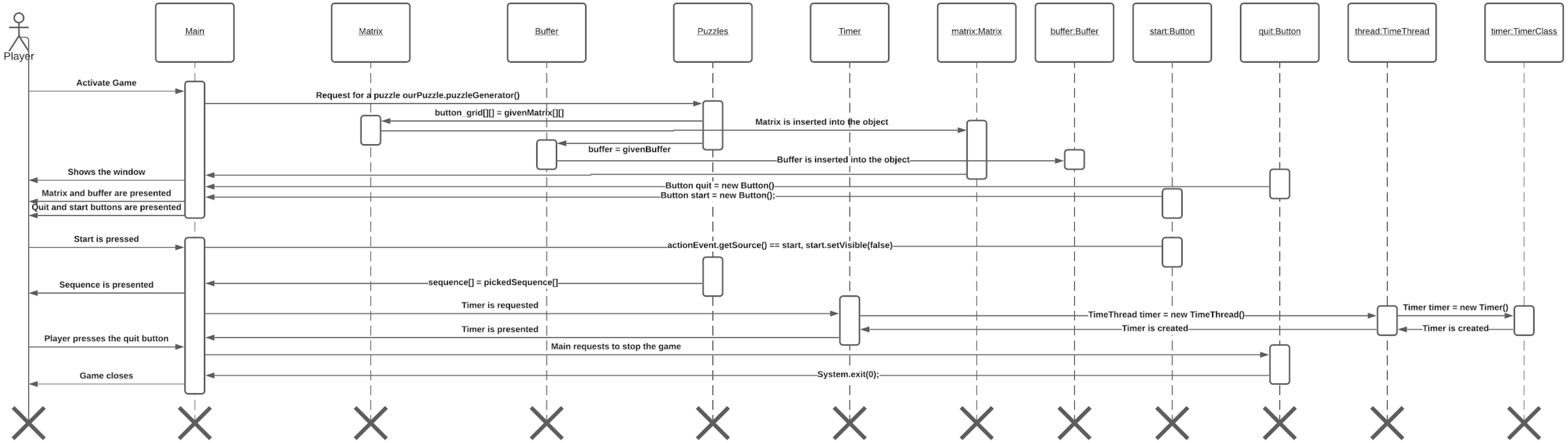
In the Make Matrix state the constructor creates the Matrix (in the form of a 2D Array of buttons) and adds it to the GridPane in Main. Set_values() also gets called from Main and it loads a puzzle at random from Puzzles.

Here the Matrix moves into the Reactive Matrix state, where the game waits for input. After a click update_availability updates the grid by disabling the buttons that the user isn't supposed to press and enables the ones he is supposed to.

Sequence diagrams

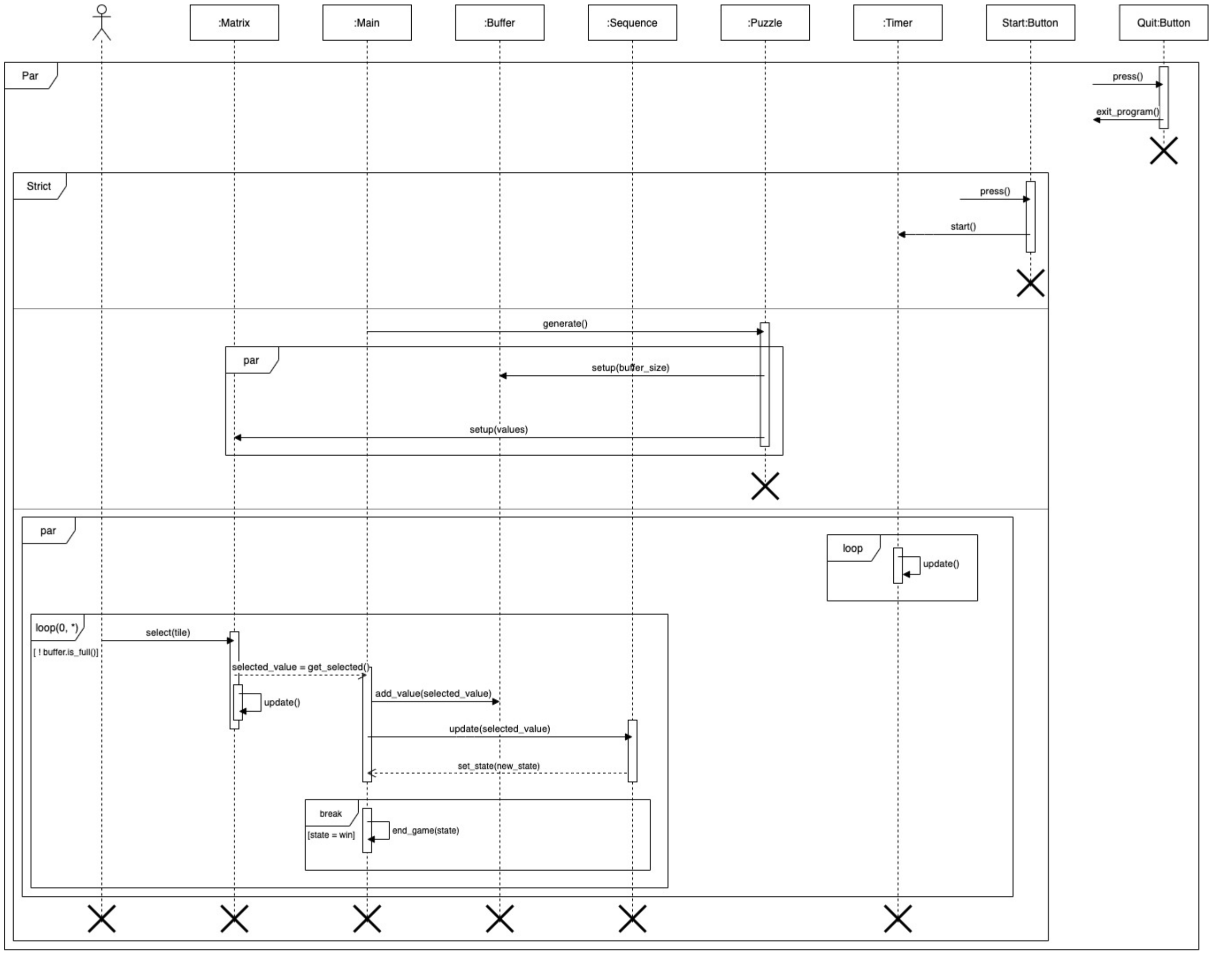
Author(s): Irakliy Marsagishvili, Maxim Abramov

Title: Player decided to start and quit the game.


Player
Main
Matrix
Buffer
Puzzles
Timer
matrix:Matrix
buffer:Buffer
start:Button
quit:Button
thread:TimeThread
timer:TimerClass
Activate Game
Request for a puzzle ourPuzzle.puzzleGenerator()
button_grid[][] = givenMatrix[][]
Matrix is inserted into the object
buffer = givenBuffer
Buffer is inserted into the object
Shows the window
Button quit = new Button()
Matrix and buffer are presented
Button start = new Button();
Quit and start buttons are presented
Start is pressed
actionEvent.getSource() == start, start.setVisible(false)
Sequence is presented
sequence[] = pickedSequence[]
Timer is requested
TimeThread timer = new TimeThread()
Timer timer = new Timer()
Timer is presented
Timer is created
Timer is created
Player presses the quit button
Main requests to stop the game
Game closes
System.exit(0);

In this scenario, the Player turns on the Cyberpunk Hacking Minigame and during the activation of this game, the Main class sends a request to the Puzzles class to generate a random puzzle with Puzzle Generator. In turn, this chooses a puzzle from a set of pre-made ones in the Puzzles Class. After the request has been sent, Puzzles class provides the information about the Matrix and the size of the Buffer to the Matrix and Buffer classes respectively. As soon as Matrix and Buffer classes receive that provided information, they will send it to the Main class, where the main logic and visuals are currently stored, so Matrix and Buffer would be visualised alongside the Quit button and the Start button. When Player decides to start the game, he/she presses the Start button, which disappears after it is pressed. Main class sends a request to the Puzzles class about the sequence of the puzzle that is made for that specific Matrix set. Puzzles class provides that information to the Main and now the Player can see the necessary sequence that has to be input into the Buffer in order to win the game. After the sequence is received, the Main sends the request to the Timer class to start the countdown timer. Timer class starts the timer and sends the information about it to the Main class, so the Player could see how much time is left. In this scenario, Player might decide to stop the game, because it seems too hard or Player has seen it before and wants to try other puzzles, so the Player presses the Quit button to stop the game. Main class receives the command and sends the signal to the Timer class to stop the timer. Timer class stops the time and sends that information back to the Main class. After that, the Main class stops the game and closes the window.

Player wins the game



In this scenario the player first launches the game, which triggers the construction of the ingame objects. From the start the player can see the start button, the amount of time they will have to complete the sequence, the size of their buffer, as well as the buffer itself, and the matrix of values to choose from. At any point during the gameplay the player can use the quit button, which exits the game and closes the application. The game starts as soon as the player presses the start button, which reveals the sequence the player has to collect to win and starts the timer countdown. Now the player can press on the matrix tiles to add their values into the buffer. Each time the player chooses a tile, the matrix updates the set of available tiles and the buffer shows the complete sequence of values the player has chosen so far. The sequence object in turn checks if the sequence of values stored in the buffer contains the goal sequence and updates the game state accordingly. In this scenario, the interaction is repeated until the player completes the sequence, in which case the game is in the win state, which allows the game to display the win screen.

Implementation

Author(s): Irakliy Marsagishvili, Ivan Ivanov, Maxim Abramov, Man Chung Stephen Kwan

UML model to code implementation

At first, we spent a few days entirely on assessing the needs of our project. Initially, we discussed how the classes would correlate to each other and if we'd use JavaFX. From there we sketched a simplified version of the class diagram to use as a baseline for the features that we need to start with. After the creation of the class diagram's first version we also made as a test an object diagram. That diagram represented a moment that could occur in our game and helped us figure out most of the objects and variables we'd need in the final product. Then we moved to the code implementation stage. We started with a very basic version of the program which contained a few of the important UI elements (Matrix, Start and Quit buttons) and that helped us understand JavaFX better. By the time we finalized the implementation we evaluated it and refined the UML diagrams according to the final Assignment 2 product we had.

Concurrency problems

The hardest implementation was how to connect every single component into one game and make it work in concurrency, such as the timer that has to count down while no click events are happening, we managed to solve it by using JavaFX's framework component that is an animation API which provides a thread called Timeline in order to let it run in concurrency meaning that the timer will tick along while the game is remaining fully interactive.

Location of the main java class

Software-Design\src\main\java\game

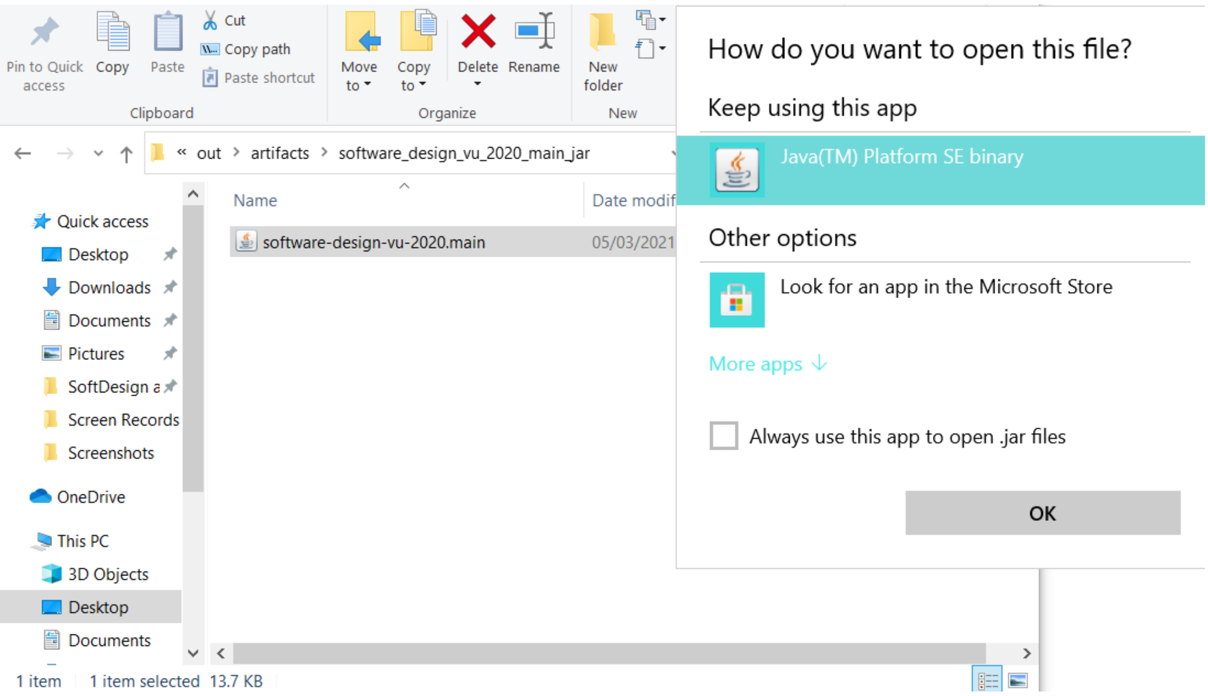
Location for jar file to execute system

<root>\out\artifacts\software_design_vu_2020_main_jar
<root>\build\out\artifacts\software_design_vu_2020_main_jar

The link to the execution of the application and how to execute it

https://youtu.be/CmqItRkZV8o

Right click on the file and press Open With and Choose Java (Windows) (If Java isn't on default)



How do you want to open this file?

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Java(TM) Platform SE binary

Other options

Look for an app in the Microsoft Store

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□ Always use this app to open .jar files

OK

Time logs

Member	Activity	Week number	Hours
Stephen	Meeting	3 to 5	34
Maxim	Meeting	3 to 5	34
Ivan	Meeting	3 to 5	34
Irakliy	Meeting	3 to 5	34
Stephen	UML	3 to 5	6
Maxim	UML	3 to 5	6
Ivan	UML	3 to 5	9
Irakliy	UML	3 to 5	9
Stephen	Code implementation	3 to 5	34
Maxim	Code implementation	3 to 5	34
Ivan	Code implementation	3 to 5	34
Irakliy	Code implementation	3 to 5	34
Stephen	UML description + fine tuning	3 to 5	4
Maxim	UML description + fine tuning	3 to 5	4
Ivan	UML description + fine tuning	3 to 5	4
Irakliy	UML description + fine tuning	3 to 5	4
		TOTAL	318