



Università degli Studi di Salerno



Dipartimento di Ingegneria dell'Informazione ed Elettrica e
Matematica Applicata

Corso di Laurea Magistrale in Ingegneria Informatica

Software Architecture Design 2024/2025

Canale I-Z

Project Work

Gruppo n. 02 – IZ

Cognome e Nome	Matricola	e-mail
Iannone Davide	0622702572	d.iannone19@studenti.unisa.it
Lomazzo Noemi	0622702663	n.lomazzo@studenti.unisa.it
Sirica Simone	0622702627	s.sirica5@studenti.unisa.it
Petrone Gianluca	0622702642	g.petrone27@studenti.unisa.it

Anno accademico 2024-2025

Summary

1. Pre-game	2
1.1. User stories, Acceptance Criteria & Tasks	2
1.2. Definition of Done	18
1.3. 1st sprint planning and backlog	18
1.4. Technologies, Languages, Frameworks & Conventions	24
1.5. Description of software architecture and selected design pattern	25
1.6. Mock-up Interface	26
2. 1st Sprint Release	28
2.1. 1st Sprint review	28
2.2. 1st Sprint retrospective	29
2.3. Burndown chart	29
2.4. 2nd Sprint backlog	30
3. 2nd Sprint Release	36
3.1. 2nd Sprint review	36
3.2. 2nd Sprint retrospective	39
3.3. Updated Burndown chart	39
3.4. 3rd Sprint backlog	39
4. 3rd Sprint (Final) Release	46

1. Pre-game

1.1. User stories, Acceptance Criteria & Tasks

US1

Description	Acceptance Criteria	Priority	Story Points	Tasks	Sprint n.
As a user I want an empty window to be displayed when I start the application So that I can make new drawings	Given the installed application When I start the application Then an empty window is displayed	MUST	1	<ul style="list-style-type: none"> Create an empty page of the program Create a space for the tool bar 	1

US2

Description	Acceptance Criteria	Priority	Story Points	Tasks	Sprint n.
As a user I want to be able to use the mouse on the window and choose the geometrical shape to add to my drawing So that I can position the geometrical form in the chosen position	Given a drawing screen When I click on the window Then the shape is drawn at the selected position	MUST	1	<ul style="list-style-type: none"> Create an event handler for the mouse 	1

US3

Description	Acceptance Criteria	Priority	Story Points	Tasks	Sprint n.
As a user I want to add line segments So that I can place line segments into my drawings	Given a list of shapes When I click 'Line segment' AND I click two points in the window	MUST	1	<ul style="list-style-type: none"> Create a segment line button in the toolbar Implement the logic for segment line creation Implementation and 	1

	Then a line segment, linking the points, is added to the drawing			execution of tests	
--	---	--	--	--------------------	--

US4

Description	Acceptance Criteria	Priority	Story Points	Tasks	Sprint n.
As a user I want to add rectangles So that I can place rectangles into my drawings	Given a list of shapes When I click 'Rectangle' Then a rectangle is added to the drawing with a defined width and height	MUST	1	<ul style="list-style-type: none"> Create rectangle shape button in the toolbar Implement the logic for rectangle creation Implementation and execution of tests 	1

US5

Description	Acceptance Criteria	Priority	Story Points	Tasks	Sprint n.
As a user I want to add ellipses So that I can place ellipses into my drawings	Given a list of shapes When I click 'Ellipse' Then an ellipse is added to the drawing with a defined width and height	MUST	1	<ul style="list-style-type: none"> Create ellipse shape button in the toolbar Implement the logic for ellipse creation Implementation and execution of tests 	1

US6

Description	Acceptance Criteria	Priority	Story Points	Tasks	Sprint n.
<p>As a user I want to choose the color of the geometrical shape So that I can color the border of the added shape</p>	<p>Given a selected shape When I open the color palette with exactly 8 predefined color options AND I choose one of this color Then the selected shape changes its border color</p>	MUST	2	<ul style="list-style-type: none"> • Create a color icon for the color of the border of a shape • Add eight different colors in the color menu • Implement the logic that after selecting the color and placing a shape, the border of the shape is coloured by the selected one • Implementation and execution of tests 	1

US7

Description	Acceptance Criteria	Priority	Story Points	Tasks	Sprint n.
<p>As a user I want to choose the color of a closed shape So that I can color the interior of the shape</p>	<p>Given a selected closed shape When I open the color palette with exactly 8 predefined color options AND I choose</p>	MUST	2	<ul style="list-style-type: none"> • Create a button for internal color • Add eight different color in the color menu • Implement the logic that after selecting the color and placing a closed shape, the interior of the shape is coloured by the selected one 	1

	one of this color Then the interior selected closed shape color changes			<ul style="list-style-type: none"> Implementation and execution of tests 	
--	---	--	--	---	--

US8

Description	Acceptance Criteria	Priority	Story Points	Tasks	Sprint n.
As a user I want to save the drawing on a file So that I don't lose the draw	Given a drawing When I click 'Save' Then the drawing is saved to a file	MUST	2	<ul style="list-style-type: none"> Create the "Save" button in the toolbar Implement save logic for the save button Implementation and execution of tests 	1

US9

Description	Acceptance Criteria	Priority	Story Points	Tasks	Sprint n.
As a user I want to load a drawing previously saved on a file So that I can continue modifying the drawing whenever I want	Given a drawing screen When I click 'Load' AND I select a file Then the selected drawing appears on the screen	MUST	2	<ul style="list-style-type: none"> Create the "Load" button in the toolbar Implement load logic for the load button Implementation and execution of tests 	1

US10

Description	Acceptance Criteria	Priority	Story Points	Tasks	Sprint n.
As a user I want to be able to select one shape	Given a drawing with shapes	MUST	1	<ul style="list-style-type: none"> Implement the logic to manage the click on a shape 	1

with the mouse So that I can perform any operation on the selected shape	When I click shape Then it becomes highlighted			<ul style="list-style-type: none"> Implementation and execution of tests 	
--	---	--	--	---	--

US11

Description	Acceptance Criteria	Priority	Story Points	Tasks	Sprint n.
As a user I want to delete a selected shape So that I can remove the shape from the drawing	Given a selected shape When I click 'Delete' Then the shape is removed	SHOULD	2	<ul style="list-style-type: none"> Create a menu for right click on the window Create "Delete" button in the right click menu Implement the logic to delete the shape Implementation and execution of tests 	1

US12

Description	Acceptance Criteria	Priority	Story Points	Tasks	Sprint n.
As a user I want to move a selected shape in a different position So that I can modify the position of a shape	Given a selected shape When I drag it to a new position Then the shape is moved into the new location	SHOULD	2	<ul style="list-style-type: none"> Add handler for mouse drag functions Implementation and execution of tests 	1

US13

Description	Acceptance Criteria	Priority	Story Points	Tasks	Sprint n.
As a user I want to change the color of a	Given a selected shape	SHOULD	2	<ul style="list-style-type: none"> Implement the logic for changing the color of a 	1

selected shape So that I can choose an appropriate color for the drawing	When I choose a new color from the palette Then the shape color is updated			placed shape <ul style="list-style-type: none"> Implementation and execution of tests 	
--	---	--	--	---	--

US14

Description	Acceptance Criteria	Priority	Story Points	Tasks	Sprint n.
As a user I want to change the size of a selected shape So that I can resize the shape	Given a selected shape When I click on a placed shape AND modify its dimensions in the specific boxes Then size shape is updated	SHOULD	3	<ul style="list-style-type: none"> Create size field in the right click menu Implement the logic to manage the resize of a shape Implementation and execution of tests 	1

US15

Description	Acceptance Criteria	Priority	Story Points	Tasks	Sprint n.
As a user I want to use a cut operation on a shape So that I can remove and possibly paste the shape	Given a selected shape When I click 'Cut' Then the selected shape is removed and copied to the clipboard AND possibly paste it in a	SHOULD	2	<ul style="list-style-type: none"> Create the "Cut" button in the right click menu Implement the logic linked to the cut button to cut a shape Implementation and execution of tests 	1

	different place				
--	-----------------	--	--	--	--

US16

Description	Acceptance Criteria	Priority	Story Points	Tasks	Sprint n.
As a user I want to use a copy operation on a shape So that I can copy an already placed shape	Given a selected shape When I click 'Copy' Then the selected shape is copied to the clipboard AND possibly paste it in a different position	SHOULD	2	<ul style="list-style-type: none"> Create the "Copy" button in the right click menu Implement the logic linked to the copy button to copy a shape Implementation and execution of tests 	1

US17

Description	Acceptance Criteria	Priority	Story Points	Tasks	Sprint n.
As a user I want to use a paste operation So that I can place again a copied shape	Given a drawing screen When I click 'Paste' Then the shape on the clipboard is added to the drawing	SHOULD	2	<ul style="list-style-type: none"> Create the "Paste" button in the right click menu Implement the logic linked to the paste button to paste a shape Implementation and execution of tests 	1

US18

Description	Acceptance Criteria	Priority	Story Points	Tasks	Sprint n.
As a user I want that my operations are	Given an action has occurred When I click	SHOULD	3	<ul style="list-style-type: none"> Create the "undo" button in the interface 	1

defeasible So that I can undo my operations	the undo arrows Then I can undo the last operation AND previous state is restored			<ul style="list-style-type: none"> Implement the logic of the button, that delete the last operation done Implementation and execution of tests 	
---	---	--	--	---	--

US19

Description	Acceptance Criteria	Priority	Story Points	Tasks	Sprint n.
As a user I want to send a shape to the front So that I can order the overlapping shapes	Given the overlapping shapes When I click 'To the front' Then the selected shape moves to the front	SHOULD	3	<ul style="list-style-type: none"> Create the "to the front" option when a shape is selected Implement the logic that places the selected shape to the front Implementation and execution of tests 	2

US20

Description	Acceptance Criteria	Priority	Story Points	Tasks	Sprint n.
As a user I want to send a shape to the back So that I can order the overlapping shapes	Given overlapping shapes When I click 'To the back' Then the selected shape moves to the back	SHOULD	3	<ul style="list-style-type: none"> Create the "to the back" option when a shape is selected Implement the logic that places the selected shape to the back Implementation and execution of tests 	2

US21

Description	Acceptance Criteria	Priority	Story Points	Tasks	Sprint n.
As a user I want to zoom the interface So that I can see better my drawing	Given a drawing When I click on the lens icon AND I can zoom up to 4 levels in or out Then the view zooms in or out accordingly	COULD	3	<ul style="list-style-type: none"> • Create the “zoom in” and “zoom out” buttons in the interface • Implement “zoom in” button that, for every click, zoom in the interface • Implement the “zoom out” button that, for every click zooms out on the interface • Implementation and execution of tests 	2

US22

Description	Acceptance Criteria	Priority	Story Points	Tasks	Sprint n.
As a user I want to use the scroll bar So that I can see the other parts of the drawing	Given a drawing screen larger than window When I click and drag the scroll bar Then the other parts of the drawing become visible	COULD	2	<ul style="list-style-type: none"> • Create a horizontal scrollbar at the bottom of the window • Create a vertical scrollbar at the right of the window • Implementation and execution of tests 	2

US23

Description	Acceptance Criteria	Priority	Story Points	Tasks	Sprint n.
As a user I want to activate and deactivate the grid So that I can place the shapes more easily	Given a drawing screen When I click on the grid icon Then the grid appears if deactivated or disappears if activated	COULD	3	<ul style="list-style-type: none"> • Create a “toggle grid” button in the toolbar • Implement the logic of the button that shows or hides a grid • Implementation and execution of tests 	2

US24

Description	Acceptance Criteria	Priority	Story Points	Tasks	Sprint n.
As a user I want to choose the grid size So that I can draw more precisely	Given an active grid When I select a new grid size Then the grid spacing updates accordingly	COULD	3	<ul style="list-style-type: none"> • Create a “grid size” option in the toolbar • Implement the logic that change the size of the grid • Implementation and execution of tests 	2

US25

Description	Acceptance Criteria	Priority	Story Points	Tasks	Sprint n.
As a user I want to enter an arbitrary polygon So that I can make more complex drawing	Given a drawing screen When I click ‘Polygon’ AND I click on different points on the drawing Then these will be connected	COULD	5	<ul style="list-style-type: none"> • Create a “Polygon” option in the toolbar • Create the logic that connects the selected points creating a closed shape • Implementation 	2

	by lines that will be visible on the drawing sheet			and execution of tests	
--	--	--	--	------------------------	--

US26

Description	Acceptance Criteria	Priority	Story Points	Tasks	Sprint n.
As a user I want to add a text string as a shape So that I can include titles or notes where needed	Given a drawing screen When I select the text string shape AND I write it AND I choose the size Then it will be added as a shape	COULD	3	<ul style="list-style-type: none"> • Create a “text” option in the toolbar • Create a field to write a text string • Create a field to choose the size of a text string • Implement the logic that places a text in the chosen point • Implementation and execution of tests 	2

US27

Description	Acceptance Criteria	Priority	Story Points	Tasks	Sprint n.
As a user I want to rotate a shape by an arbitrary angle So that I can change the shape direction	Given a selected shape When I click ‘Rotation’ AND I set a rotation angle Then the shape rotates accordingly	COULD	8	<ul style="list-style-type: none"> • Create a “Rotate” option in the right click menu of a shape • Create a field in the “Rotate” option where an angle can be specified • Implement the logic that rotates the selected shape at the chosen angle • Implementation and execution of tests 	2 partially + 3 partially

US28

Description	Acceptance Criteria	Priority	Story Points	Tasks	Sprint n.
<p>As a user I want to mirror a shape horizontally or vertically So that I can mirror the shape more easily</p>	<p>Given a selected shape When I click 'Mirror horizontal' Then the shape mirrors with a vertical axis of symmetry.</p> <p>Given a selected shape When click "Mirror vertical" Then the shape mirrors with a horizontal axis of symmetry.</p>	COULD	8	<ul style="list-style-type: none"> • Create the "Mirror horizontal" and "Mirror vertical" options in the right click menu of a shape • Implement the logic that mirrors the shape horizontally or vertically • Implementation and execution of tests 	3

US29

Description	Acceptance Criteria	Priority	Story Points	Tasks	Sprint n.
<p>As a user I want to stretch a shape horizontally or vertically So that I can modify the shape appearance</p>	<p>Given a selected shape When I stretched it in a direction (horizontally or vertically) Then it changes accordingly</p>	COULD	8	<ul style="list-style-type: none"> • Create the "Stretch" options in the right click menu of a shape • Implement the logic that stretches the shape • Implementation and execution of tests 	3

US30

Description	Acceptance Criteria	Priority	Story Points	Tasks	Sprint n.
As a user I want to be able to select more shapes with the mouse So that I can perform any operations on the selected shapes	Given a set of shapes When I select multiple shapes Then all selected shapes can be moved or modified together	COULD	3	<ul style="list-style-type: none"> Implement the logic that can select more than one shape Implementation and execution of tests 	3

US31

Description	Acceptance Criteria	Priority	Story Points	Tasks	Sprint n.
As a user I want to group more than one selected shape So that I can do the same operations on all the selected shapes	Given a set of shapes When I select more than one and click 'Group' Then I group the selected shapes AND perform operations on them as if they were a single shape	WON'T	5	<ul style="list-style-type: none"> Create a "Group" option in the right click menu of a shape Implement the logic that performs the same operations on the selected shape Implementation and execution of tests 	3

US32

Description	Acceptance Criteria	Priority	Story Points	Tasks	Sprint n.
As a user I want to ungroup the selected	Given a selected grouped shape When I click	WON'T	5	<ul style="list-style-type: none"> Create an "Ungroup" option in the 	3

shapes So that I can operate on a single shape	'Ungroup' Then the shapes become separate elements again			right click menu of a shape <ul style="list-style-type: none"> Implementation and execution of tests 	
--	--	--	--	--	--

US33

Description	Acceptance Criteria	Priority	Story Points	Tasks	Sprint n.
As a user I want to add new shape creation commands So that I can create my own shapes	Given a drawing When I click 'New Shape Command' AND assign it a name Then the shape is saved in the command library with all its properties Given a created shape command When I click its associated button Then a copy of the original shape is inserted into the drawing exactly as it was when the command was created (not the current state if the shape has since changed or been deleted)	WON'T	8	<ul style="list-style-type: none"> Create a "New shape commands" option in the toolbar Create a field to write the name of the shape Implement the logic that saves a shape with the same properties as when it was created Implementation and execution of tests 	3

US34

Description	Acceptance Criteria	Priority	Story Points	Tasks	Sprint n.
As a user I want to export a library of shapes created So that I can save my personal shapes	Given the saved shapes When I click 'Export library' Then a 'shapes library file' is created	WON'T	8	<ul style="list-style-type: none"> • Create a "Export library" button in the toolbar • Implement the logic that saves the personal shapes in a file • Implementation and execution of tests 	3 partially

US35

Description	Acceptance Criteria	Priority	Story Points	Tasks	Sprint n.
As a user I want to import a library of shapes created So that I can reuse my personal shapes	Given an existing 'shapes library file' When I click 'Import library' Then the saved shapes appear	WON'T	8	<ul style="list-style-type: none"> • Create a "Import library" button in the toolbar • Implement the logic that import the personal shapes from a saved file • Implementation and execution of tests 	3 partially

N.B. For the breakdown of the 35 User Stories into three Sprints, the team's capacity was estimated based on an average availability of about 32 hours per Sprint (4 team members × approx. 8 hours). For simplicity and planning purposes, we approximated 1 Story Point to roughly 1 hour of work, even though Story Points primarily represent relative effort and complexity, not time. Based on this, we distributed around 32 Story Points per Sprint to match the team's estimated capacity.

Since the total estimated points for all User Stories is about 118, it was necessary to select the main features to be implemented within the three Sprints, distributing about 32 Story Points for each.

In the first Sprint, the basic User Stories were included, which are necessary to allow the user to create, place and color simple shapes, as well as to save and load the drawing, editing operations (cut, copy, paste). Then US n. 1 through n. 18 will be implemented.

In the second Sprint, the User Stories inherent functionalities related to the management of the arrangement of overlapping shapes, supporting functionalities such as zoom and grid were provided. In addition, features such as text input, polygon creation and some of the figure distortion features will be handled.

Then US n. 19 through n. 26 will be implemented and n. 27 partially will be implemented.

Finally, the third Sprint was devoted to more advanced and complex features, such as figure grouping and custom shape export/import options.

Thus, will be completed US n. 27 and US n. 28 through n. 32 will be implemented.

US n. 33, n. 34 and n. 35 will, in addition, be initiated and remain in the backlog for possible later implementation.

This ensured a balanced distribution of the workload among the three Sprints, respecting the team's capabilities and the goal of implementing the main functionalities within the available time frame.

Sprint n.	Total Story Points for Sprint
1	32
2	32
3	30 + 2
	<hr/> 96

1.2. Definition of Done

- The user story implementation meets ALL the acceptance criteria.
- The unit tests were written, executed and passed.
- All acceptance criteria have at least a test case.
- End-user documentation is available.
- All the code has been properly documented.
- All bugs fixed.

1.3. 1st sprint planning and backlog

#US	Task	Assigned To	Status
1	<ul style="list-style-type: none"> • Create an empty page of the program • Create a space for the tool bar 	Iannone Davide	In Progress
2	<ul style="list-style-type: none"> • Create an event handler for the mouse 	Petrone Gianluca	In Progress
3	<ul style="list-style-type: none"> • Create a segment line button in the toolbar • Implement the logic for segment line creation • Implementation and execution of tests 	Interface: Iannone Davide Logic: Petrone Gianluca	In Progress
4	<ul style="list-style-type: none"> • Create rectangle shape button in the toolbar • Implement the logic for rectangle creation • Implementation and execution of tests 	Interface: Iannone Davide Logic: Petrone Gianluca	In Progress
5	<ul style="list-style-type: none"> • Create ellipse shape button in the toolbar • Implement the logic for ellipse creation • Implementation and execution of tests 	Interface: Iannone Davide Logic: Petrone Gianluca	In Progress
6	<ul style="list-style-type: none"> • Create a color icon for the color of the border of a shape • Add eight different colors in the color menu • Implement the logic that 	Interface: Iannone Davide Logic: Petrone Gianluca	In Progress

	<p>after selecting the color and placing a shape, the border of the shape is coloured by the selected one</p> <ul style="list-style-type: none"> ● Implementation and execution of tests 		
7	<ul style="list-style-type: none"> ● Create a button for internal color ● Add eight different color in the color menu ● Implement the logic that after selecting the color and placing a closed shape, the interior of the shape is coloured by the selected one ● Implementation and execution of tests 	<p>Interface: Iannone Davide Logic: Petrone Gianluca</p>	In Progress
8	<ul style="list-style-type: none"> ● Create the “Save” button in the toolbar ● Implement save logic for the save button ● Implementation and execution of tests 	<p>Interface: Iannone Davide Logic: Petrone Gianluca</p>	In Progress
9	<ul style="list-style-type: none"> ● Create the “Load” button in the toolbar ● Implement load logic for the load button ● Implementation and execution of tests 	<p>Interface: Iannone Davide Logic: Petrone Gianluca</p>	In Progress
10	<ul style="list-style-type: none"> ● Implement the logic to manage the click on a shape ● Implementation and execution of tests 	Lomazzo Noemi	In Progress
11	<ul style="list-style-type: none"> ● Create a menu for right click on the window ● Create “Delete” button in the right click menu ● Implement the logic to delete the shape ● Implementation and execution of tests 	<p>Interface: Sirica Simone Logic: Lomazzo Noemi</p>	In Progress
12	<ul style="list-style-type: none"> ● Add handler for mouse drag 	Lomazzo Noemi	In Progress

	functions <ul style="list-style-type: none"> ● Implementation and execution of tests 		
13	<ul style="list-style-type: none"> ● Implement the logic for changing the color of a placed shape ● Implementation and execution of tests 	Lomazzo Noemi	In Progress
14	<ul style="list-style-type: none"> ● Create size field in the right click menu ● Implement the logic to manage the resize of a shape ● Implementation and execution of tests 	Interface: Iannone Davide Logic: Petrone Gianluca	In Progress
15	<ul style="list-style-type: none"> ● Create the “Cut” button in the right click menu ● Implement the logic linked to the cut button to cut a shape ● Implementation and execution of tests 	Interface: Sirica Simone Logic: Lomazzo Noemi	In Progress
16	<ul style="list-style-type: none"> ● Create the “Copy” button in the right click menu ● Implement the logic linked to the copy button to copy a shape ● Implementation and execution of tests 	Interface: Sirica Simone Logic: Lomazzo Noemi	In Progress
17	<ul style="list-style-type: none"> ● Create the “Paste” button in the right click menu ● Implement the logic linked to the paste button to paste a shape ● Implementation and execution of tests 	Interface: Sirica Simone Logic: Lomazzo Noemi	In Progress
18	<ul style="list-style-type: none"> ● Create the “undo” button in the interface ● Implement the logic of the button, that delete the last operation done ● Implementation and execution of tests 	Sirica Simone	In Progress

19	<ul style="list-style-type: none"> ● Create the “to the front” option when a shape is selected ● Implement the logic that places the selected shape to the front ● Implementation and execution of tests 	-	To Do
20	<ul style="list-style-type: none"> ● Create the “to the back” option when a shape is selected ● Implement the logic that places the selected shape to the back ● Implementation and execution of tests 	-	To Do
21	<ul style="list-style-type: none"> ● Create the “zoom in” and “zoom out” buttons in the interface ● Implement “zoom in” button that, for every click, zoom in the interface ● Implement the “zoom out” button that, for every click zooms out on the interface ● Implementation and execution of tests 	-	To Do
22	<ul style="list-style-type: none"> ● Create a horizontal scrollbar at the bottom of the window ● Create a vertical scrollbar at the right of the window ● Implementation and execution of tests 	-	To Do
23	<ul style="list-style-type: none"> ● Create a “toggle grid” button in the toolbar ● Implement the logic of the button that shows or hides a grid ● Implementation and execution of tests 	-	To Do
24	<ul style="list-style-type: none"> ● Create a “grid size” option in the toolbar ● Implement the logic that 	-	To Do

	change the size of the grid <ul style="list-style-type: none"> ● Implementation and execution of tests 		
25	<ul style="list-style-type: none"> ● Create a “Polygon” option in the toolbar ● Create the logic that connects the selected points creating a closed shape ● Implementation and execution of tests 	-	To Do
26	<ul style="list-style-type: none"> ● Create a “text” option in the toolbar ● Create a field to write a text string ● Create a field to choose the size of a text string ● Implement the logic that places a text in the chosen point ● Implementation and execution of tests 	-	To Do
27	<ul style="list-style-type: none"> ● Create a “Rotate” option in the right click menu of a shape ● Create a field in the “Rotate” option where an angle can be specified ● Implement the logic that rotates the selected shape at the chosen angle ● Implementation and execution of tests 	-	To Do
28	<ul style="list-style-type: none"> ● Create the “Mirror horizontal” and “Mirror vertical” options in the right click menu of a shape ● Implement the logic that mirrors the shape horizontally or vertically ● Implementation and execution of tests 	-	To Do
29	<ul style="list-style-type: none"> ● Create the “Stretch” options in the right click menu of a 	-	To Do

	shape <ul style="list-style-type: none"> ● Implement the logic that stretches the shape ● Implementation and execution of tests 		
30	<ul style="list-style-type: none"> ● Implement the logic that can select more than one shape ● Implementation and execution of tests 	-	To Do
31	<ul style="list-style-type: none"> ● Create a “Group” option in the right click menu of a shape ● Implement the logic that performs the same operations on the selected shape ● Implementation and execution of tests 	-	To Do
32	<ul style="list-style-type: none"> ● Create an “Ungroup” option in the right click menu of a shape ● Implementation and execution of tests 	-	To Do
33	<ul style="list-style-type: none"> ● Create a “New shape commands” option in the toolbar ● Create a field to write the name of the shape ● Implement the logic that saves a shape with the same properties as when it was created ● Implementation and execution of tests 	-	To Do
34	<ul style="list-style-type: none"> ● Create a “Export library” button in the toolbar ● Implement the logic that saves the personal shapes in a file ● Implementation and execution of tests 	-	To Do
35	<ul style="list-style-type: none"> ● Create a “Import library” 	-	To Do

	<p>button in the toolbar</p> <ul style="list-style-type: none">● Implement the logic that import the personal shapes from a saved file● Implementation and execution of tests		
--	--	--	--

1.4. Technologies, Languages, Frameworks & Conventions

Technologies and tools

Programming Language -> Java

Framework -> JavaFX

IDE -> Netbeans

Gui Builder -> Scene Builder

Testing -> JUnit (via Maven)

Board -> Trello

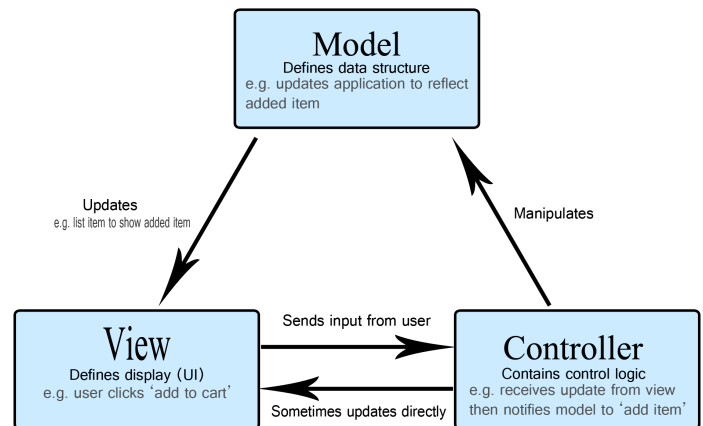
Conventions

- Standard Java style (camelCase for methods and variables, PascalCase for classes)
- Variable names in English, meaningful and consistent

1.5. Description of software architecture and selected design pattern

The architecture we use in this software is the MVC (Model - View - Controller). The MVC consists in three different parts:

- View, that renders the model and corresponds to the User Interface where the user can interact with.
- Model, that represents the data and encapsulates the application state. It notifies the view of changes.
- Controller, that defines the application behaviour and updates the model according to the user actions.



We adopt this pattern to separate model (data) from view to improve the separation of concerns and to achieve loose coupling.

To increase understanding of the basic principles of object-oriented design and to make software systems easier to modify while increasing maintainability, certain design patterns were chosen.

In particular:

- Factory for the creation of the shapes. The **ShapeFactory** class takes care of building the shapes requested by the user, preventing the constructors of specific classes from being used directly in the code. This way, if we want to add new shapes in the future, we can easily do so without modifying other parts of the program;
- Operations such as adding, moving, deleting or coloring a shape are handled by **command** objects. Each operation is saved and can be undone or repeated (undo/redo functionality);
- To allow multiple shapes to be grouped and treated as a single entity (e.g., to move them together), we used the **Composite** pattern. The ShapeGroup class contains multiple Shape objects within it, but it can be used as if it were a normal shape. This allows us to apply the same operations to both individual shapes and groups;
- The **Decorator** pattern allowed us to add extra functionality to shapes, such as border color or fill color;
- For transformations (e.g. rotating or stretching a shape) we used the **Strategy** pattern, so that each transformation is treated as a separate strategy.

1.6. Mock-up Interface

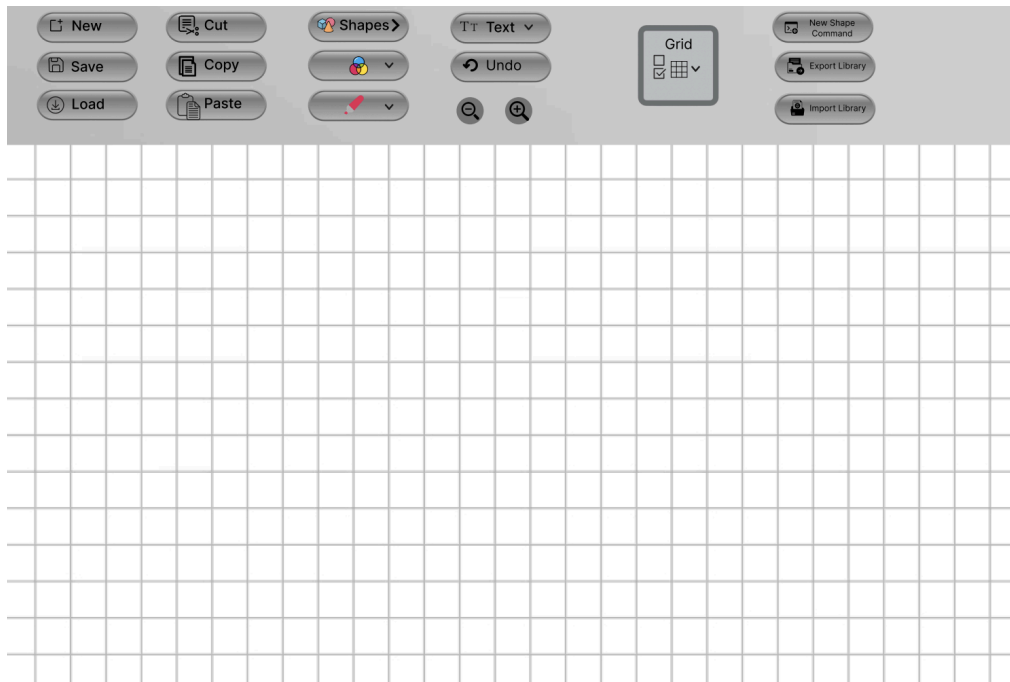


Figura 1: Empty canvas

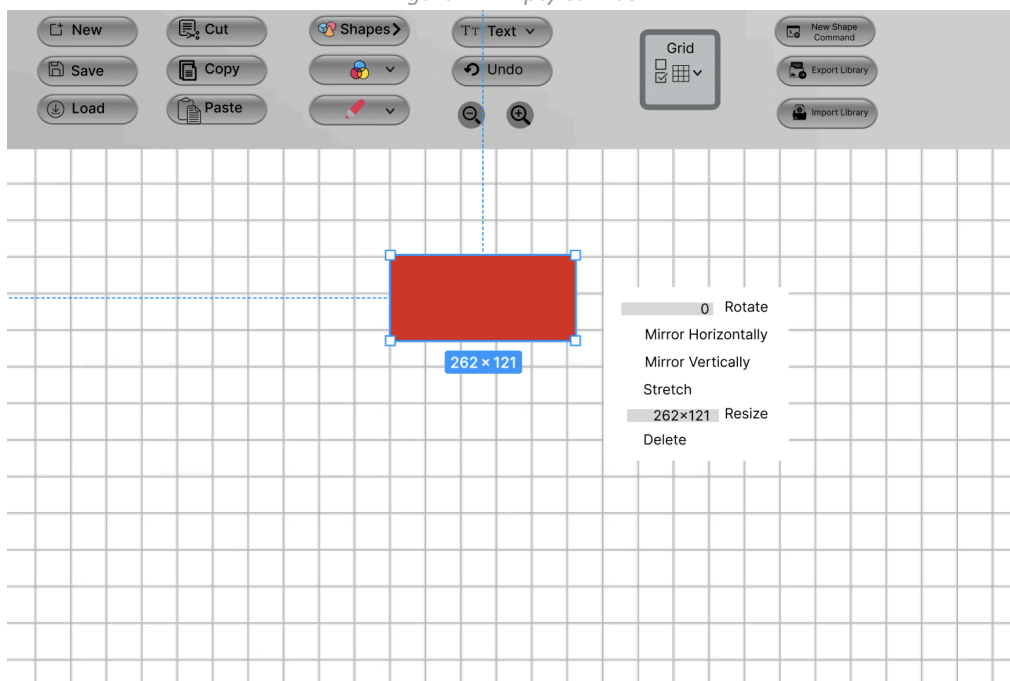


Figura 2: Simple shape options

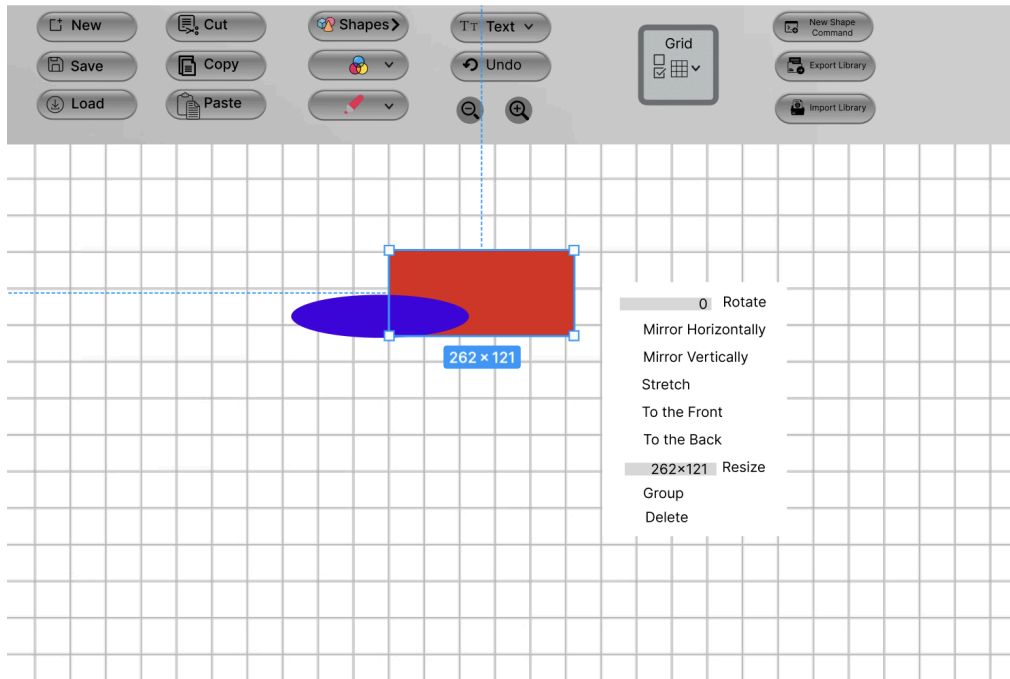


Figura 3: Overlap of simple shapes

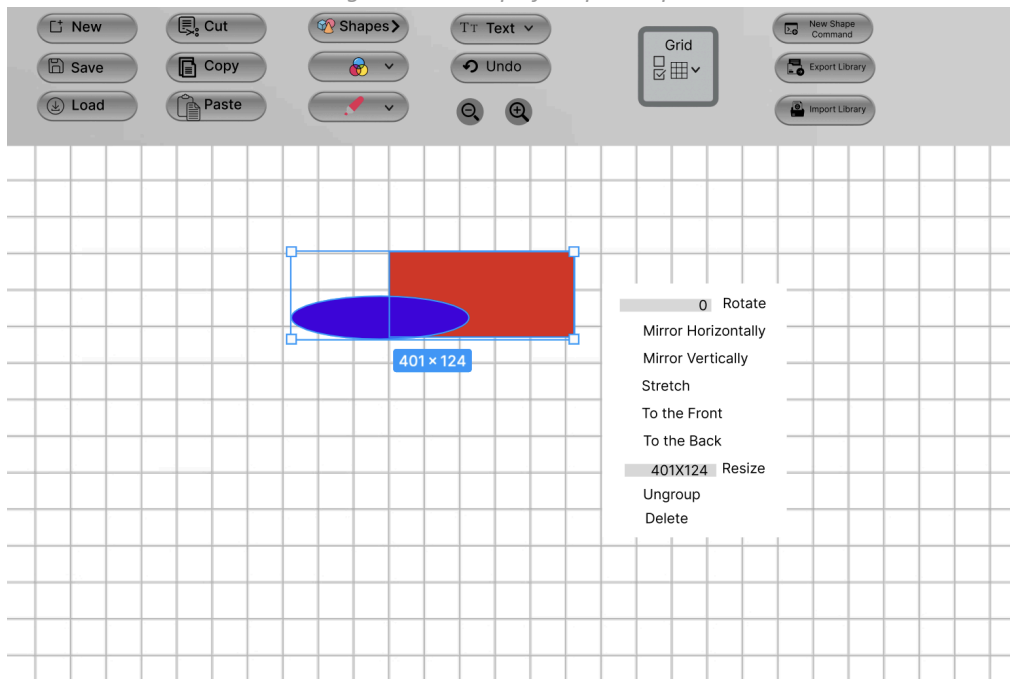


Figura 4: Grouping of simple shapes

2. 1st Sprint Release

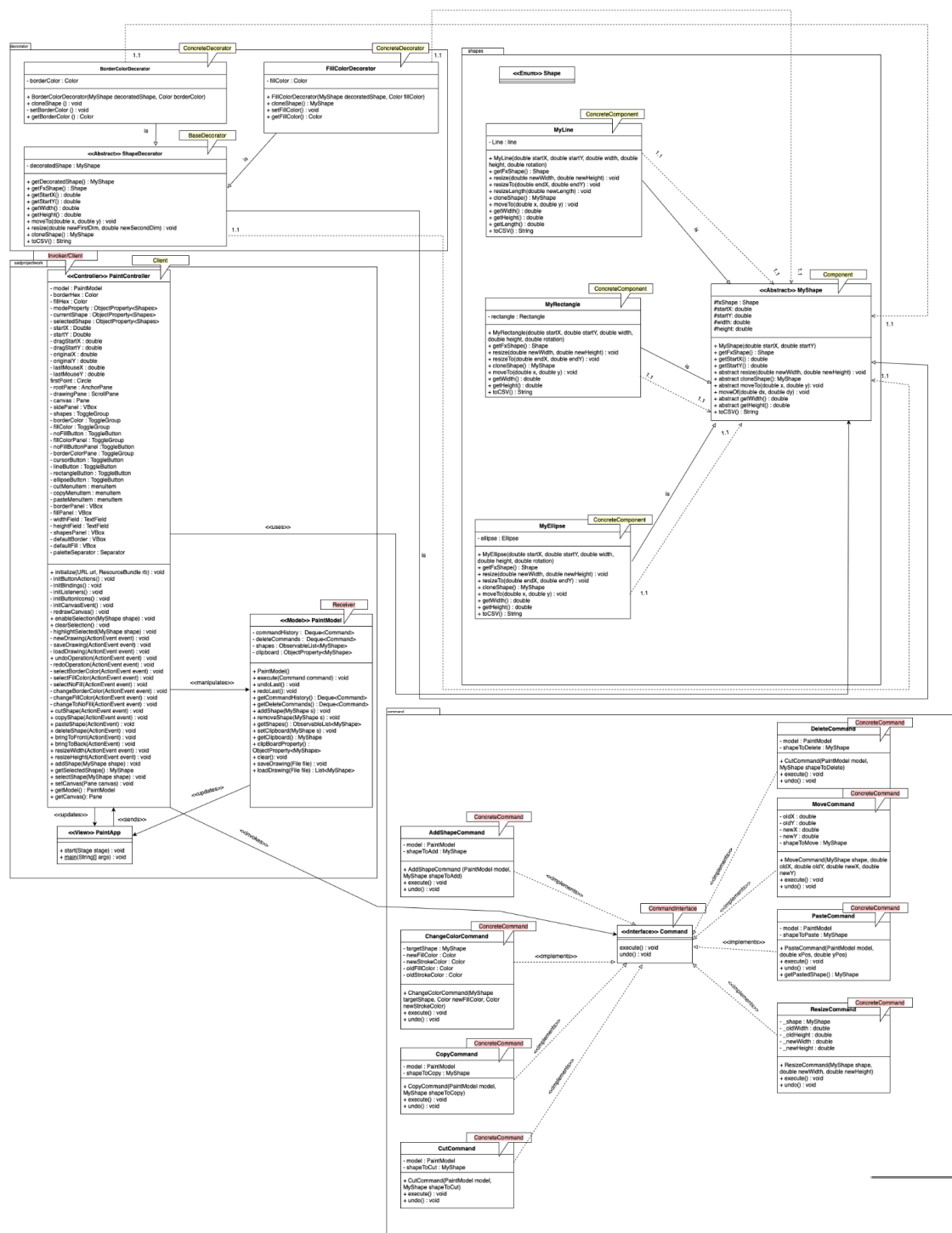
2.1. 1st Sprint review

All user stories and all tasks related to them, planned for the 1st sprint, have been completed. So US n. 1 through n. 18 are completed and the product backlog will contain only us n. 19 through n. 35.

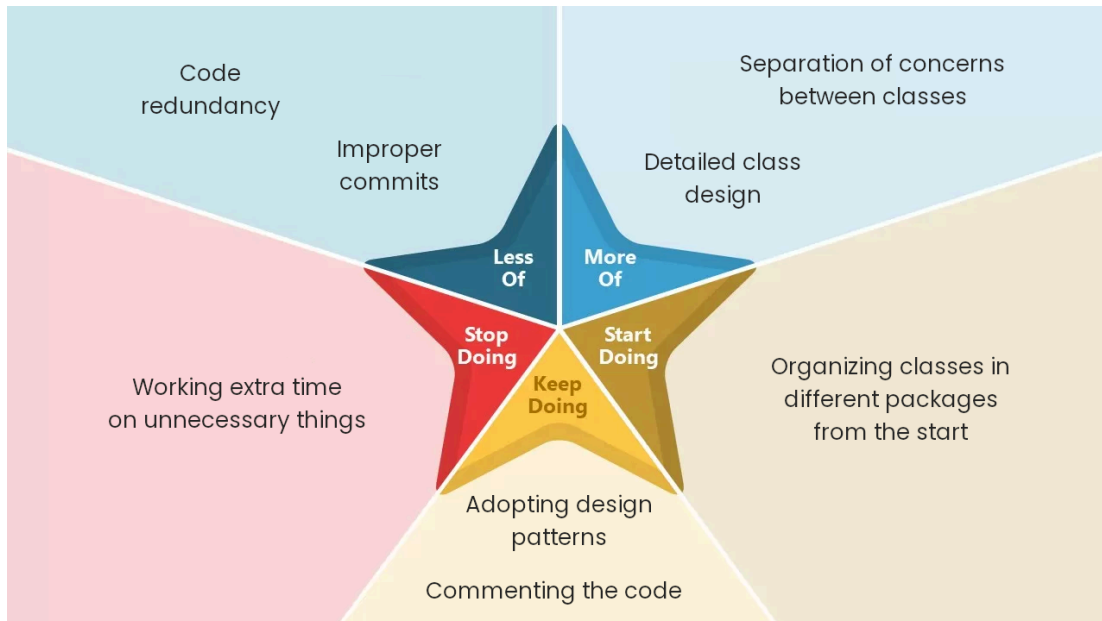
For this reason, the Project Velocity can continue to be 32 story points divided by 8h of work per person on the team.

No additional user stories have been added to those already planned initially.

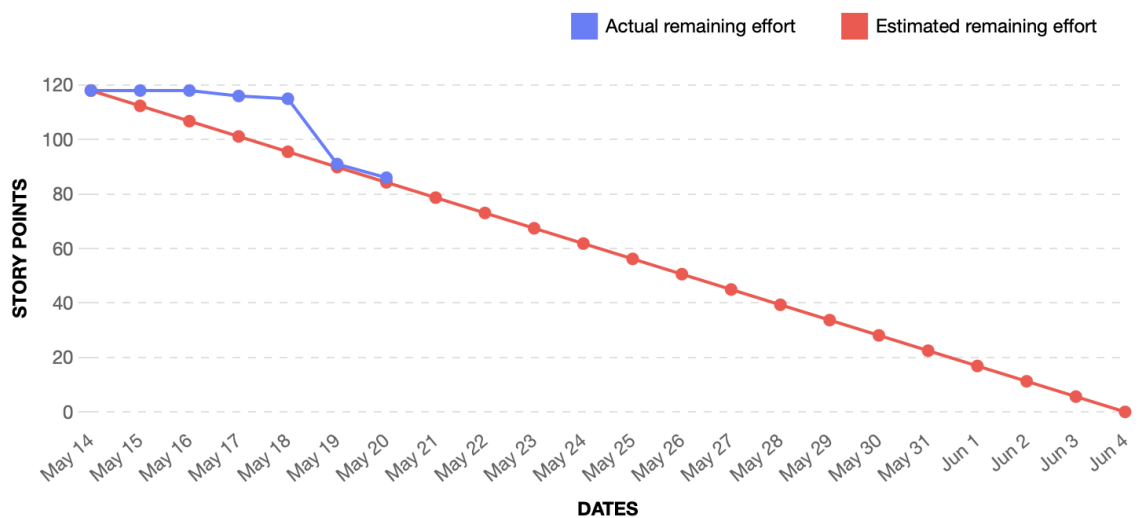
At the moment, the designed design patterns were respected, as also indicated by the class diagram below.



2.2. 1st Sprint retrospective



2.3. Burndown chart



2.4. 2nd Sprint backlog

#US	Task	Assigned To	Status
1	<ul style="list-style-type: none"> Create an empty page of the program Create a space for the tool bar 	Iannone Davide	Done
2	<ul style="list-style-type: none"> Create an event handler for the mouse 	Petrone Gianluca	Done
3	<ul style="list-style-type: none"> Create a segment line button in the toolbar Implement the logic for segment line creation Implementation and execution of tests 	Interface: Iannone Davide Logic: Petrone Gianluca	Done
4	<ul style="list-style-type: none"> Create rectangle shape button in the toolbar Implement the logic for rectangle creation Implementation and execution of tests 	Interface: Iannone Davide Logic: Petrone Gianluca	Done
5	<ul style="list-style-type: none"> Create ellipse shape button in the toolbar Implement the logic for ellipse creation Implementation and execution of tests 	Interface: Iannone Davide Logic: Petrone Gianluca	Done
6	<ul style="list-style-type: none"> Create a color icon for the color of the border of a shape Add eight different colors in the color menu Implement the logic that after selecting the color and placing a shape, the border of the shape is coloured by the selected one Implementation and execution of tests 	Interface: Iannone Davide Logic: Petrone Gianluca	Done
7	<ul style="list-style-type: none"> Create a button for internal 	Interface: Iannone Davide	Done

	<ul style="list-style-type: none"> color • Add eight different color in the color menu • Implement the logic that after selecting the color and placing a closed shape, the interior of the shape is coloured by the selected one • Implementation and execution of tests 	Logic: Petrone Gianluca	
8	<ul style="list-style-type: none"> • Create the “Save” button in the toolbar • Implement save logic for the save button • Implementation and execution of tests 	Interface: Iannone Davide Logic: Petrone Gianluca	Done
9	<ul style="list-style-type: none"> • Create the “Load” button in the toolbar • Implement load logic for the load button • Implementation and execution of tests 	Interface: Iannone Davide Logic: Petrone Gianluca	Done
10	<ul style="list-style-type: none"> • Implement the logic to manage the click on a shape • Implementation and execution of tests 	Lomazzo Noemi	Done
11	<ul style="list-style-type: none"> • Create a menu for right click on the window • Create “Delete” button in the right click menu • Implement the logic to delete the shape • Implementation and execution of tests 	Interface: Sirica Simone Logic: Lomazzo Noemi	Done
12	<ul style="list-style-type: none"> • Add handler for mouse drag functions • Implementation and execution of tests 	Lomazzo Noemi	Done
13	<ul style="list-style-type: none"> • Implement the logic for changing the color of a placed shape • Implementation and 	Lomazzo Noemi	Done

	execution of tests		
14	<ul style="list-style-type: none"> ● Create size field in the right click menu ● Implement the logic to manage the resize of a shape ● Implementation and execution of tests 	Interface: Iannone Davide Logic: Petrone Gianluca	Done
15	<ul style="list-style-type: none"> ● Create the “Cut” button in the right click menu ● Implement the logic linked to the cut button to cut a shape ● Implementation and execution of tests 	Interface: Sirica Simone Logic: Lomazzo Noemi	Done
16	<ul style="list-style-type: none"> ● Create the “Copy” button in the right click menu ● Implement the logic linked to the copy button to copy a shape ● Implementation and execution of tests 	Interface: Sirica Simone Logic: Lomazzo Noemi	Done
17	<ul style="list-style-type: none"> ● Create the “Paste” button in the right click menu ● Implement the logic linked to the paste button to paste a shape ● Implementation and execution of tests 	Interface: Sirica Simone Logic: Lomazzo Noemi	Done
18	<ul style="list-style-type: none"> ● Create the “undo” button in the interface ● Implement the logic of the button, that delete the last operation done ● Implementation and execution of tests 	Sirica Simone	Done
19	<ul style="list-style-type: none"> ● Create the “to the front” option when a shape is selected ● Implement the logic that places the selected shape to the front ● Implementation and execution of tests 	Interface: Sirica Simone Logic: Lomazzo Noemi	In Progress

20	<ul style="list-style-type: none"> ● Create the “to the back” option when a shape is selected ● Implement the logic that places the selected shape to the back ● Implementation and execution of tests 	Interface: Sirica Simone Logic: Lomazzo Noemi	In Progress
21	<ul style="list-style-type: none"> ● Create the “zoom in” and “zoom out” buttons in the interface ● Implement “zoom in” button that, for every click, zoom in the interface ● Implement the “zoom out” button that, for every click zooms out on the interface ● Implementation and execution of tests 	Interface: Sirica Simone Logic: Lomazzo Noemi	In Progress
22	<ul style="list-style-type: none"> ● Create a horizontal scrollbar at the bottom of the window ● Create a vertical scrollbar at the right of the window ● Implementation and execution of tests 	Interface: Sirica Simone Logic: Petrone Gianluca	In Progress
23	<ul style="list-style-type: none"> ● Create a “toggle grid” button in the toolbar ● Implement the logic of the button that shows or hides a grid ● Implementation and execution of tests 	Interface: Sirica Simone Logic: Lomazzo Noemi	In Progress
24	<ul style="list-style-type: none"> ● Create a “grid size” option in the toolbar ● Implement the logic that change the size of the grid ● Implementation and execution of tests 	Interface: Sirica Simone Logic: Iannone Davide	In Progress
25	<ul style="list-style-type: none"> ● Create a “Polygon” option in the toolbar ● Create the logic that connects the selected points creating a closed shape 	Interface: Sirica Simone Logic: Iannone Davide	In Progress

	<ul style="list-style-type: none"> ● Implementation and execution of tests 		
26	<ul style="list-style-type: none"> ● Create a “text” option in the toolbar ● Create a field to write a text string ● Create a field to choose the size of a text string ● Implement the logic that places a text in the chosen point ● Implementation and execution of tests 	Interface: Sirica Simone Logic: Iannone Davide	In Progress
27	<ul style="list-style-type: none"> ● Create a “Rotate” option in the right click menu of a shape ● Create a field in the “Rotate” option where an angle can be specified ● Implement the logic that rotates the selected shape at the chosen angle ● Implementation and execution of tests 	Interface: Sirica Simone Logic: Petrone Gianluca	In Progress/ To Do
28	<ul style="list-style-type: none"> ● Create the “Mirror horizontal” and “Mirror vertical” options in the right click menu of a shape ● Implement the logic that mirrors the shape horizontally or vertically ● Implementation and execution of tests 	-	To Do
29	<ul style="list-style-type: none"> ● Create the “Stretch” options in the right click menu of a shape ● Implement the logic that stretches the shape ● Implementation and execution of tests 	-	To Do
30	<ul style="list-style-type: none"> ● Implement the logic that can select more than one shape ● Implementation and 	-	To Do

	execution of tests		
31	<ul style="list-style-type: none"> ● Create a “Group” option in the right click menu of a shape ● Implement the logic that performs the same operations on the selected shape ● Implementation and execution of tests 	-	To Do
32	<ul style="list-style-type: none"> ● Create an “Ungroup” option in the right click menu of a shape ● Implementation and execution of tests 	-	To Do
33	<ul style="list-style-type: none"> ● Create a “New shape commands” option in the toolbar ● Create a field to write the name of the shape ● Implement the logic that saves a shape with the same properties as when it was created ● Implementation and execution of tests 	-	To Do
34	<ul style="list-style-type: none"> ● Create a “Export library” button in the toolbar ● Implement the logic that saves the personal shapes in a file ● Implementation and execution of tests 	-	To Do
35	<ul style="list-style-type: none"> ● Create a “Import library” button in the toolbar ● Implement the logic that import the personal shapes from a saved file ● Implementation and execution of tests 	-	To Do

3. 2nd Sprint Release

3.1. 2nd Sprint review

Also in the second sprint, all planned user stories were completed. In addition, user story n. 27, which we had planned only to be set in the second sprint, was actually completely carried out and user story n. 29 planned for the next sprint was equally completed.

This is because we realized during implementation that US n. 27 and n. 29 were overestimated in terms of story points. Thus, for both USs, the story points changed from 8 to 5.

US27

Description	Acceptance Criteria	Priority	Story Points	Tasks	Sprint n.
As a user I want to rotate a shape by an arbitrary angle So that I can change the shape direction	Given a selected shape When I click 'Rotation' AND I set a rotation angle Then the shape rotates accordingly	COULD	5	<ul style="list-style-type: none"> • Create a "Rotate" option in the right click menu of a shape • Create a field in the "Rotate" option where an angle can be specified • Implement the logic that rotates the selected shape at the chosen angle • Implementation and execution of tests 	2

US29

Description	Acceptance Criteria	Priority	Story Points	Tasks	Sprint n.
As a user I want to stretch a shape horizontally or vertically So that I can modify the shape appearance	Given a selected shape When I stretched it in a direction (horizontally or vertically) Then it changes accordingly	COULD	5	<ul style="list-style-type: none"> • Create the "Stretch" options in the right click menu of a shape • Implement the logic that stretches the shape • Implementation and execution of tests 	2

Therefore, it was decided to increase the project velocity from 32 story points to 36 story points.

No more user stories were added than originally planned.

As for patterns, what was said in the first sprint cannot be reconfirmed.

In fact, the Strategy pattern was no longer applied.

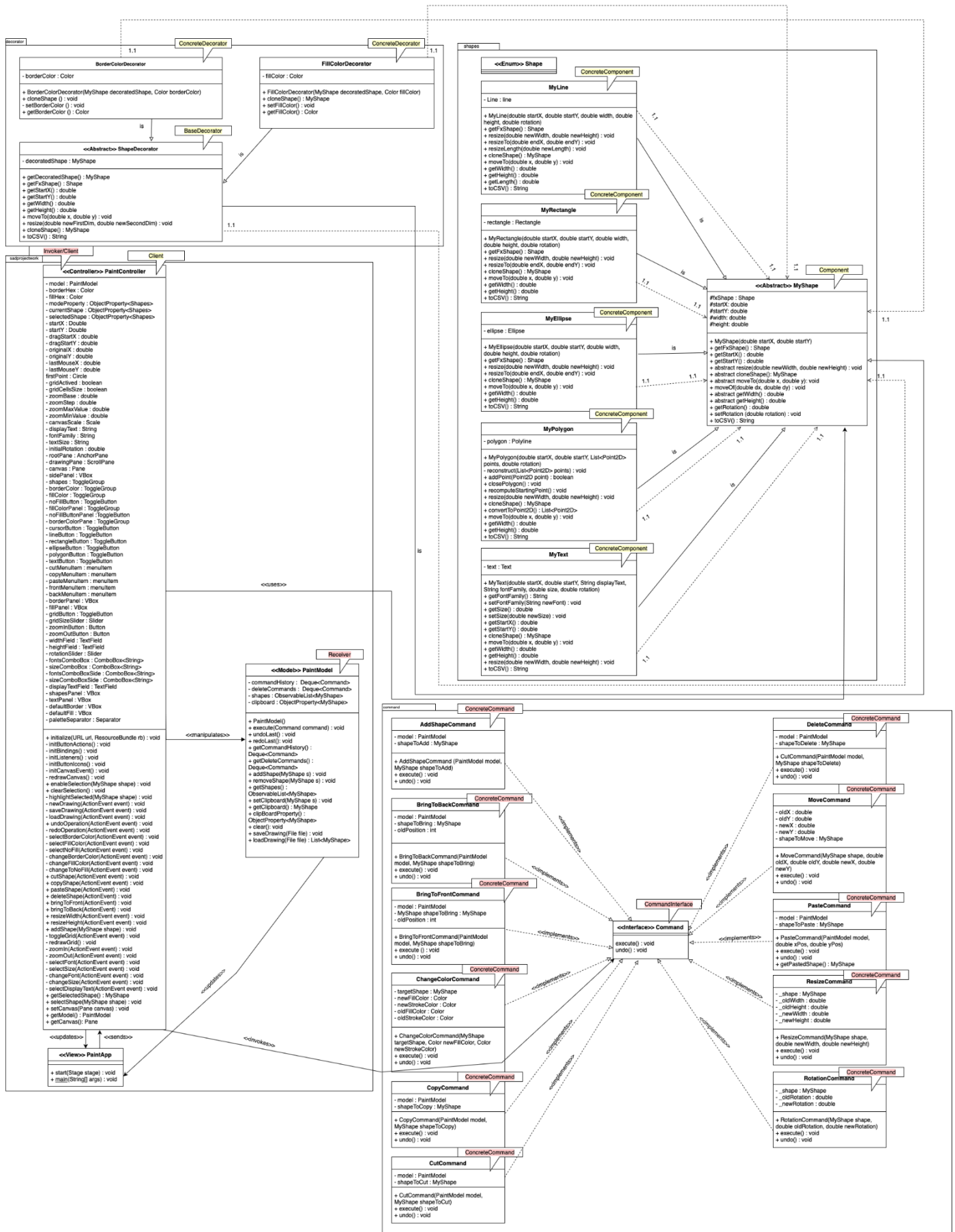
Initially, the Strategy pattern was intended to treat transformations as separate and interchangeable strategies, each with its own logic.

Separate, because each type of transformation would be implemented in a different class; interchangeable, because we could have applied any of these strategies to a shape, simply by changing the object passed, but in the design this flexibility is not as necessary as the ability to undo each operation.

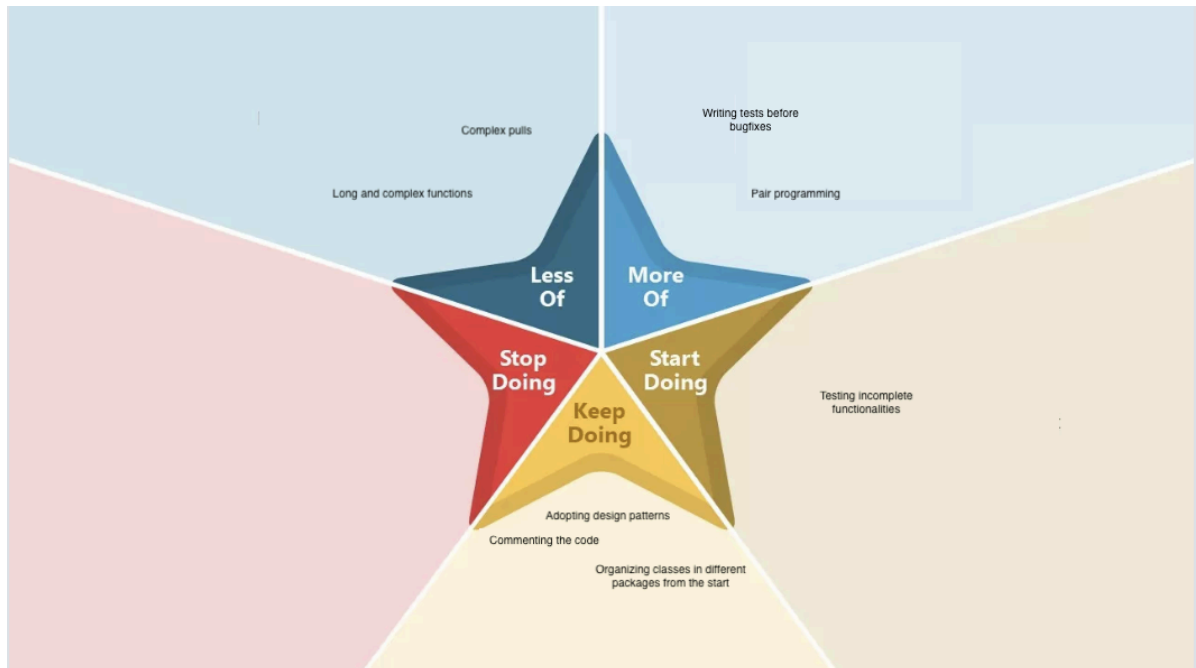
So although the Strategy pattern was originally intended to handle transformations such as rotation, it was dropped in favor of the Command pattern to ensure consistency with the architecture of the system, in which all operations must be undoable.

In fact, the Command pattern allows each action to be treated as an independent object that can be executed, undone, and reapplied. Consequently, transformations were also modeled as commands (RotateCommand, etc.), integrating seamlessly with the undo/redo system and the expected behavior of all other operations.

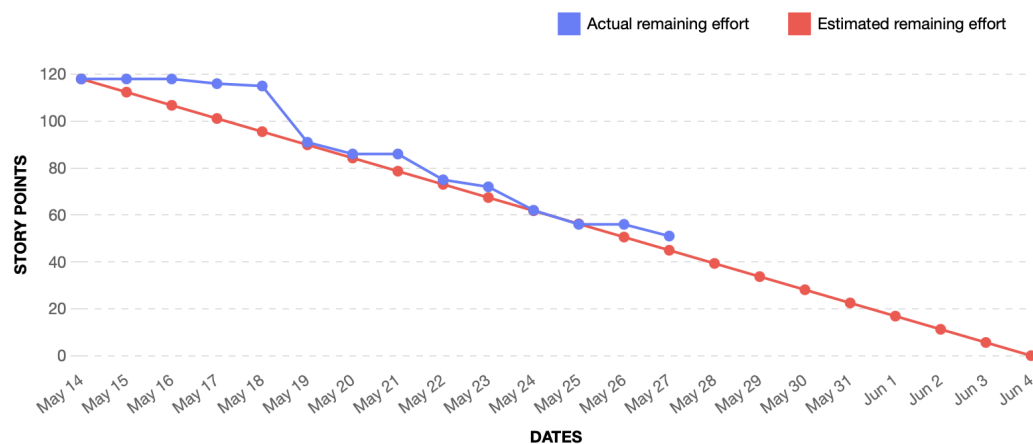
An updated version of the class diagram is below.



3.2. 2nd Sprint retrospective



3.3. Updated Burndown chart



3.4. 3rd Sprint backlog

#US	Task	Assigned To	Status
1	<ul style="list-style-type: none"> Create an empty page of the program Create a space for the tool bar 	Iannone Davide	Done
2	<ul style="list-style-type: none"> Create an event handler for the mouse 	Petrone Gianluca	Done

3	<ul style="list-style-type: none"> ● Create a segment line button in the toolbar ● Implement the logic for segment line creation ● Implementation and execution of tests 	Interface: Iannone Davide Logic: Petrone Gianluca	Done
4	<ul style="list-style-type: none"> ● Create rectangle shape button in the toolbar ● Implement the logic for rectangle creation ● Implementation and execution of tests 	Interface: Iannone Davide Logic: Petrone Gianluca	Done
5	<ul style="list-style-type: none"> ● Create ellipse shape button in the toolbar ● Implement the logic for ellipse creation ● Implementation and execution of tests 	Interface: Iannone Davide Logic: Petrone Gianluca	Done
6	<ul style="list-style-type: none"> ● Create a color icon for the color of the border of a shape ● Add eight different colors in the color menu ● Implement the logic that after selecting the color and placing a shape, the border of the shape is coloured by the selected one ● Implementation and execution of tests 	Interface: Iannone Davide Logic: Petrone Gianluca	Done
7	<ul style="list-style-type: none"> ● Create a button for internal color ● Add eight different color in the color menu ● Implement the logic that after selecting the color and placing a closed shape, the interior of the shape is coloured by the selected one ● Implementation and execution of tests 	Interface: Iannone Davide Logic: Petrone Gianluca	Done
8	<ul style="list-style-type: none"> ● Create the “Save” button in the toolbar 	Interface: Iannone Davide Logic: Petrone Gianluca	Done

	<ul style="list-style-type: none"> ● Implement save logic for the save button ● Implementation and execution of tests 		
9	<ul style="list-style-type: none"> ● Create the “Load” button in the toolbar ● Implement load logic for the load button ● Implementation and execution of tests 	Interface: Iannone Davide Logic: Petrone Gianluca	Done
10	<ul style="list-style-type: none"> ● Implement the logic to manage the click on a shape ● Implementation and execution of tests 	Lomazzo Noemi	Done
11	<ul style="list-style-type: none"> ● Create a menu for right click on the window ● Create “Delete” button in the right click menu ● Implement the logic to delete the shape ● Implementation and execution of tests 	Interface: Sirica Simone Logic: Lomazzo Noemi	Done
12	<ul style="list-style-type: none"> ● Add handler for mouse drag functions ● Implementation and execution of tests 	Lomazzo Noemi	Done
13	<ul style="list-style-type: none"> ● Implement the logic for changing the color of a placed shape ● Implementation and execution of tests 	Lomazzo Noemi	Done
14	<ul style="list-style-type: none"> ● Create size field in the right click menu ● Implement the logic to manage the resize of a shape ● Implementation and execution of tests 	Interface: Iannone Davide Logic: Petrone Gianluca	Done
15	<ul style="list-style-type: none"> ● Create the “Cut” button in the right click menu ● Implement the logic linked to the cut button to cut a shape 	Interface: Sirica Simone Logic: Lomazzo Noemi	Done

	<ul style="list-style-type: none"> Implementation and execution of tests 		
16	<ul style="list-style-type: none"> Create the “Copy” button in the right click menu Implement the logic linked to the copy button to copy a shape Implementation and execution of tests 	Interface: Sirica Simone Logic: Lomazzo Noemi	Done
17	<ul style="list-style-type: none"> Create the “Paste” button in the right click menu Implement the logic linked to the paste button to paste a shape Implementation and execution of tests 	Interface: Sirica Simone Logic: Lomazzo Noemi	Done
18	<ul style="list-style-type: none"> Create the “undo” button in the interface Implement the logic of the button, that delete the last operation done Implementation and execution of tests 	Sirica Simone	Done
19	<ul style="list-style-type: none"> Create the “to the front” option when a shape is selected Implement the logic that places the selected shape to the front Implementation and execution of tests 	Interface: Sirica Simone Logic: Lomazzo Noemi	Done
20	<ul style="list-style-type: none"> Create the “to the back” option when a shape is selected Implement the logic that places the selected shape to the back Implementation and execution of tests 	Interface: Sirica Simone Logic: Lomazzo Noemi	Done
21	<ul style="list-style-type: none"> Create the “zoom in” and “zoom out” buttons in the interface 	Interface: Sirica Simone Logic: Lomazzo Noemi	Done

	<ul style="list-style-type: none"> ● Implement “zoom in” button that, for every click, zoom in the interface ● Implement the “zoom out” button that, for every click zooms out on the interface ● Implementation and execution of tests 		
22	<ul style="list-style-type: none"> ● Create a horizontal scrollbar at the bottom of the window ● Create a vertical scrollbar at the right of the window ● Implementation and execution of tests 	Interface: Sirica Simone Logic: Petrone Gianluca	Done
23	<ul style="list-style-type: none"> ● Create a “toggle grid” button in the toolbar ● Implement the logic of the button that shows or hides a grid ● Implementation and execution of tests 	Interface: Sirica Simone Logic: Lomazzo Noemi	Done
24	<ul style="list-style-type: none"> ● Create a “grid size” option in the toolbar ● Implement the logic that change the size of the grid ● Implementation and execution of tests 	Interface: Sirica Simone Logic: Iannone Davide	Done
25	<ul style="list-style-type: none"> ● Create a “Polygon” option in the toolbar ● Create the logic that connects the selected points creating a closed shape ● Implementation and execution of tests 	Interface: Sirica Simone Logic: Iannone Davide	Done
26	<ul style="list-style-type: none"> ● Create a “text” option in the toolbar ● Create a field to write a text string ● Create a field to choose the size of a text string ● Implement the logic that places a text in the chosen point 	Interface: Sirica Simone Logic: Iannone Davide	Done

	<ul style="list-style-type: none"> Implementation and execution of tests 		
27	<ul style="list-style-type: none"> Create a “Rotate” option in the right click menu of a shape Create a field in the “Rotate” option where an angle can be specified Implement the logic that rotates the selected shape at the chosen angle Implementation and execution of tests 	Interface: Sirica Simone Logic: Petrone Gianluca	Done
28	<ul style="list-style-type: none"> Create the “Mirror horizontal” and “Mirror vertical” options in the right click menu of a shape Implement the logic that mirrors the shape horizontally or vertically Implementation and execution of tests 	Interface: Sirica Simone Logic: Lomazzo Noemi	In Progress
29	<ul style="list-style-type: none"> Create the “Stretch” options in the right click menu of a shape Implement the logic that stretches the shape Implementation and execution of tests 	Interface: Sirica Simone Logic: Iannone Davide	Done
30	<ul style="list-style-type: none"> Implement the logic that can select more than one shape Implementation and execution of tests 	Sirica Simone	In Progress
31	<ul style="list-style-type: none"> Create a “Group” option in the right click menu of a shape Implement the logic that performs the same operations on the selected shape Implementation and execution of tests 	Interface: Sirica Simone Logic: Iannone Davide	In Progress

32	<ul style="list-style-type: none"> ● Create an “Ungroup” option in the right click menu of a shape ● Implementation and execution of tests 	Interface: Sirica Simone Logic: Iannone Davide	In Progress
33	<ul style="list-style-type: none"> ● Create a “New shape commands” option in the toolbar ● Create a field to write the name of the shape ● Implement the logic that saves a shape with the same properties as when it was created ● Implementation and execution of tests 	Interface: Sirica Simone Logic: Petrone Gianluca	In Progress
34	<ul style="list-style-type: none"> ● Create a “Export library” button in the toolbar ● Implement the logic that saves the personal shapes in a file ● Implementation and execution of tests 	All the member	In Progress
35	<ul style="list-style-type: none"> ● Create a “Import library” button in the toolbar ● Implement the logic that import the personal shapes from a saved file ● Implementation and execution of tests 	All the member	In Progress

4. 3rd Sprint (Final) Release