

Module Interface Specification for Flow

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1 Revision History

Date	Version	Notes
Date 1	1.0	Notes
Date 2	1.1	Notes

2 Symbols, Abbreviations and Acronyms

See SRS Documentation at <https://github.com/ritual-17/flow/tree/main/docs/SRS-Meyer>

Contents

1	Revision History	i
2	Symbols, Abbreviations and Acronyms	ii
3	Introduction	1
4	Notation	1
5	Module Decomposition	1
6	MIS of Display Interface Module	3
6.1	Module	3
6.2	Uses	3
6.3	Syntax	3
6.3.1	Exported Constants	3
6.3.2	Exported Access Programs	3
6.4	Semantics	3
6.4.1	State Variables	3
6.4.2	Environment Variables	3
6.4.3	Assumptions	3
6.4.4	Access Routine Semantics	3
6.4.5	Local Functions	4
7	MIS of Input Interface Module	5
7.1	Module	5
7.2	Uses	5
7.3	Syntax	5
7.3.1	Exported Constants	5
7.3.2	Exported Access Programs	5
7.4	Semantics	5
7.4.1	State Variables	5
7.4.2	Environment Variables	5
7.4.3	Assumptions	5
7.4.4	Access Routine Semantics	5
7.4.5	Local Functions	5
8	MIS of File Interface Module	6
8.1	Module	6
8.2	Uses	6
8.3	Syntax	6
8.3.1	Exported Constants	6
8.3.2	Exported Access Programs	6

8.4	Semantics	6
8.4.1	State Variables	6
8.4.2	Environment Variables	6
8.4.3	Assumptions	6
8.4.4	Access Routine Semantics	6
8.4.5	Local Functions	7
9	MIS of Geometry State Parser Module	8
9.1	Module	8
9.2	Uses	8
9.3	Syntax	8
9.3.1	Exported Constants	8
9.3.2	Exported Access Programs	8
9.4	Semantics	8
9.4.1	State Variables	8
9.4.2	Environment Variables	8
9.4.3	Assumptions	8
9.4.4	Access Routine Semantics	8
9.4.5	Local Functions	8
10	MIS of Geometry State Converter Module	9
10.1	Module	9
10.2	Uses	9
10.3	Syntax	9
10.3.1	Exported Constants	9
10.3.2	Exported Access Programs	9
10.4	Semantics	9
10.4.1	State Variables	9
10.4.2	Environment Variables	9
10.4.3	Assumptions	9
10.4.4	Access Routine Semantics	9
10.4.5	Local Functions	9
11	MIS of Commands Parser Module	10
11.1	Module	10
11.2	Uses	10
11.3	Syntax	10
11.3.1	Exported Constants	10
11.3.2	Exported Access Programs	10
11.4	Semantics	10
11.4.1	State Variables	10
11.4.2	Environment Variables	10
11.4.3	Assumptions	10

11.4.4	Access Routine Semantics	10
11.4.5	Local Functions	10
12	MIS of Mode Commands Module	11
12.1	Module	11
12.2	Uses	11
12.3	Syntax	11
12.3.1	Exported Constants	11
12.3.2	Exported Access Programs	11
12.4	Semantics	11
12.4.1	State Variables	11
12.4.2	Environment Variables	11
12.4.3	Assumptions	11
12.4.4	Access Routine Semantics	12
12.4.5	Local Functions	12
13	MIS of Shape Interface Module	13
13.1	Module	13
13.2	Uses	13
13.3	Syntax	13
13.3.1	Exported Constants	13
13.3.2	Exported Access Programs	13
13.4	Semantics	13
13.4.1	State Variables	13
13.4.2	Environment Variables	13
13.4.3	Assumptions	13
13.4.4	Access Routine Semantics	14
13.4.5	Local Functions	14
14	MIS of User Preference Module	15
14.1	Module	15
14.2	Uses	15
14.3	Syntax	15
14.3.1	Exported Constants	15
14.3.2	Exported Access Programs	15
14.4	Semantics	15
14.4.1	State Variables	15
14.4.2	Environment Variables	15
14.4.3	Assumptions	15
14.4.4	Access Routine Semantics	15
14.4.5	Local Functions	15

15 MIS of Text Buffer Module	16
15.1 Module	16
15.2 Uses	16
15.3 Syntax	16
15.3.1 Exported Constants	16
15.3.2 Exported Access Programs	16
15.4 Semantics	16
15.4.1 State Variables	16
15.4.2 Environment Variables	16
15.4.3 Assumptions	16
15.4.4 Access Routine Semantics	17
15.4.5 Local Functions	17
16 MIS of Geometry State Module	18
16.1 Module	18
16.2 Uses	18
16.3 Syntax	18
16.3.1 Exported Constants	18
16.3.2 Exported Access Programs	18
16.4 Semantics	18
16.4.1 State Variables	18
16.4.2 Environment Variables	18
16.4.3 Assumptions	18
16.4.4 Access Routine Semantics	19
16.4.5 Local Functions	19
17 MIS of Geometry State Mutator Module	20
17.1 Module	20
17.2 Uses	20
17.3 Syntax	20
17.3.1 Exported Constants	20
17.3.2 Exported Access Programs	20
17.4 Semantics	20
17.4.1 State Variables	20
17.4.2 Environment Variables	20
17.4.3 Assumptions	20
17.4.4 Access Routine Semantics	21
17.4.5 Local Functions	21
18 MIS of Undo Redo Module	22
18.1 Module	22
18.2 Uses	22
18.3 Syntax	22

18.3.1	Exported Constants	22
18.3.2	Exported Access Programs	22
18.4	Semantics	22
18.4.1	State Variables	22
18.4.2	Environment Variables	22
18.4.3	Assumptions	22
18.4.4	Access Routine Semantics	22
18.4.5	Local Functions	23
19	MIS of User Persistence Module	24
19.1	Module	24
19.2	Uses	24
19.3	Syntax	24
19.3.1	Exported Constants	24
19.3.2	Exported Access Programs	24
19.4	Semantics	24
19.4.1	State Variables	24
19.4.2	Environment Variables	24
19.4.3	Assumptions	24
19.4.4	Access Routine Semantics	24
19.4.5	Local Functions	25
20	Appendix	27

3 Introduction

The following document details the Module Interface Specifications for Flow

Complementary documents include the System Requirement Specifications and Module Guide. The full documentation and implementation can be found at <https://github.com/ritual-17/flow>.

4 Notation

The specification of Flow uses several derived data types, including sequences, strings, and tuples. Sequences are ordered lists containing elements of the same data type. Strings are sequences of characters. Tuples represent a finite collection of values, potentially of different types. Functions are described by specifying the data types of their inputs and outputs, and local functions are documented using their type signatures followed by their behavioural descriptions.

Several modules, most notably the Shape Interface Module, operate on geometric objects that are placed on a two-dimensional canvas. Shapes are treated abstractly and are not tied to a specific rendering or user interface implementation. A shape is represented conceptually as a tuple consisting of a shape type and a finite set of parameters. The shape type is drawn from a predefined set of supported shapes (e.g., rectangle, circle, text box), while the parameters describe properties such as position, size, and orientation.

Positions are expressed using Cartesian coordinates in a two-dimensional plane, typically represented as (x, y) pairs of real numbers. The canvas may be conceptually overlaid with a uniform grid that provides a visual reference and optional alignment structure for placing and manipulating shapes. The grid does not impose semantic constraints on shape placement, but may be used to support consistent positioning, snapping behaviour, or alignment operations. Dimensions such as width, height, or radius are represented using real-valued quantities. Collections of shapes are represented as sequences of shape tuples. Operations on shapes, such as insertion, deletion, movement, resizing, or transformation, are described in terms of updates applied to these abstract representations. Any constraints on valid coordinates or dimensions are specified explicitly in the relevant module interfaces.

5 Module Decomposition

Level 1	Level 2
Hardware-Hiding	6 Display Interface Module 7 Input Interface Module 8 File Interface Module
Behaviour-Hiding	9 Geometry State Parser Module 10 Geometry State Converter Module 11 Commands Parser Module 12 Mode Commands Module 13 Shape Interface Module 14 User Preference Module 9 Geometry State Parser Module
Software Decision	15 Text Buffer Module 16 Geometry State Module 17 Geometry State Mutator Module 18 Undo Redo Module 19 User Persistence Module

Table 1: Module Hierarchy

6 MIS of Display Interface Module

6.1 Module

Display for the system

This is the module that will handle the display for the system. This is a module that when called updates the display.

6.2 Uses

16 Geometry State Module

6.3 Syntax

6.3.1 Exported Constants

N/A

6.3.2 Exported Access Programs

Name	In	Out	Exceptions
display	Shapes	Display to screen	-
resize	width, length	Resize the screen as needed	-
status		Show status	-

6.4 Semantics

6.4.1 State Variables

N/A

6.4.2 Environment Variables

- System Screen
- Rendering API

6.4.3 Assumptions

6.4.4 Access Routine Semantics

display(Shapes):

- output: Outputs Shapes visually on the screen

resize(length,width):

- output: Outputs resized version of the current screen

status():

- output: Outputs current status of the program ex waiting fr input, rendering etc.

6.4.5 Local Functions

N/A

7 MIS of Input Interface Module

7.1 Module

Input Module. Deals with User inputs and passes them on to the [12](#) Mode Commands Module

7.2 Uses

[12](#) Mode Commands Module

7.3 Syntax

7.3.1 Exported Constants

7.3.2 Exported Access Programs

Name	In	Out	Exceptions
get_keyboard_inputs	-	keyboard_inputs	-
get_mouse_inputs	-	mouse_inputs	-

7.4 Semantics

7.4.1 State Variables

7.4.2 Environment Variables

- Keyboard API
- Mouse API

7.4.3 Assumptions

7.4.4 Access Routine Semantics

get_keyboard_inputs():

- output: Data containing all current keyboard inputs. All keys will be off if the user is not using a keyboard.

get_mouse_inputs():

- output: Data containing mouse location and inputs. All inputs are off if the user does not have a mouse.

7.4.5 Local Functions

N/A

8 MIS of File Interface Module

8.1 Module

[9](#) Geometry State Parser Module

8.2 Uses

[12](#) Mode Commands Module

8.3 Syntax

8.3.1 Exported Constants

N/A

8.3.2 Exported Access Programs

Name	In	Out	Exceptions
open	file_path	opened_file	Invalid File
save	file_path, opened_note	success	Saving Error

8.4 Semantics

8.4.1 State Variables

N/A

8.4.2 Environment Variables

- File System

8.4.3 Assumptions

N/A

8.4.4 Access Routine Semantics

open(file_path):

- output: The opened file
- exception: Invalid File if file is missing or of an incorrect type.

save(file_path, opened_note):

- output: If the Module was successful in saving opened_note to file_path
- exception: No Space if there is not enough space to save the file.

8.4.5 Local Functions

N/A

9 MIS of Geometry State Parser Module

9.1 Module

File parser takes the file input and parses it into data structure containing all shapes which is then stored by the [16](#) Geometry State Module which holds all shape data.

9.2 Uses

[16](#) Geometry State Module

9.3 Syntax

9.3.1 Exported Constants

N/A

9.3.2 Exported Access Programs

Name	In	Out	Exceptions
parse	opened_file	shapes	Invalid File

9.4 Semantics

9.4.1 State Variables

N/A

9.4.2 Environment Variables

N/A

9.4.3 Assumptions

N/A

9.4.4 Access Routine Semantics

parse(opened_file):

- output: Data structure containing all shapes from the given file.
- exception: Invalid File: if the file given is able to be parsed.

9.4.5 Local Functions

10 MIS of Geometry State Converter Module

10.1 Module

Note converter that converts notes to files of different file types, sending it to the file interface module

10.2 Uses

8 File Interface Module

10.3 Syntax

10.3.1 Exported Constants

Legal file types

- PDF
- fnote

10.3.2 Exported Access Programs

Name	In	Out	Exceptions
convert	opened_note, file_type	file	Invalid file_type

10.4 Semantics

10.4.1 State Variables

10.4.2 Environment Variables

10.4.3 Assumptions

10.4.4 Access Routine Semantics

convert(opened_note, file_type):

- output: file that is ready to be saved on the computer.
- exception: Invalid file_type if the given file type is not compatible with the ones implemented

10.4.5 Local Functions

convert_*(opened_note) functions that do the converting once the file type has been determined. (ex convert_pdf)

11 MIS of Commands Parser Module

11.1 Module

Command Parser, converts keyboard inputs into commands and passes them onto the shape mutator.

11.2 Uses

[17](#) Geometry State Mutator Module [14](#) User Preference Module

11.3 Syntax

11.3.1 Exported Constants

Command names/ids ex ctrl + s -> "C-s", d + d -> "dd"

11.3.2 Exported Access Programs

Name	In	Out	Exceptions
parse_commands	keyboard_inputs, mouse_inputs	parsed _{input}	-

11.4 Semantics

11.4.1 State Variables

N/A

11.4.2 Environment Variables

N/A

11.4.3 Assumptions

Inputs have been already cleaned by the other modules.

11.4.4 Access Routine Semantics

parse_commands(keyboard_inputs, mouse_inputs):

- output: commands, which would be used by the Geometry State Mutator Module [17](#)

11.4.5 Local Functions

N/A

12 MIS of Mode Commands Module

12.1 Module

Main Module contains the commands usable in the current mode.

12.2 Uses

N/A

12.3 Syntax

12.3.1 Exported Constants

Modes:

- normalMode
- insertMode
- visualMode
- commandMode
- lineMode
- textMode

12.3.2 Exported Access Programs

Name	In	Out	Exceptions
get_commands	mode	commands	-

12.4 Semantics

12.4.1 State Variables

N/A

12.4.2 Environment Variables

N/A

12.4.3 Assumptions

Mode given will always be a valid mode.

12.4.4 Access Routine Semantics

`get_commands(mode)`:

- output: commands that can be run in the given mode

12.4.5 Local Functions

N/A

13 MIS of Shape Interface Module

13.1 Module

Module that contains information about shapes.

13.2 Uses

13.3 Syntax

13.3.1 Exported Constants

Shapes: Types of shapes

- Rectangle
- circle
- Triangle
- Text Box

13.3.2 Exported Access Programs

Name	In	Out	Exceptions
create_shape	shape_type, points	shape	Invalid Points
move_shape	shape, new_points	-	Invalid Points

13.4 Semantics

13.4.1 State Variables

N/A

13.4.2 Environment Variables

N/A

13.4.3 Assumptions

N/A

13.4.4 Access Routine Semantics

`create_shape(shape_type, points)`:

- output: Shape with type `shape_type` using `points` for location and size.
- exception: Invalid points if the points are not possible for the type of shape.

`move_shape()`:

- transition: changes the points of the shape to the new points
- exception: Invalid points if the points are not possible for the type of shape.

13.4.5 Local Functions

N/A

14 MIS of User Preference Module

14.1 Module

User preferences, provides an interface for creating and manipulating user preferences in the system.

14.2 Uses

6 Display Interface Module 19 User Persistence Module

14.3 Syntax

14.3.1 Exported Constants

N/A

14.3.2 Exported Access Programs

Name	In	Out	Exceptions
get_command_preferences	mode	commands	-
modify	-	-	-
get_theme_preferences	-	theme	-

14.4 Semantics

14.4.1 State Variables

Command preferences: users defined commands Theme preferences: user theme preferences

14.4.2 Environment Variables

14.4.3 Assumptions

14.4.4 Access Routine Semantics

get_command_preferences(mode):

- output: Any user defined preferences for the current mode

modify():

- transition: Has the user input their preferences where the moudles saves it to a file.

get_theme_preferences():

- output: Theme preferences for the system

14.4.5 Local Functions

15 MIS of Text Buffer Module

15.1 Module

TextBuffer

15.2 Uses

Geometry State Module ([16](#))

15.3 Syntax

15.3.1 Exported Constants

None

15.3.2 Exported Access Programs

Name	In	Out	Exceptions
createText	location, text, formatting	TextID	Invalid Location
modifyText	TextID, text	-	Text Not Found
moveText	TextID, newLocation	TextObject	Text Not Found
deleteText	TextID	-	Text Not Found

15.4 Semantics

15.4.1 State Variables

text : MapTextID, TextObject

Where TextObject contains:

- position : location
- content : string

15.4.2 Environment Variables

Screen (for rendering text)

15.4.3 Assumptions

TextIDs are unique and immutable.

15.4.4 Access Routine Semantics

createText(location, text, formatting):

- transition: Text box at location with text and formatting
- output: TextID of the created text box
- exception: Invalid Location

modifyText(TextID, text):

- transition: Text in text box is modified to now contain text with formatting
- exception: Text Not Found

moveText(TextID, newLocation):

- transition: text box is moved to location.
- exception: Text Not Found

deleteText(TextID):

- transition: text box is removed from the text buffer
- exception: Text Not Found

15.4.5 Local Functions

generateTextID() : TextID

16 MIS of Geometry State Module

16.1 Module

GeometryState ([16](#))

16.2 Uses

None

16.3 Syntax

16.3.1 Exported Constants

ShapeType = Circle, Rectangle, Triangle, TextBox

LineType = Line, Arrow

16.3.2 Exported Access Programs

Name	In	Out	Exceptions
getShapes	-	SetShape	-
getText	-	SetTextBox	-
getLines	-	SetLine	-

16.4 Semantics

16.4.1 State Variables

- Shapes : SetShape
- TextBoxes : SetTextBox
- Lines : SetLine

16.4.2 Environment Variables

None

16.4.3 Assumptions

Geometry is immutable except via Geometry State Mutator Module ([17](#)).

16.4.4 Access Routine Semantics

getShapes():

- output: Data Structure containing all shapes

getText():

- output: Data structure containing all text boxes

getLines():

- output: Data structure containing all lines

16.4.5 Local Functions

None

17 MIS of Geometry State Mutator Module

17.1 Module

GeometryStateMutator ([17](#))

17.2 Uses

Undo Redo Module [18](#) Geometry State Module [16](#)

17.3 Syntax

17.3.1 Exported Constants

N/A

17.3.2 Exported Access Programs

Name	In	Out	Exceptions
addShape	shapeSpec	GeometryID	Invalid Spec
addLine	lineSpec	GeometryID	Invalid Spec
delete	GeometryID	-	Not Found
resize	GeometryID	-	Not Found
move	GeometryID, location	-	Not Found, Invalid Transform

17.4 Semantics

17.4.1 State Variables

None

17.4.2 Environment Variables

None

17.4.3 Assumptions

Mutations must be recorded by Undo Redo Module.

17.4.4 Access Routine Semantics

addShape(shapeSpec):

- transition: Adds the shape to the canvas
- output: GeometryID of the added shape
- exception: Invalid Spec if the shapeSpec is invalid

addLine(lineSpec):

- transition: Adds the line to the canvas
- output: GeometryID of the added line
- exception: Invalid Spec if the lineSpec is invalid

delete(GeometryID):

- transition: Deletes the shape/line/textbox with the given GeometryID
- exception: Not Found if the GeometryID does not exist

resize(GeometryID):

- transition: Resizes the shape/line/textbox with the given GeometryID
- exception: Not Found if the GeometryID does not exist

move(GeometryID, location):

- transition: Moves the shape/line/textbox with the given GeometryID to location
- exception: Not Found if the GeometryID does not exist
- exception: Invalid Transform if the location is invalid

17.4.5 Local Functions

None

18 MIS of Undo Redo Module

18.1 Module

UndoRedoModule ([18](#))

18.2 Uses

Geometry State Module [16](#)

18.3 Syntax

18.3.1 Exported Constants

None

18.3.2 Exported Access Programs

Name	In	Out	Exceptions
undo	-	-	Cant Undo
redo	-	-	Cant Redo
addCommand	command	-	-

18.4 Semantics

18.4.1 State Variables

- undoStack : StackCommand
- redoStack : StackCommand

18.4.2 Environment Variables

None

18.4.3 Assumptions

Commands fully capture inverse operations.

18.4.4 Access Routine Semantics

undo():

- transition: Pops command from undoStack, executes its inverse, and pushes it onto redoStack
- exception: Cant Undo if undoStack is empty

redo():

- transition: Pops command from redoStack, re-executes it, and pushes it onto undoStack
- exception: Cant Redo if redoStack is empty

addCommand(command):

- transition: Pushes command onto undoStack and clears redoStack

18.4.5 Local Functions

N/A

19 MIS of User Persistence Module

19.1 Module

UserPersistenceModule ([19](#))

19.2 Uses

User Preference Module [14](#)

19.3 Syntax

19.3.1 Exported Constants

None

19.3.2 Exported Access Programs

Name	In	Out	Exceptions
save	FilePath	-	IOException
load	FilePath	User Themes and Saves	IOException

19.4 Semantics

19.4.1 State Variables

None

19.4.2 Environment Variables

File System

19.4.3 Assumptions

File format is versioned and backward compatible.

19.4.4 Access Routine Semantics

save(commands,theme):

- transition: Saves user preferences to file at FilePath
- exception: IOException if there is an issue writing to the file

load(FilePath):

- output: User Themes and Saves loaded from file at FilePath
- exception: IOError if there is an issue reading from the file

19.4.5 Local Functions

None

References

20 Appendix

Appendix — Reflection

[Not required for CAS 741 projects —SS]

The information in this section will be used to evaluate the team members on the graduate attribute of Problem Analysis and Design.

The purpose of reflection questions is to give you a chance to assess your own learning and that of your group as a whole, and to find ways to improve in the future. Reflection is an important part of the learning process. Reflection is also an essential component of a successful software development process.

Reflections are most interesting and useful when they're honest, even if the stories they tell are imperfect. You will be marked based on your depth of thought and analysis, and not based on the content of the reflections themselves. Thus, for full marks we encourage you to answer openly and honestly and to avoid simply writing “what you think the evaluator wants to hear.”

Please answer the following questions. Some questions can be answered on the team level, but where appropriate, each team member should write their own response:

1. What went well while writing this deliverable?
2. What pain points did you experience during this deliverable, and how did you resolve them?
3. Which of your design decisions stemmed from speaking to your client(s) or a proxy (e.g. your peers, stakeholders, potential users)? For those that were not, why, and where did they come from?
4. While creating the design doc, what parts of your other documents (e.g. requirements, hazard analysis, etc), if any, needed to be changed, and why?
5. What are the limitations of your solution? Put another way, given unlimited resources, what could you do to make the project better? (LO_ProbSolutions)
6. Give a brief overview of other design solutions you considered. What are the benefits and tradeoffs of those other designs compared with the chosen design? From all the potential options, why did you select the documented design? (LO_Explores)