Software Requirements Specification

Scales

CPSC 362
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Table of Contents

1. Introduction **4**

1.1 Purpose **4**

1.2 Scope of the Problem **4**

1.3 Intended Audience **4**

2.1 User Objectives 5

2.2 Product Functions **5**

2.3 Operating Environment **5**

2.4 Similar System Information **5**

2.5 User Characteristics **7**

2.6 Design and Implementation Constraints **7**

2.7 Assumptions **8**

3. Functional Requirements **9**

3.1 The app shall display a home page 9

3.2 The app shall display a learn and play option 9
3.3 The app shall let the user select from four mathematical modules 9
3.4 The app shall generate randomized practice problems 9
3.5 The app shall have an on screen keyboard to enter answer to problems 9
3.6 The app shall provide learning examples 10
3.7 The app shall have a globally available 'back' navigation button 10
3.8 The app shall display feedback to practice problem answers 10
5.0 Non-Functional Requirements 12
6.0 Interface Requirement 13
6.1 GUI 13
6.2 Hardware Interfaces 13
6.3 Software Interfaces 14
8.0 UML Diagrams 17
8.1. Use Case Diagram 17
8.2 Activity Diagram for Play Module 18
APPENDIX A: USER OPERATIONS MANUAL 19
APPENDIX B: References and Tools Used 21

Table of Figures

1. Introduction 4
1.1 Purpose 4
1.2 Scope of the Problem 4
1.3 Intended Audience 4
2.1 User Objectives 5
2.2 Product Functions 5
2.3 Operating Environment 5
2.4 Similar System Information 5
2.5 User Characteristics 7
2.6 Design and Implementation Constraints 7
2.7 Assumptions 8
3. Functional Requirements 9
3.1 The app shall display a home page 9
3.2 The app shall display a learn and play option 9
3.3 The app shall let the user select from four mathematical modules 9
3.4 The app shall generate randomized practice problems 9
3.5 The app shall have an on screen keyboard to enter answer to problems 9
3.6 The app shall provide learning examples 10

3.7 The app shall have a globally available 'back' navigation button 10

3.8 The app shall display feedback to practice problem answers 10

5.0 Non-Functional Requirements 12

6.0 Interface Requirement 13

6.1 GUI 13

6.2 Hardware Interfaces 13

6.3 Software Interfaces 14

8.0 UML Diagrams 17

8.1. Use Case Diagram 17

8.2 Activity Diagram for Play Module 18

APPENDIX A: USER OPERATIONS MANUAL 19

APPENDIX B: References and Tools Used 21

1. Introduction

1.1 Purpose

The following document offers a description of the software requirements for our 362 group project. The document will explain the general purpose and reasoning behind our desktop application, Scales, including the software requirements and overall goals to be accomplished.

1.2 Scope of the Problem

As people transition into working and attending school from their homes, a demand for intelligent, intuitive, and simple software applications to help students learn the course material in a virtual way is needed. Scales attempts to solve this problem by creating an application for first graders to practice and learn mathematical concepts.

Scales aims to provide minimalistic and intuitive user interfaces, to provide a seamless experience such that any age and any level of technical expertise will be able to utilize the learning platform effectively. Scales does this by providing mathematical practice problems, and learning modules with only two clicks: selecting the module, and selecting the subject.

1.3 Intended Audience

The Intended Audience of this document includes Professor Lidia Morrison, and the members of our group to verify the functionality of the software. Other users include all students enrolled in CPSC 362 for Fall 2020 at California State University, Fullerton. The application is intended for first grade students and first grade teachers in need of a tool to practice and learn mathematics.

2. Overall Description

2.1 User Objectives

Scales is a desktop application that provides a platform with which a user can learn and practice first grade mathematics. With just two clicks, a user can practice or learn addition, subtraction, multiplication and division.

2.2 Product Functions

Scales is a desktop application that intends to create a learning and practicing platform that is simple enough for first graders, with no technological expertise, to utilize.

Below are the basic functions of Scales:

- Users can select and follow along with interactive learning modules
- Users can practice the mathematical concepts of the four basic operations

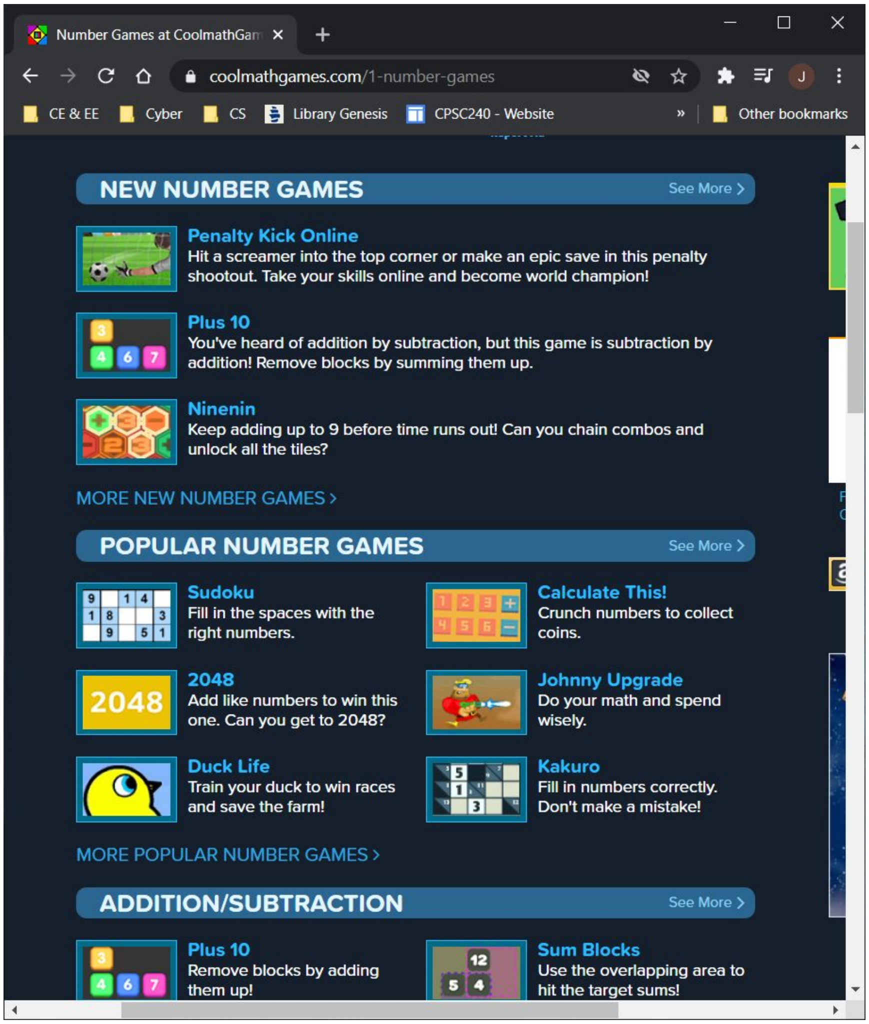
2.3 Operating Environment

Scales is a desktop application that will be developed using PyQt5 framework, a GUI development framework that enables cross platform GUI development using Python. The primary target operating system for this project is Windows 10. However, as the project is built on a cross platform framework, the app can be exported to other operating systems as well.

2.4 Similar System Information

There are websites that serve various math games for various levels of elementary students as Web Apps. These websites include mathplayground.com and coolmathgames.com.

Coolmathgames.com - A website with various math games aimed at teaching mathematics to elementary students. Scales aims to be as engaging to students as the games found on this website, however Scales seeks to avoid overly gamifying mathematics which somewhat takes away from the educational element of the game.



NEW NUMBER GAMES See More >

Penalty Kick Online
Hit a screamer into the top corner or make an epic save in this penalty shootout. Take your skills online and become world champion!

Plus 10
You've heard of addition by subtraction, but this game is subtraction by addition! Remove blocks by summing them up.

Ninenin
Keep adding up to 9 before time runs out! Can you chain combos and unlock all the tiles?

MORE NEW NUMBER GAMES >

POPULAR NUMBER GAMES See More >

Sudoku
Fill in the spaces with the right numbers.

Calculate This!
Crunch numbers to collect coins.

2048
Add like numbers to win this one. Can you get to 2048?

Johnny Upgrade
Do your math and spend wisely.

Duck Life
Train your duck to win races and save the farm!

Kakuro
Fill in numbers correctly. Don't make a mistake!

MORE POPULAR NUMBER GAMES >

ADDITION/SUBTRACTION See More >

Plus 10
Remove blocks by adding them up!

Sum Blocks
Use the overlapping area to hit the target sums!

Figure 1 Top Number Games on Coolmathgames.com

As can be seen, although some games are directly related to math, others listed on the website have no practical relation to mathematics and instead risk distracting students from the mathematical skills they purported to instill.

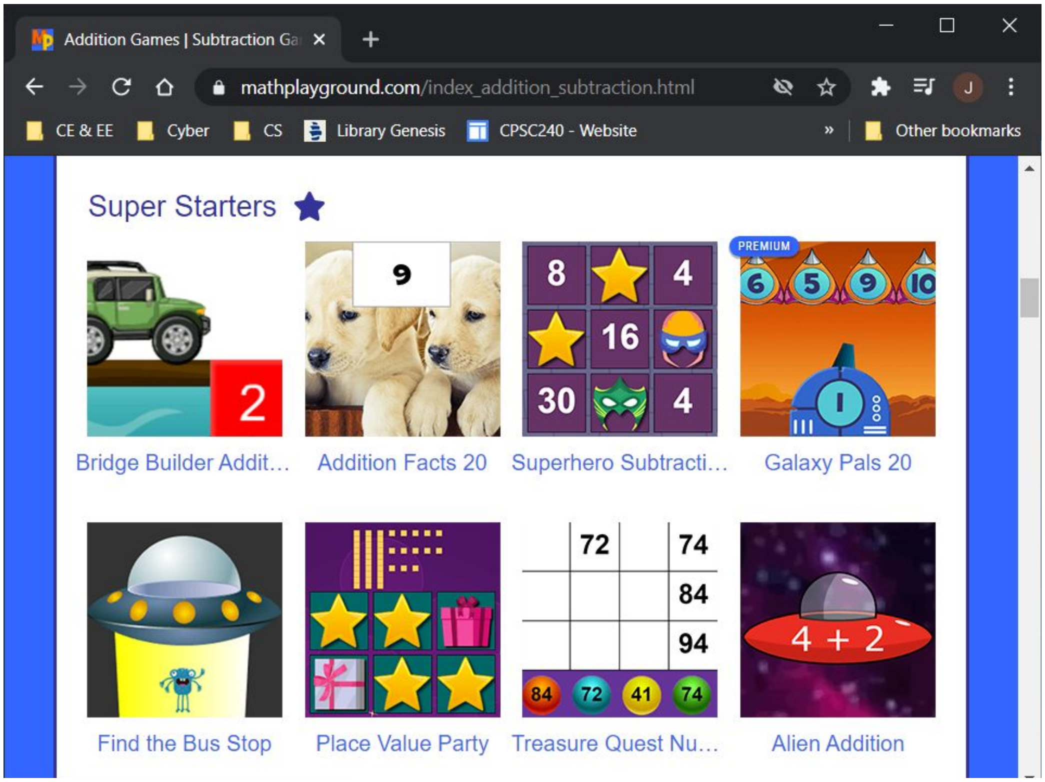


Figure 2 Top Addition Games on Mathplayground.com

2.5 User Characteristics

Scales was built with first graders in mind, however the app can be used to learn and practice mathematics at any age. No skills other than what is required for the simple operation of a computer and a mouse is needed for Scales. Optional keyboard usage is available in the practice module.

2.6 Design and Implementation Constraints

Scales is compatible with computers running Windows 10 as their operating system. The application is not intended to operate on another operating system as is, unless it is specifically re-compiled; neither is it intended to operate on a any device other than a PC.   The required input device for Scales is a mouse. The app additionally supports keyboard, but it is not necessary to use with Scales.

2.7 Assumptions

This SRS assumes that:

- Users have a prior knowledge in operating a computer running Windows 10
- Users Understand English
- Users do not have Ophidiophobia, the fear of snakes, including cartoon snakes.
- Users are able to read and understand common mathematical notations on computers (eg '+' for addition, '-' for subtraction, ' * ' for multiplication, and '/' for division.)
- A minimum estimate of 600 Mb free spaces will be required to install the app.

3. Functional Requirements

3.1 The app shall display a home page

Description: On clicking the app icon, the app will launch directly to the home page

Pre-condition: User has downloaded and installed Scales

Post-condition: The home page is displayed

3.2 The app shall display a learn and play option

Description: On the home page, learn and play buttons enable a user to pick a module

Pre-condition: User is at the home page

Post-condition: Home page renders the navigation options listed above

3.3 The app shall let the user select from four mathematical modules

Description: The app will let a user select from four different mathematical modules: addition, subtraction, multiplication and division

Pre- condition: User has selected play or learn module

Post-condition: User can then select from four different math modules

3.4 The app shall generate randomized practice problems

Description: After selecting a mathematical module from the four options, the application will randomly generate problems for the user to solve

Pre-condition: the User has selected one of the four math modules

Post-condition: Program continuously generates random math problems

3.5 The app shall have an on screen keyboard to enter answer to problems

Description: Scales will provide a UI with which the user can click to formulate an answer to the generated math problems.

Pre-condition: User is playing one of the practice modules

Post-condition: Users can click on the on-screen keyboard to enter in answers to problems.

3.6 The app shall provide learning examples

Description: When a user has navigated to a learn module, the app should display a tutorial a user can interact with by clicking next to see the next tutorial string, or back to see the previous.

Pre-condition: User has selected a learn module

Post-condition: User can click 'next' and 'back' to cycle through the instructional text

3.7 The app shall have a globally available 'back' navigation button

Description: A global back button should be available to the user in the top right corner of the screen that allows users to go back to their previously navigated screen.

Pre-condition: The user is using the scales app and has navigated away from the home screen

Post-condition: The user can continuously navigate backwards, until they've reached the home page.

3.8 The app shall display feedback to practice problem answers

Description: The application should display visual and audio feedback for a user when they have answered a question

Pre-condition: The user has answered a question to a practice problem

Post-condition: A resulting window text pop up indicating correct or incorrect, along with a corresponding audio chime

4.0 Quality Attributes for Scales

Quality Attribute	**Brief Description**
RT-1	The app shall navigate swiftly, not making the user wait more than a second between pages
RT-2	The app shal respond to answers to questions swiftly, giving feedback in under 500ms.
SS-1	The app will not collect and user data on the host system
SA-1	The app shall be available as long as it remains installed on the user's device.
AC-1	The system shall be accessible indefinitely by any operating system that installs it, as long as they do not remove it.

RT: response time

SS: system security

SA: system availability

AC: system accessibility

5.0 Non-Functional Requirements

Security:

- The system will not collect any user data whatsoever.

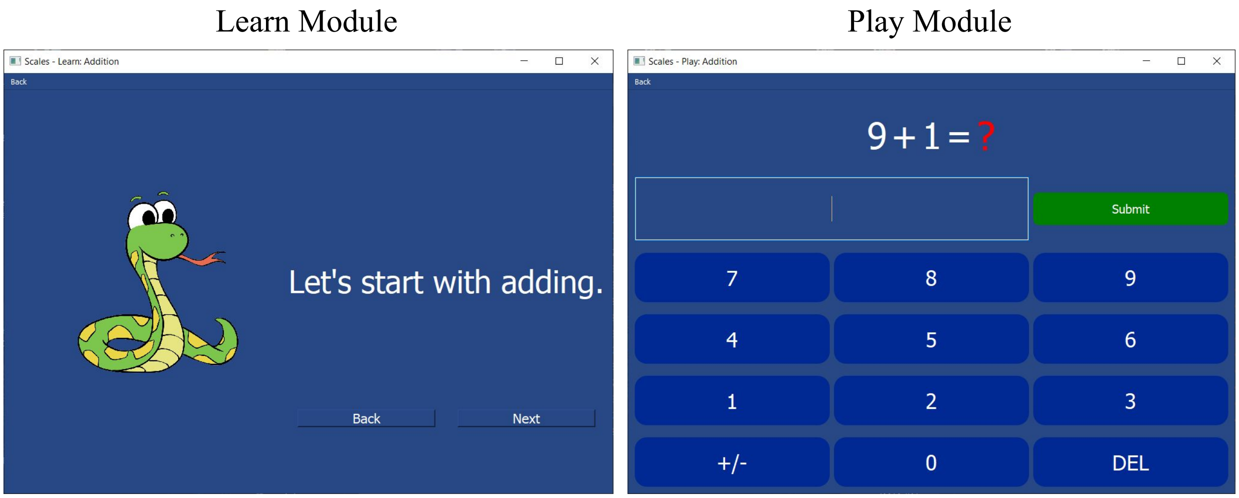
Usability:

- After starting the application the software ***will*** finish loading within 3000 milliseconds.
- When switching between screens, the system ***will*** load the next screen within 1000 milliseconds.

6.0 Interface Requirement

6.1 GUI

When the user has successfully opened the Scales app, it will immediately launch to the home screen. There they will have two options: 'Learn' and 'Play'. Clicking on either results in a similar interface: four more buttons indicating four choices - Addition, Subtraction, Multiplication and Division. Depending on the selected module from the home screen, these choices differ. Starting with the learn module, a cartoon snake and text will appear on screen. Depending on the chosen math submodule, back and next buttons will display that allows the user to cycle through some instructional text. For the play module, an on screen keyboard, text input box, submit button and a math problem appear. On submitting an answer, feedback will occur in the form of a pop up window


Learn Module

Play Module

Let's start with adding.

9 + 1 = ?

Figure 3 User Interface for Login screen and Create New Account

6.2 Hardware Interfaces

The application will function on any desktop computer with a working installation of the Windows 10 operating system. The required input device is a mouse. A keyboard may be used for the play module to input answers to practice problems, but this is not required to elicit functionality from the application.

6.3 Software Interfaces

As already stated in the "Operating Environment" section above, Scales will be developed with the cross platform PyQt5 framework using Python. The target operating system of the project will be Windows 10, but should be relatively portable so as to be executable on other operating systems.

7.0 SWOT Analysis for Scales

Strengths:

S1: Since the scope of this project is not so wide, the expected functionality of the app can be realized before the product's deadline. This means that all the functional requirements will be met.

S2: The software tools and techniques required for developing this desktop app is readily available and is within our reach.

S3: Since this project is a course work in the 362 class, it requires little or no form of financial support. Therefore we can say that this project is economically feasible.

Weakness:

W1: Due to interfacing with a framework we haven't used before, PyQT, our group cannot make code sprints as feasibly as we would with a more familiar framework.

W2: Since this is the first version of our app, it may lack features compared to other education tools already on the market

Opportunities:

O1: Nearly everyone is getting their education from their homes due to COVID-19. There is an unmet demand for educational tools to make class more interactive.

O2: This project allows us to learn proper methods for constructing a software project, as well as learn new technologies required for building the product.

Threats:

T1: Some frameworks make it easier and faster to build user interfaces with python, such that others may have more robust features as they are able to produce working products faster.

T2: There are already education apps on market, as well as exclusive deals between software creators and education leaders. This makes it difficult to elicit adoption of our application, as most students will already have access to a similar application.

8.0 UML Diagrams

8.1. Use Case Diagram

While on the main application screen, the user is presented with 2 options which allow the user to navigate to the respective modules. When either of the two options are clicked, the resulting screens are similar: four submodules in the form of math subjects (addition, subtraction, multiplication, and division). If the Learn module is initially selected, a tutorial screen is shown; if the Play module is selected, math problems are shown.

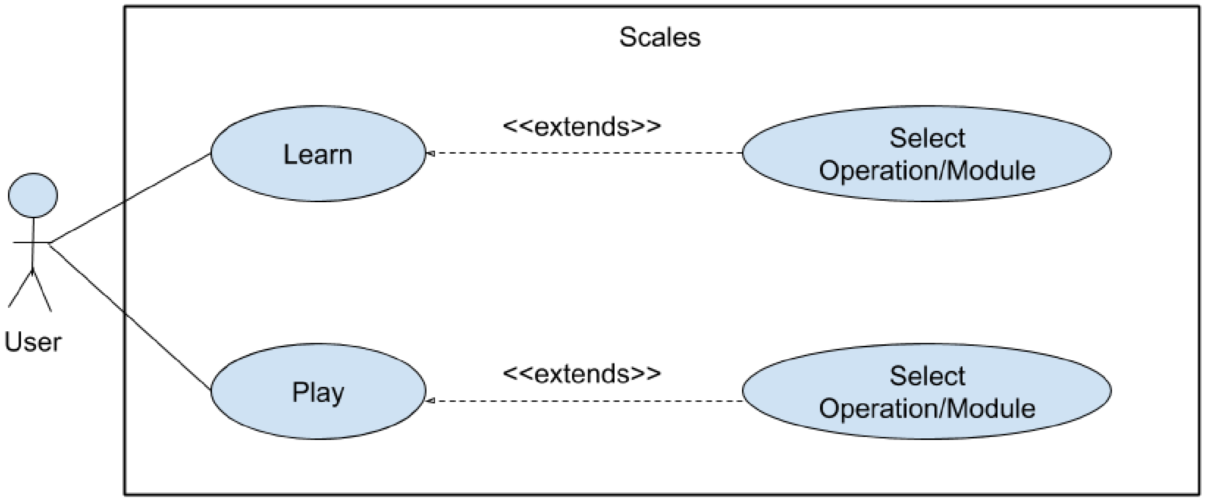


Figure 4 Use Case diagram for Scales

8.2 Activity Diagram for Play Module

The activity diagram shows a description of the processes involved in interaction with the play module. Users will need to answer a question to be provided feedback.

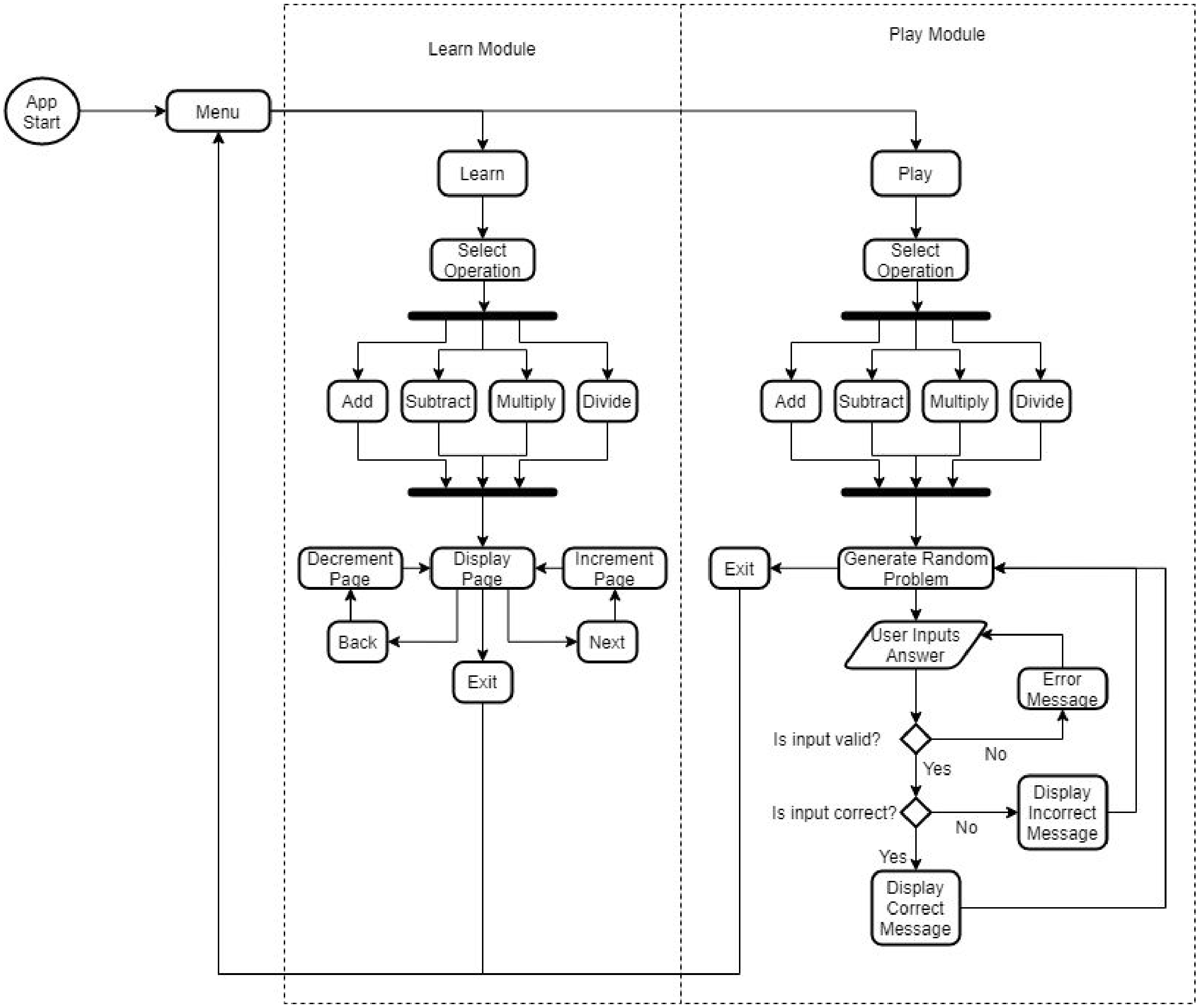


Figure 5 Activity Diagram for Use Case Learn and Play

APPENDIX A: USER OPERATIONS MANUAL

This section of this document provides an understanding of how to use the Scales app.

1. **Running** - On the Windows 10 operating system, assuming the user has already followed the installation instructions provided in the README.MD file, the user will simply need to open a command line in the directory of the files, and enter "python App.py."

2. **Home Screen** - On loading the application, the home screen will display.

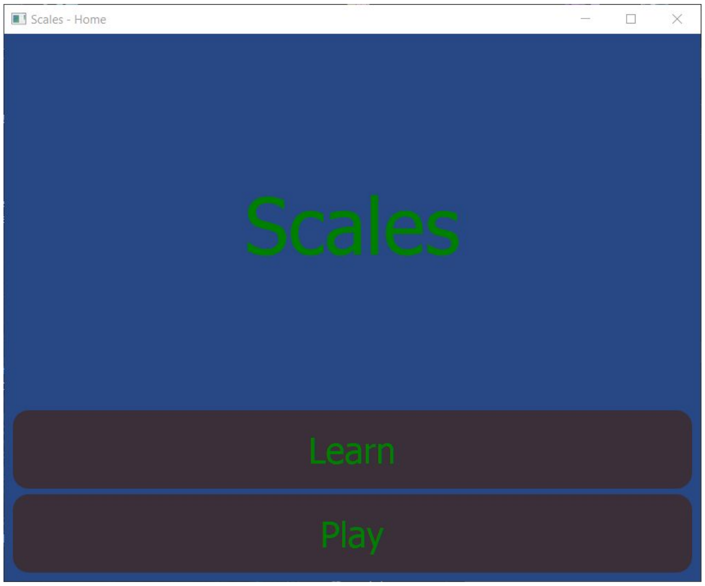


Figure 6 Screenshot of the Home Screen

3. **Module Selector** - Select subject for the selected module.

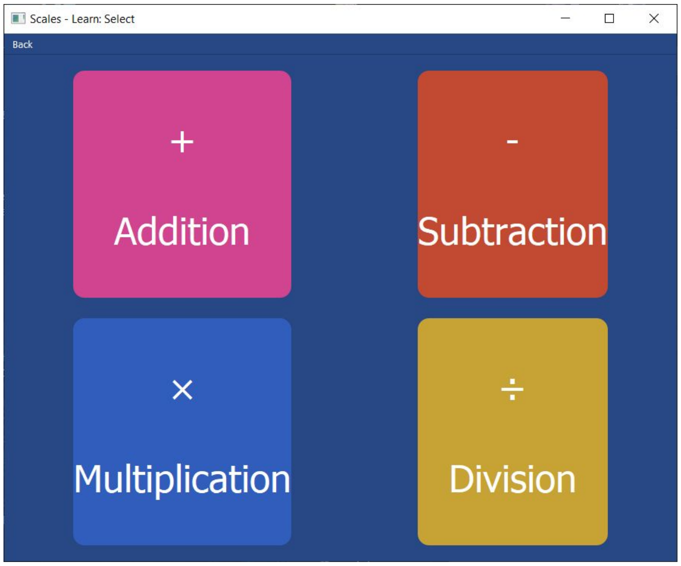
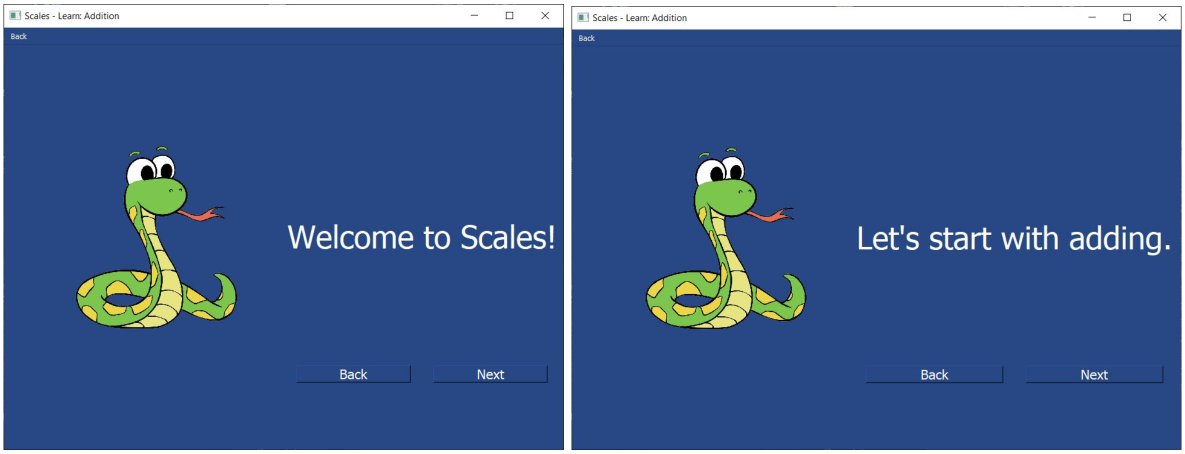


Figure 7 Screenshot of the module selector

4. **Learn Module** - An interactive tutorial displays upon selection of a module

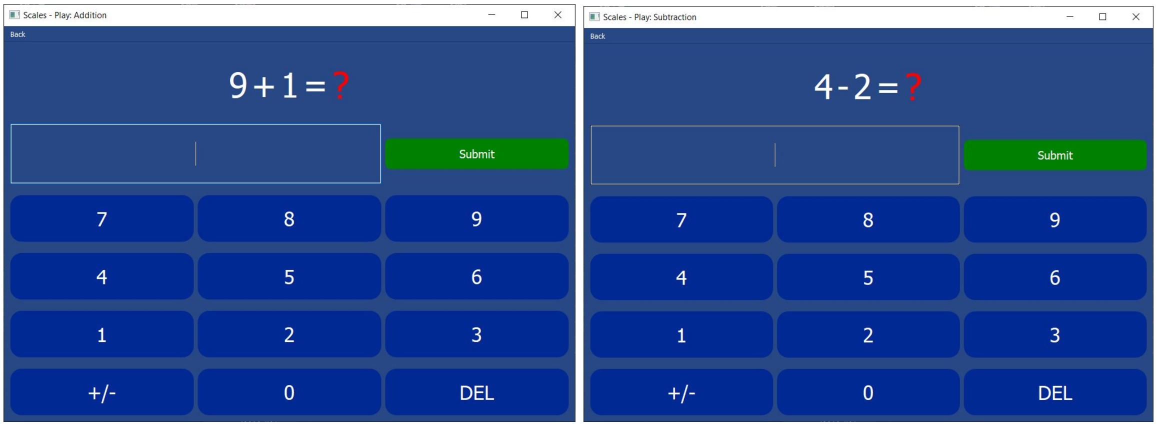


Welcome to Scales!

Let's start with adding.

Figure 8 Screenshot of the Addition Learning Module

5. **Play Module** - Upon selection of a play module, math problems are displayed on screen



9+1=?

4-2=?

Figure 9 Screenshot of the Addition and Subtraction Play Modules

APPENDIX B: References and Tools Used

References

Lecture Notes and Slides by Lidia Morrison

SRS Example posted by Lidia Morrison

Tools Used

The following tools were used for developing this SRS and drawing all UML diagrams

- Google Docs
- Google Drawings
- Diagrams.net