Project Report for D2

SOEN 6481
Software Systems Requirements Specification
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ETERNITY: NUMBERS

Zan Wang

Student ID: 27779704

Contents

Abstract

Along with fast development of human society, it emerges lots of revolution in various territories. The development of traditional regular calculator is just one of them that is under great challenge. People are not only satisfied with the default process to obtain results from using traditional regular calculator, but desire for a more convenient and efficient solution. The widely used solution based on regular calculator with its design of scientific mode, therefore attracts lots of people's attention. Hence, how to validate the scientific number and the scientific mathematical calculation and decent user-device interaction experience become crucial topic for calculator designer. To better serve to this goal here, a simple but efficient calculator design with several specific scientific calculation function with scientific number (PI), is used to model and verify a scientific calculator.

The whole project report for deliver 2 is organized as follows: the section of introduction gives the general topics that the report discusses here; the first chapter, User Stories regarding problem 6, presents the user stories elicited from user's requirements and for each use case, as well as their acceptance test cases; the second chapter regarding problem 7, shows the backward traceability matrix for each user story and its related information; the third chapter, Java scratch for problem 8, demonstrates the coding work to implement the user stories.

Keywords: user stories, traceability, implementation

1. Introduction

In the report of delivery 1, a simple design for a math/scientific calculator similar to most regular calculator in market was introduced. It supports functions for both regular calculation and scientific number calculation regarding PI. Enter a formula by typing on the keyboard. Type in the formula as you would say it, then press "=" button.

In this report for deliver 2, we are going to discuss three topics: user stories, backward traceability matrix and function implementation by coding.

1.1 User Stories

When a user story is completed and working, acceptance test is a series of test cases that determine if requirements elicited from user stories are satisfied. Before user stories are marked as "done", all test cases must be fulfilled so that they are ensured that the user stories work as planned and tested.

1.2 Traceability Matrix

Requirements Traceability Matrix helps to ensure that all the requirements will be covered in the tests. Traceability Matrix is usually in tabular format as it holds multiple to and fro relationships between requirements and test cases. It is a document which is used to validate that all the requirements are linked to test cases.

1.3 Implementation

Functions derived from each use case are implemented through coding by Java.

2. User Stories: Problem 6

2.1 Definition

User stories reflect what a particular class of user needs and the value to be gained. They describe pieces of functionality from a user's point of view, expressed in a solid, compact way. Each user story will have one or more acceptance tests. These tests typically cover a high level test scenario.

2.2 User Stories Description

Here, based on the perspective of maintainability or usability, 8 user stories are elicited from persona and interview discussion. Each use story has several acceptance criteria.

User Story Identifier and Name	US-1: Get PI
User Story Statement	As a calculator user, I want to find one exclusive button for PI, so that I can use PI for various mathematic calculation directly.
Constrains	1. The PI value gained from the system must be corrected to fourteen digit places. 2. System response time for calculating PI must $<$ 500ms.
Acceptance Criteria	1. User can turn on calculator by pressing "start" button 2. The cursor will shine on the screen waiting for interaction from user. 3. Then user can press "PI" button. 4. The approximate PI value should be displayed on screen.
Priority	High
Estimate (in Story Points)	3

Table 2.1: User Story 1

User Story Identifier and Name	US-2: Calculate Circular Area
User Story Statement	As a calculator user, I want to have a quick button for circular area calculation, so that I can reach an area of a specific circular by giving its radius number only.
Constrains	1. The circular area value must correct to fourteen digit places; 2. System response time for calculating area must $<$ 700ms
Acceptance Criteria	1. User can turn on calculator by pressing "start" button. 2. The cursor will shine on the screen waiting for interaction from user. 3. User choose to press "shift" button to switch to scientific calculation mode. 4. Then user can input the radius value for the target circular. 5. User can hit "area" button to get the result of circular area calculation. 6. The area of the target circular should be displayed on screen
Priority	High
Estimate (in Story Points)	5

Table 2.2: User Story 2

User Story Identifier and Name	US-3: Calculate Circular Circumference
User Story Statement	As a calculator user, I want to have a quick button for circular circumference calculation, so that I can reach a circumference of a specific circular by giving its radius number only.
Constrains	1. The circular area value must correct to fourteen digit places; 2. System response time for calculating area must $<$ 700ms
Acceptance Criteria	1. User can turn on calculator by pressing "start" button 2. The cursor should shine on the screen waiting for interaction from user. 3. Then user can press "shift" button to switch to scientific calculation mode. 4. Then user can input the radius value for the target circular. 5. User can hit "ccf" button to get the result of circular circumference calculation. 6. The circumference of the target circular should be displayed on screen
Priority	High
Estimate (in Story Points)	5

Table 2.3: User Story 3

User Story Identifier and Name	US-4: Recall Last 10 Results
User Story Statement	As a calculator user, I want to find one exclusive button for historical results calculated previously, so that I can use them for the on-going calculation directly.
Constrains	1. The memory should be able to store 20 records automatic update to the latest 10 results up to now. 2. All stored results must correct to fourteen digit places; 3. System response time for calculating area must $<$ 300ms
Acceptance Criteria	1. User can turn on calculator by pressing "start" button 2. Cursor should shine on the screen waiting for interaction from user. 3. Then user will inject at least 10 results in calculator memory. 4. User can press "RC" button. 5. Last 10 historical results should be displayed on screen.
Priority	Medium
Estimate (in Story Points)	5

Table 2.4: User Story 4

User Story Identifier and Name	US-5: Calculate Special Number
User Story Statement	As a calculator user, I want to find one exclusive button for shifting to from regular calculation to scientific calculation, so that I can access the area or the circumference of a circular.
Constrains	N/V
Acceptance Criteria	1. User can turn on calculator by pressing "start" button. 2. Cursor should shine on the screen waiting for interaction from user. 3. Then user will press "shift" button to switch to scientific calculation mode. 4. Calculator should wait for user to enter necessary parameter such as radius, to begin calculation
Priority	Medium
Estimate (in Story Points)	3

Table 2.5: User Story 5

User Story Identifier and Name	US-6: Calculate Regular Number
User Story Statement	As a calculator user, I want to make basic arithmetic calculation once I turn on the calculator, so that I can process regular number calculation easily.
Constrains	N/V
Acceptance Criteria	1. User can turn on calculator by pressing "start" button. 2. Cursor should shine on the screen waiting for user to enter regular numbers and operators to begin calculation
Priority	High
Estimate (in Story Points)	3

Table 2.6: User Story 6

User Story Identifier and Name	US-7: Input regular number
User Story Statement	As a calculator user, I want to make basic arithmetic calculation once I turn on the calculator, so that I can process regular number calculation easily.
Constrains	1. System can read valid digit number exclusively
Acceptance Criteria	1. User can turn on calculator by pressing “start” button. 2. Cursor should shine on the screen waiting for user to enter regular numbers and operators to begin calculation
Priority	High
Estimate (in Story Points)	3

Table 2.7: User Story 7

User Story Identifier and Name	US-8: Input radius value
User Story Statement	As a calculator user, I want to input circular radius directly from calculator under special number calculation mode, so that I can have the calculation results for circular area or circular circumference conveniently.
Constrains	1. System can read valid digit number exclusively
Acceptance Criteria	1. User can turn on calculator by pressing “start” button. 2. Cursor should shine on the screen waiting for interaction from user. 3. Then user press “shift” button to switch to scientific calculation mode. 4. User can input the radius value for the target circular. 5. Calculator should wait for user to press “ccf” or “area” button to complete calculation
Priority	High
Estimate (in Story Points)	3

Table 2.8: User Story 8

3. Traceability Matrix: Problem 7

3.1 Test Cases of User Stories

TC-1	Turn on calculator by pressing “start” button
TC-2	Cursor shining on the screen waiting for interaction from user
TC-3	“PI” button for getting PI number properly functions
TC-4	Screen properly displays results and numbers
TC-5	“shift” button properly functions
TC-6	radius value input by users accepted by calculator correctly
TC-7	“area” button for getting circular area properly functions
TC-8	“ccf” button for getting circular circumference properly functions
TC-9	”RC” button for getting 10 historical results properly functions
TC-10	”=” button for getting calcualtion resluts properly functionsn

Table 3.1: Acceptance Test Cases

Test Case ID / User Story ID	1	2	3	4	5	6	7	8	9	10
US-1	X	X	X	X						
US-2	X	X		X	X	X	X			
US-3	X	X		X	X	X		X		
US-4	X	X		X					X	
US-5	X	X		X	X					X
US-6	X	X		X						X
US-7	X	X								
US-8	X	X			X	X				

Table 3.2: Backward Traceability Matrix 1

User Story ID	Use Case ID and Name	Interview Question No.
US-1	UC-1 Get PI	6
US-1	UC-2 Calculate Circular Area	7
US-3	UC-3 Calculate circular circumference	7
US-4	UC-4 Recall Last 10 Results	7
US-5	UC-5 Calculate Special Number	N/V
US-6	UC-6 Calculate Regular Number	N/V
US-7	UC-7 Input Regular Number	N/V
US-8	UC-8 Input Radius Value	N/V

Table 3.3: Backward Traceability Matrix 2

4. Implementation: Problem 8

4.1 Code for Main User Stories
4.2 Results

5. Conclusion

6. Future Work