

The Universal Parabolic Constant Eternity Numbers (D2)

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Project Repository [**https://github.com/Ferosnow95/SOEN6481**](https://github.com/Ferosnow95/SOEN6481)

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Chapter 1

User Stories

Project based user stories are created to try and comprehend the scope of the project's base user requirements . As one of the prerequisites for the project report, The following initial User stories were created so characterize the user requirements for the calculator and its overarching functionalities,

There are **two global constraints** for the UPCcalculator,

1. All of the processed results for **Arithmetic operands** should output for in at least 2 Decimal places.
2. All output displays of the calculator should be defined and formatted with consistency to allow users recognise outputs more easily.

User Stories are prioritize based on the hypothesized domain knowledge of the concrete architecture of a calculator and the actual user requirements for the UPC Calculator a illustrated in the previous deliverable , Variables such functional dependencies also contributed to the prioritization decisions to streamline the implementation process and conserve time. The **Fibonacci Sequence** was used for user story estimation.

1.1 US1 - Select and allow Numerical input

US1 - Select and allow Numerical input	
Story ID	US1
Priority	HIGH
Description	As an user of calculator, I want to easily input digital numerical numbers of my choosing so that I can perform the calculations I want.
Acceptance Test	I know I'm done when I press the displayed number is equal to the numerical press on the keyboard
Acceptance Criteria	The user should be able to input the numbers using the keyboard or a numeric pad.
Estimate	5 points
Constrains	The display cannot start from 0 ie Input 01 = "1"
Implementation	User Story Implemented

1.2 US2 - Select Operands for Arithmetic Calculations

US2 - Select Operands for Arithmetic Calculations	
Story ID	US2
Priority	HIGH
Description	As an user of calculator, I want to be able to chose form a selection of all the Arithmetic mathematical operations so that I can perform my calculations
Acceptance Test	I know I am done When the operations related to the selected opened is displayed and available for selection <ol style="list-style-type: none"> 1. Add Operand : $1+1=2$ 2. Subtract Operand : $2-2=0$ 3. Divide Operand : $4/2=2$ 4. Multiply Operand: $2*2=4$
Acceptance Criteria	The User should be able to see and select their desired arithmetic operands when the calculator asks them to do so.
Estimate	8 points
Constrains	The selection display should be legible line after line
Implementation	User Story Implemented

1.3 US3 - Calculate the Universal Parabolic Constant

US3 - Calculate the Universal Parabolic Constant	
Story ID	US3
Priority	HIGH
Description	As an user of calculator, I want the calculator to allow the user Universal Parabolic Constant as a constant so that I can utilize it in my calculations/functions
Acceptance Test	I know I am done when, I press the "P" constant and the output is approximately "2.29558714939"
Acceptance Criteria	The user should be able to press the button "P", to get the constant output
Estimate	13 points
Constrains	The calculator should accurately display at least 10 Decimal places when showing the results
Implementation	User Story Implemented

1.4 US4 - Calculate the approximate distance from arc of parabola

US4 -Calculate the approximate distance from arc of parabola	
Story ID	US4
Priority	HIGH
Description	As an user of calculator, I want to be able calculate the Arc distance from my entered point utilizing the Universal parabolic constant so that, I can get the approximate distance to the arc extreme from the point.
Acceptance Test	I know I am done when, When the result output is within the range of the the actual approximate distance.
Acceptance Criteria	<ol style="list-style-type: none"> 1. The user should be able to press the function button "S" to initiate the function. 2. The user should be able to enter the their distance point that needs to be calculated.
Estimate	5 points
Constrains	The result output should be displayed as per the selected input unit.
Implementation	User Story Implemented

1.5 US5 - Calculate the approximate Surface Area

US5- Calculate the approximate Surface Area	
Story ID	US5
Priority	LOW
Description	As an user of calculator, I want to be able to calculate the approximate surface area within a simulated arc utilizing the Universal parabolic constant so that, I can get the approximate surface area covered by the arc.
Acceptance Test	I know I am done when, When the result output is within the range of the the actual average area.
Acceptance Criteria	<ol style="list-style-type: none"> 1. The user should be able to press the function button "Ar" to initiate the function 2. The user should be able to enter the their axis points for the area to be calculated.
Estimate	8 points
Constrains	The calculator should accurately display atleast 10 Decimal places when showing the results.

1.6 US6 - Generate area of surface constant (X-Axis)

US6 - Generate Area of surface constant	
Story ID	US6
Priority	LOW
Description	As an user of calculator, I want to be able to press a button to generate the area constant of the Universal parabolic constant In order to utilize it in further calculations.
Acceptance Test	I know I am done when, I press the "A(x)" constant button and the output is approximately "14.4235994"
Acceptance Criteria	The user should be able to press the button "A(x)", to get the constant output.
Estimate	5 points
Constrains	The calculator should accurately display atleast 10 Decimal places when showing the results

Chapter 2

Backwards Tractability Matrix

Tractability is useful element in SRS documentation which allows development teams to analyse documentations and trace problems to their initial inceptions, as one of the requirements for this project's documentation process, enlisted user stories are back traced to their initial sources to allow reliable context to their eventual implementations

The following table illustrates the active sources utilized for the creation of the user stories and eventually for the functionalities embedded in the UPC calculator.

Sources Descriptions

Deliverable 1 Domain and Use Case Modelling

Interview: Source: (D1) Haneen Zafar Iqbal.

Online Sources: Universal Parabolic Constant Applications Analysis[2]

	Interviewee	Online Sources	Domain Modal	Use Case
US#1			✓	✓
US#2			✓	✓
US#3	✓	✓	✓	✓
US#4	✓	✓	✓	✓
US#5	✓	✓		
US#6		✓		

Chapter 3

Implementation

The Universal Parabolic (**UPC calculator**) calculator is implemented in the form of an conditional based calculator, where the user can perform calculations based on their selection of parameters/operands. The calculator also utilizes the Universal parabolic constant to calculate the approximate point distance from a parabolic arc. both of which are implemented from scratch in JAVA without the use of any library functions. executable JAR files can be found side the source code, to allow an easier analysis of the calculator's functions.

The Source of the calculator can be found on the linked repository [3] or attached to this document in a later section. Furthermore,

3.1 User Stories Implemented

The following user stories were implemented in the UPC calculator, the User story selections were based purely on prioritization hierarchy of the stories, the functional requirements and the overall domain requirements of a calculator's core functionalities.

1. **US1** - Select and allow Numerical input
2. **US2** - Select Operands for Calculations
3. **US3** - Calculate the Universal Parabolic Constant
4. **US4** - Calculate the average distance from arc of parabola

3.2 Acceptance Testing

The user stories acceptance tests were conducted in code using a sandbox implementation of **Junit (Unit Testing)** for every core calculator class. this was done to streamline the testing process of the calculator's functions and allow easier future development/analysis of the UPC calculator.

3.3 Code Structure

The java implementation was I done ion the utilizing the memento design pattern. all of the calculator's functions were dedicated to their on method classes to allow for easier code maintainability and reuse ability and the momentocache Class was utilized to store the users numbers temporally for calculation and result purposes.

3.4 Additional Functionalities

The calculator features a error handler to allow the user to reenter their selections even if they make mistakes, furthermore additional UI formation was done to the output of the calculator to allow the users with ease of user when using the calculator and understanding the results.

Chapter 4

References

[1] **Reese, Sylvester and Sondow**, Jonathan. "Universal Parabolic Constant." From MathWorld—A Wolfram Web Resource, created by Eric W. Weisstein.
<http://mathworld.wolfram.com/UniversalParabolicConstant.html>

[2] *Calculator Function Keys*
<https://docs.oracle.com/cd/E19455-01/806-2901/6jc3a4lu1/index.html>).