

Canvas Graph Project Document

Group: Canvas Graph

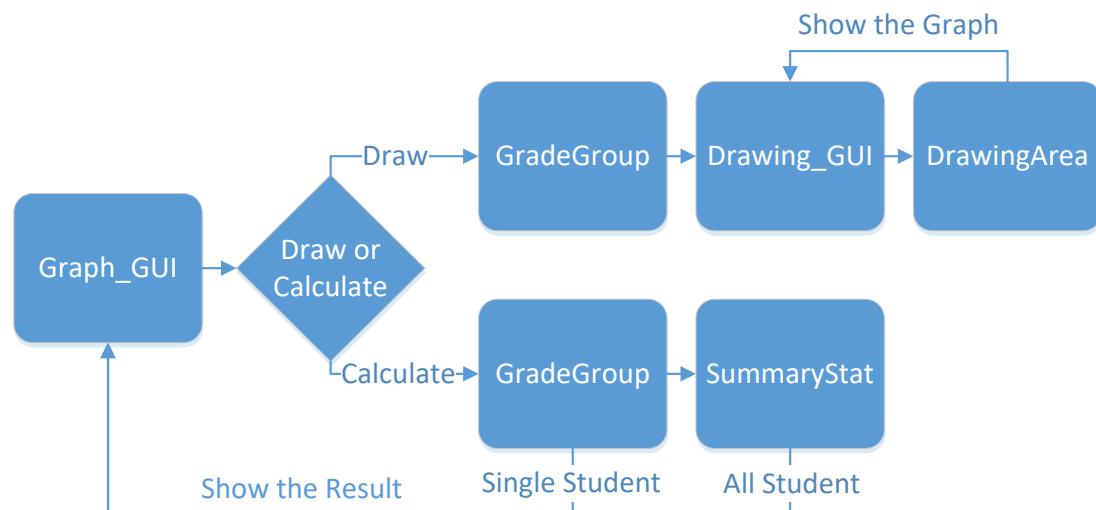
Program Language: Java

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Date: 12/16/2016

Introduction

The goal of our project is to design a program that generates graphs and shows summary statistics of various assignments, quizzes, tests and projects, and we also can save the graph to designated path.



GUI

In the GUI part, there are two major parts. The left one will show the summary statistics. The right one is the selection area. We can decide:

- (1) what kind of assignment, all assignment or one assignment, and its name;
- (2) all student or single student, and his ID;
- (3) what kind of graph;
- (4) the width of the group.

There are also two buttons. We can show the summary statistics by pressing the “Calculate” and show the graph by pressing the “Draw”.

There are some menu on the top. We can save the graph to designated path, and exit.

The screenshot shows a window titled "Graph GUI" with a menu bar containing "File". The main area is divided into two columns of input fields and two buttons at the bottom.

Assignment Type:	Graph Type:
<input type="radio"/> Assignment	<input type="radio"/> Histogram
<input type="radio"/> Quiz	<input type="radio"/> Pie Chart
<input type="radio"/> Test	Graph Option:
<input type="radio"/> Project	Width of Group: 10
<input type="radio"/> All	<input type="text"/>
Assignment Num:	Student Num:
<input type="radio"/> All Assignment	<input type="radio"/> All Student
<input type="radio"/> One Assignment	<input type="radio"/> Single Student
Assignment Name:	Student ID:
<input type="text"/>	<input type="text"/>
<input type="button" value="Calculate"/>	<input type="button" value="Draw"/>

Summary statistics

Our program can show the summary statistic for a category of assignments or all the assignments, and show the details of each category of assignment for single student.

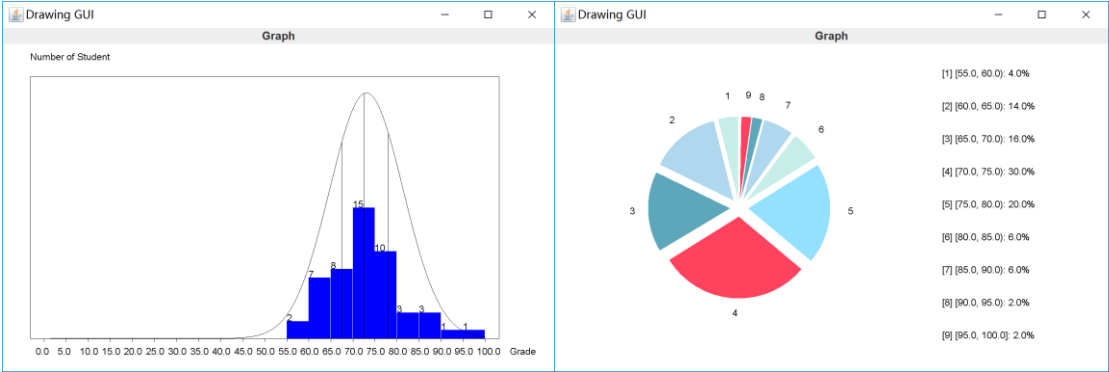
<p>Graph GUI</p> <p>File</p> <p>50 students participate in the exam</p> <p>Highest score: 100.0</p> <p>Lowest score: 30.0</p> <p>Average: 65.1</p> <p>Variance: 275.4900000000001</p> <p>Standard Deviation: 16.59789143234767</p> <p>Median: 67.5</p> <p>Mode(s): [65, 70]</p>	<p>Graph GUI</p> <p>File</p> <p>Grade:</p> <p>Student: 1</p> <p>Assignment: 76.5</p> <p>Quiz: 85.0</p> <p>Test: 81.0</p> <p>Project: 39.0</p> <p>All: 63.25000000000001</p>
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Graph

Our program could also display distribution of grades using histograms and pie chart (for an individual assignment, test, quiz or project, and for a category of assignments, tests, quizzes or projects and for all of them with different weights).

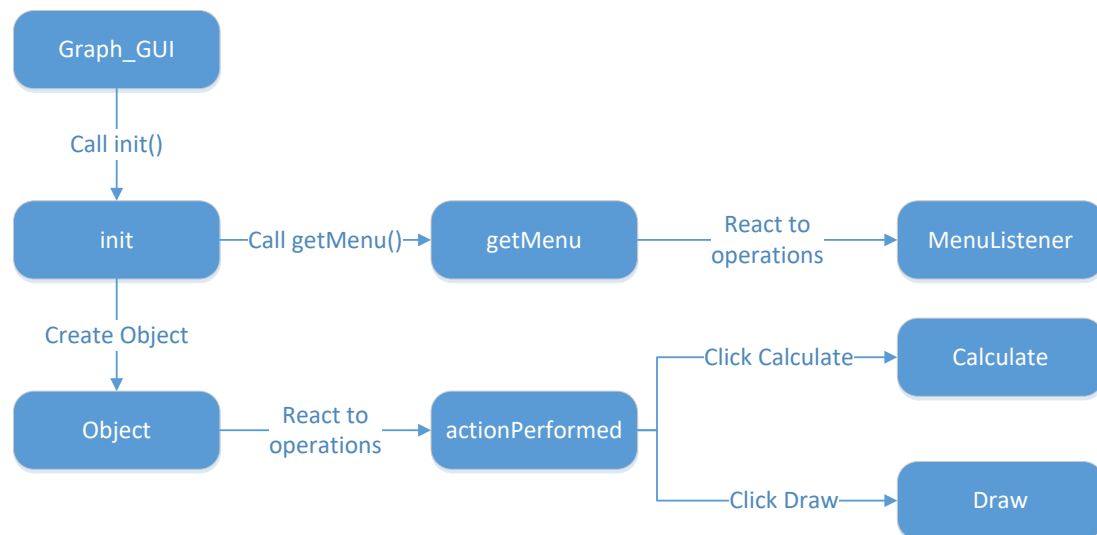
The left one is a histogram plot of our sample scores. We can change width of bands to get different graphs. And the curve in this graph is the normal distribution calculated through the variance and mean of our sample scores.

The right one is a pie chart of our sample scores. It illustrates numerical proportion of different score groups.



Part 1: Graph GUI

For the Graph GUI class, we have public methods of the constructor `Graph_GUI()`, the initiation function `init()`; `actionPerformed(ActionEvent e)` shows how the program reacts to the operations done by the user (like selecting a radio button or pressed a button), and it will also call functions to handle with data and draw the graph; `getMenu()` will set the menu and menubar; public class `MenuListener` which make us be able to react to the operation on menu.



Graph_GUI:

(extends `Jframe` and implements `ActionListener` and `AdjustmentListener`)

Holding private elements for GUI.

Setting the basic setup of the GUI window.

Calling `init` function.

`init`:

Calling `getMenu` function, and set the return result as the menubar.

Setting up all buttons' colors, names, positions, font, and add `actionListener` to them.

Setting the input and output textfield on the GUI.

Placing all buttons and textfield on GUI.

`getMenu`:

Setting up all options' colors, names, font, and add `actionListener` to them.

`MenuListener`:(implements `ActionListener`)

Setting what should be done when "exit", "save", "open" operations are clicked.

`actionPerformed`:

Getting the input from textfield and buttons.

Calling corresponding functions or methods.

Part 2: SummaryStat

The SummaryStat class calculates the following statistics:

- (1) mean: the average of all the scores in a certain task.
- (2) mode: the most frequently appeared score(s) in a certain task.
- (3) median: The "median" is the "middle" value in the list of scores.
- (4) variance: variance is the expectation of the squared deviation of a random variable from its mean, and it informally measures how far a set of numbers are spread out from their mean.
- (5) standard deviation: it is the square root of variance. A low standard deviation indicates that the scores tend to be close to the mean (also called the expected value) of the scores, while a high standard deviation indicates that the scores are spread out over a wider range of values.
- (6) lowest score and highest score.

The methods in this class are listed as follow:

count(ArrayList<Double> list): get the number of students who has a score in a certain task.

min(ArrayList<Double> list): calculate the minimum score

max(ArrayList<Double> list): calculate the highest score

average(ArrayList<Double> list): calculate the average score

median(ArrayList<Double> list): calculate the median score

mode(final ArrayList<Double> list): find the mode(s) in a list of score

variance(ArrayList<Double> list): calculate variance

StdDev(ArrayList<Double> list): calculate standard deviation

Part3: Graph

Class:

Drawing_GUI, DrawingArea, (abstract) Shape, Rect, Arc, Line, Str.

Method:

In the Drawing_GUI class, there are 2 methods, one is constructor, and the other is save().

The constructor sets up the GUI window to show the graph, and create DrawingArea object to draw the graph.

The save() method is to call the saveImage method in DrawingArea to save the graph.

In the DrawingArea class, there are 9 methods, they are constructor, paint(), drawingHistogram(), drawingPie(), clear(), variance(), average(), Gauss() and saveImage().

The constructor gets the parameters from Drawing_GUI.

The paint() sets up the background of the graph, decides to call drawingHistogram() or drawingPie() and paint the shapes on the graph.

The drawingHistogram() is to draw the histogram and distribution and save the graph into BufferedImage.

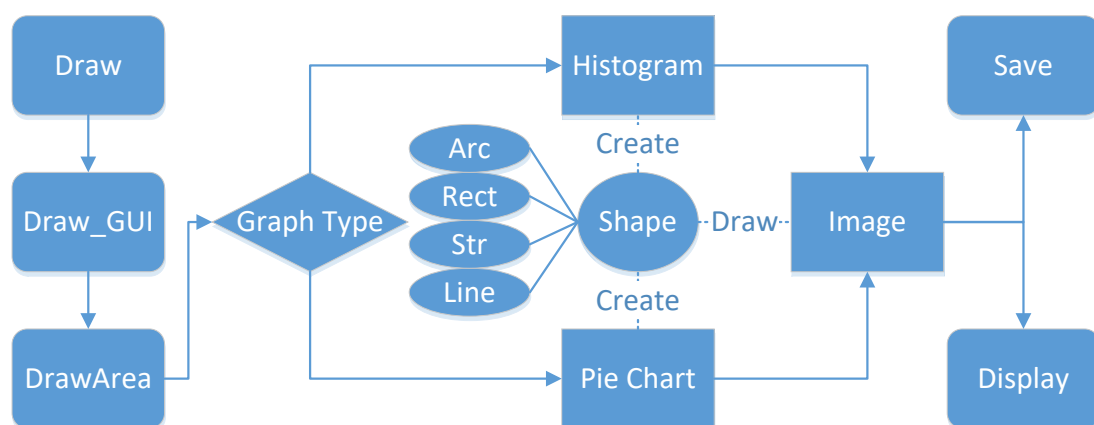
The drawingPie() is to draw the pie chart and save the graph into BufferedImage.

The clear() is to clear the graph.

The variance(), average(), Gauss() are to calculate the variance, average, distribution.

The saveImage() is to save the graph to designated path.

In the Shape, Rect, Arc, Line, Str classes, they are used to draw the histogram and pie chart.



Part 4: Grade

Class:

GradeGroup.

Method:

In the GradeGroup class, there are 12 methods. They are two constructors, `getStudentFile()`, `getAllGradeFile()`, `getMultiGradeFile()`, `getSingleGradeFile()`, `cal()`, `getNum()`, `getGrade()`, `getDone()`, `getFull()`, `getStr()`.

One constructor is called by draw, the other is called by calculate. They decide which kind of grade do they want to get.

The `getStudentFile()` is to get the grade of single student and all assignments.

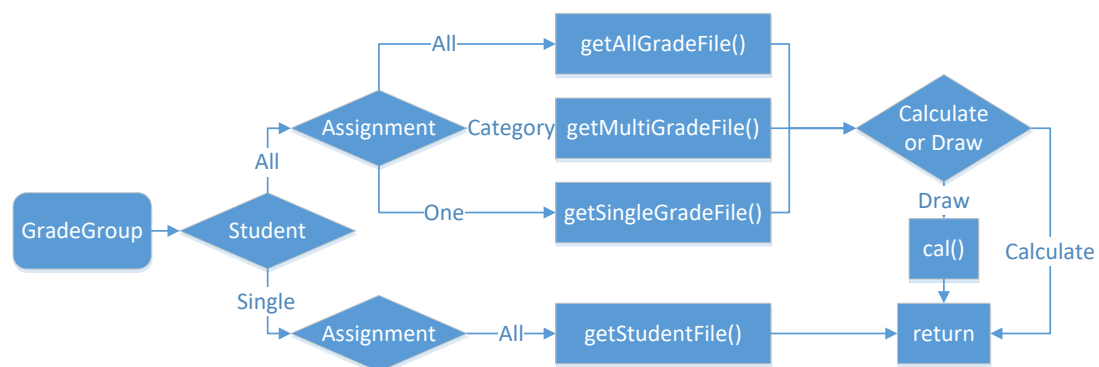
The `getAllGradeFile()` is to get the grade of all students and all assignments.

The `getMultiGradeFile()` is to get the grade of all students and a category of assignments.

The `getSingleGradeFile()` is to get the grade of all students and one assignment.

The `cal()` is to calculate how many students are there in every grade group.

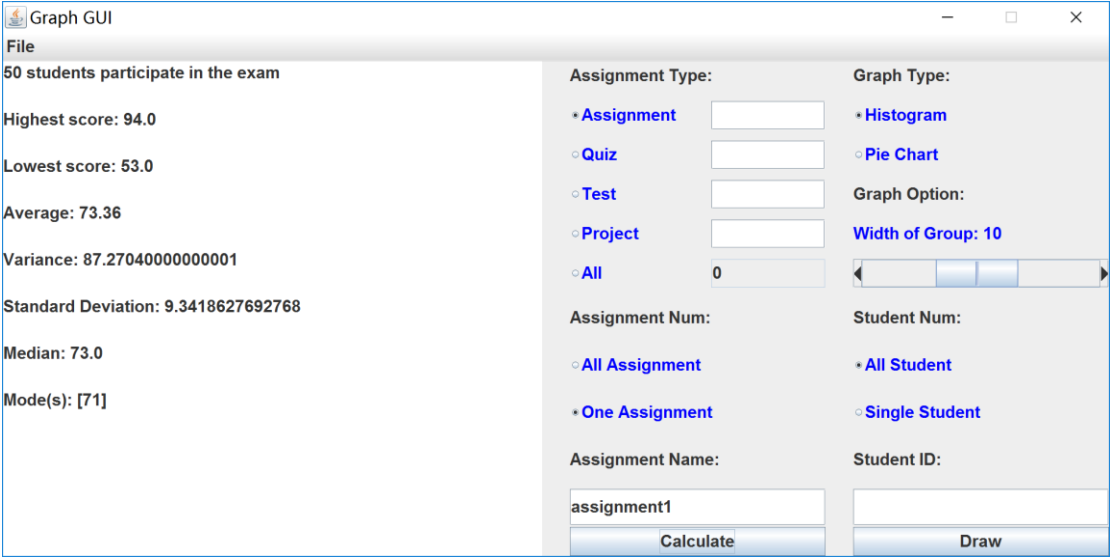
The `getNum()`, `getGrade()`, `getDone()`, `getFull()`, `getStr()` are to return the numbers of students in each group, the grade, whether the calculation is done, the fullscore of this grade and the StringBuffer of one student and all assignments.



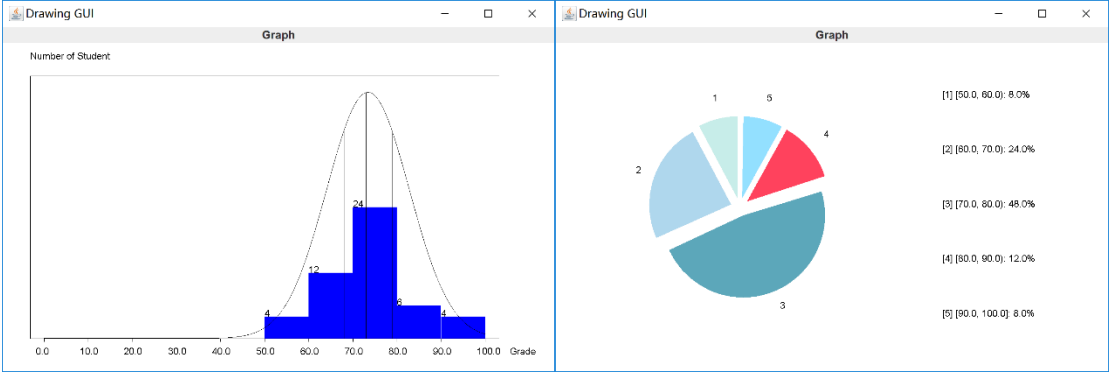
Example

Case 1:
Assignment Num: One Assignment;
Assignment Name: assignment1;
Student Num: All Student.

Graph_GUI:



Drawing_GUI:



Case 2:
Assignment Type: Quiz,
Assignment Num: All Assignment,
Student Num: All Student.

Graph_GUI:

Graph GUI

File

50 students participate in the exam

Highest score: 100.0

Lowest score: 30.0

Average: 65.1

Variance: 275.4900000000001

Standard Deviation: 16.59789143234767

Median: 67.5

Mode(s): [65, 70]

Assignment Type:

Assignment

Quiz

Test

Project

All

0

Assignment Num:

All Assignment

One Assignment

Assignment Name:

Calculate

Graph Type:

Histogram

Pie Chart

Graph Option:

Width of Group: 5

Student Num:

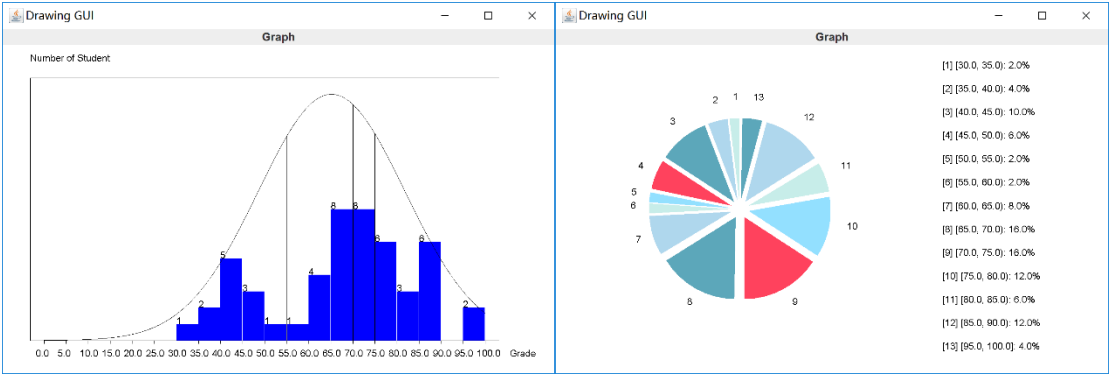
All Student

Single Student

Student ID:

Draw

Drawing_GUI:



Case 3:

Assignment Type: All,
Assignment Num: All Assignment,
Student Num: All Student.

Graph_GUI:

Graph GUI

File

50 students participate in the exam

Highest score: 90.69999999999999

Lowest score: 60.150000000000006

Average: 76.57000000000001

Variance: 63.13909999999997

Standard Deviation: 7.946011578144092

Median: 76.525

Mode(s): [85, 86]

Assignment Type:

Assignment

30

Quiz

10

Test

20

Project

40

All

100

Graph Type:

Histogram

Pie Chart

Graph Option:

Width of Group: 5

Assignment Num:

All Assignment

One Assignment

Student Num:

All Student

Single Student

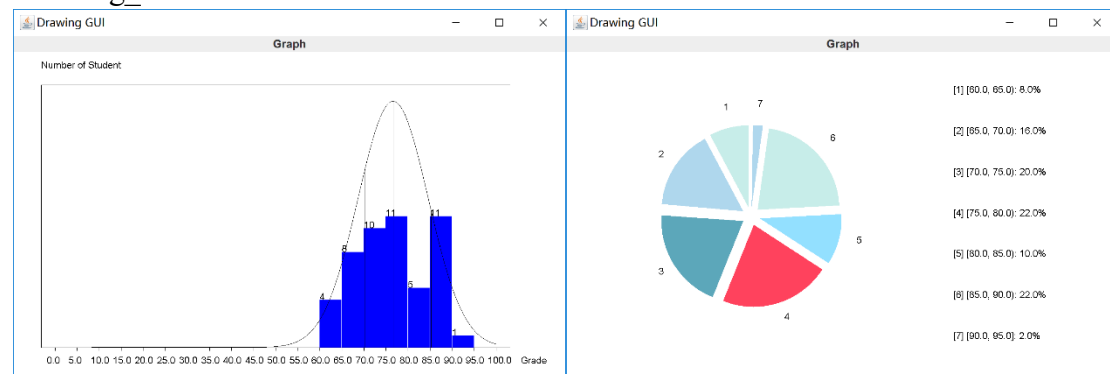
Assignment Name:

Student ID:

Calculate

Draw

Drawing_GUI:



Case 4:
Assignment Type: All,
Assignment Num: All Assignment,
Student Num: Single Student.

Student ID: 1

The screenshot shows the 'Graph GUI' window. On the left, a list of scores is displayed: Grade: (empty), Student: 1, Assignment: 76.5, Quiz: 85.0, Test: 81.0, Project: 39.0, and All: 63.25000000000001. The middle section contains controls for 'Assignment Type' (radio buttons for Assignment, Quiz, Test, Project, All with corresponding input fields), 'Assignment Num' (radio buttons for All Assignment, One Assignment), and 'Assignment Name' (input field). The right section contains controls for 'Graph Type' (radio buttons for Histogram, Pie Chart), 'Graph Option' (Width of Group: 5 with a slider), 'Student Num' (radio buttons for All Student, Single Student), and 'Student ID' (input field with '1'). At the bottom are 'Calculate' and 'Draw' buttons.

Field	Value
Grade:	
Student:	1
Assignment:	76.5
Quiz:	85.0
Test:	81.0
Project:	39.0
All:	63.25000000000001

Assignment Type: Assignment (30), Quiz (10), Test (20), Project (40), All (100)

Assignment Num: All Assignment, One Assignment

Assignment Name:

Graph Type: Histogram, Pie Chart

Graph Option: Width of Group: 5

Student Num: All Student, Single Student

Student ID: 1

Buttons: Calculate, Draw

Student ID: 22

The screenshot shows the 'Graph GUI' window with Student ID 22. The scores list on the left is: Grade: (empty), Student: 22, Assignment: 94.5, Quiz: 40.0, Test: 89.0, Project: 96.0, and All: 88.54999999999998. The controls and layout are identical to the first screenshot, but the 'Student ID' input field now contains '22'.

Field	Value
Grade:	
Student:	22
Assignment:	94.5
Quiz:	40.0
Test:	89.0
Project:	96.0
All:	88.54999999999998

Assignment Type: Assignment (30), Quiz (10), Test (20), Project (40), All (100)

Assignment Num: All Assignment, One Assignment

Assignment Name:

Graph Type: Histogram, Pie Chart

Graph Option: Width of Group: 5

Student Num: All Student, Single Student

Student ID: 22

Buttons: Calculate, Draw

(We can move the scroll bar of the width to get the width of group we want)

Figure 1 displays two windows from the 'Drawing GUI' application. The left window shows a histogram of student grades with a normal distribution curve overlaid. The x-axis is labeled 'Grade' and ranges from 0.0 to 100.0. The y-axis is labeled 'Number of Student'. The histogram bars are blue, and the curve is black. The right window shows a pie chart with five slices labeled 1 to 5. To the right of the pie chart is a list of categories and their percentages: [1] [50.0, 60.0]: 8.0%, [2] [60.0, 70.0]: 24.0%, [3] [70.0, 80.0]: 48.0%, [4] [80.0, 90.0]: 12.0%, and [5] [90.0, 100.0]: 8.0%.

Figure 1 displays two plots generated by the Drawing GUI. The left plot is a histogram showing the distribution of student grades, with a normal distribution curve overlaid. The x-axis is labeled 'Grade' and ranges from 0.0 to 100.0. The y-axis is labeled 'Number of Student'. The right plot is a pie chart showing the distribution of grades across 10 bins, with a legend on the right.

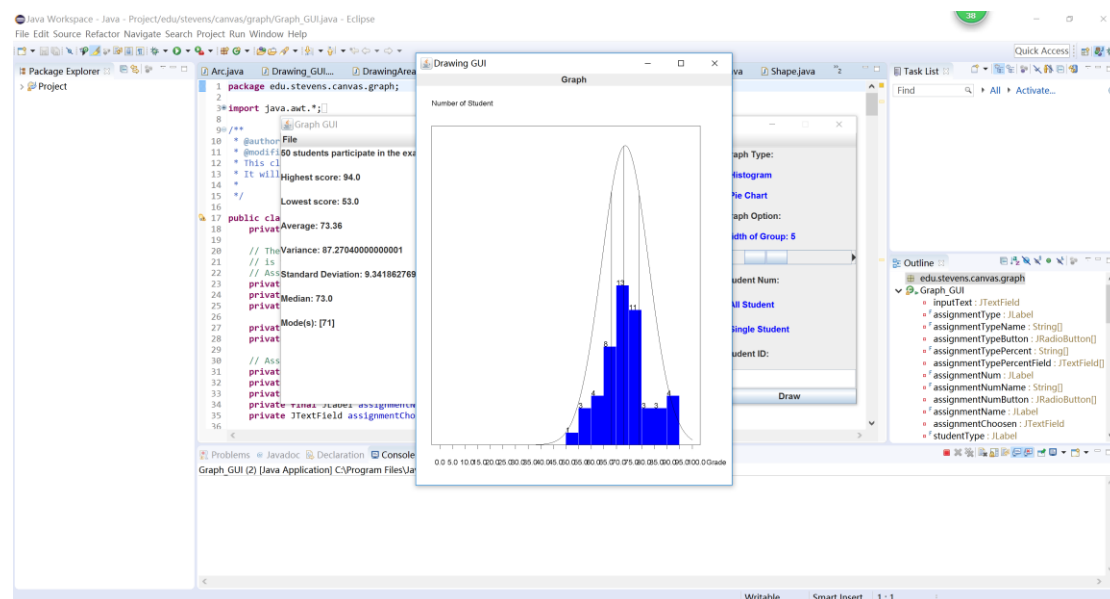
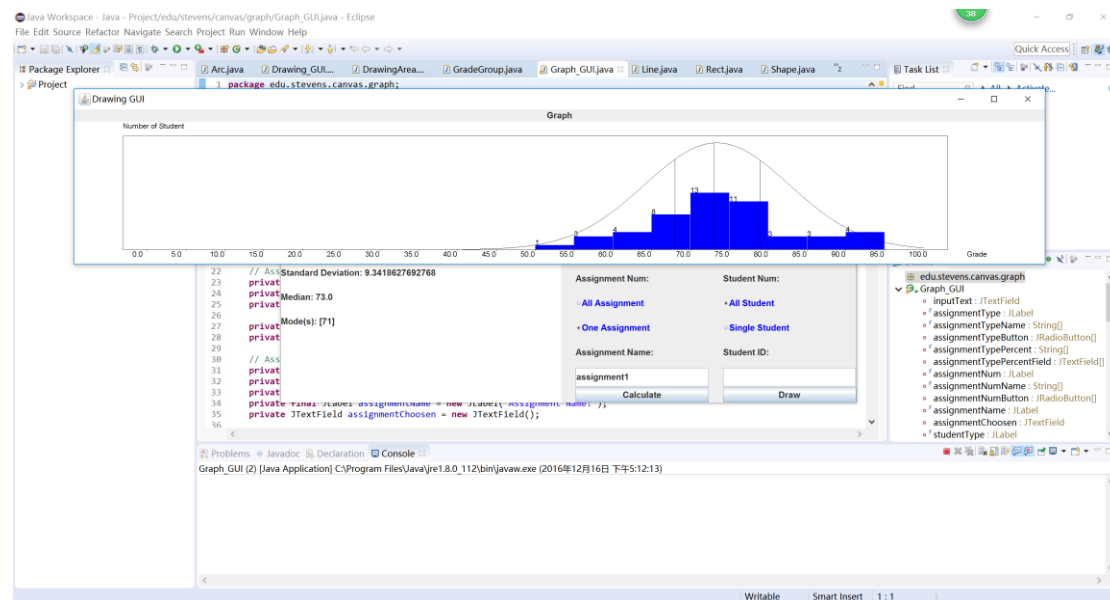
Bin	Grade Range	Percentage
[1]	[50.0, 55.0)	2.0%
[2]	[55.0, 60.0)	6.0%
[3]	[60.0, 65.0)	8.0%
[4]	[65.0, 70.0)	16.0%
[5]	[70.0, 75.0)	26.0%
[6]	[75.0, 80.0)	22.0%
[7]	[80.0, 85.0)	6.0%
[8]	[85.0, 90.0)	6.0%
[9]	[90.0, 95.0)	8.0%
[10]	[95.0, 100.0)	0.0%

Case 6:

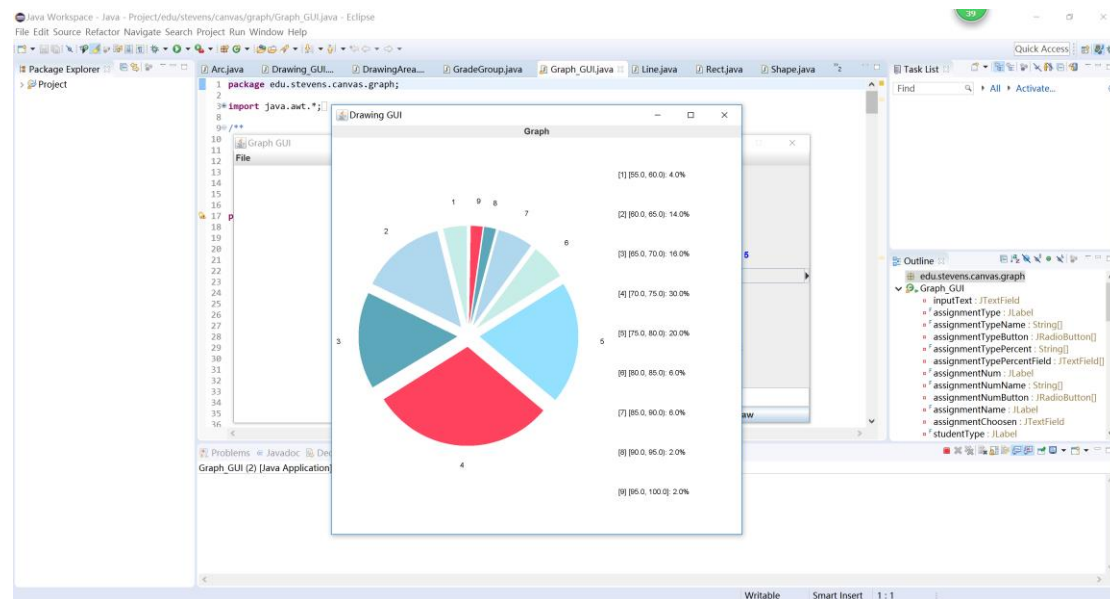
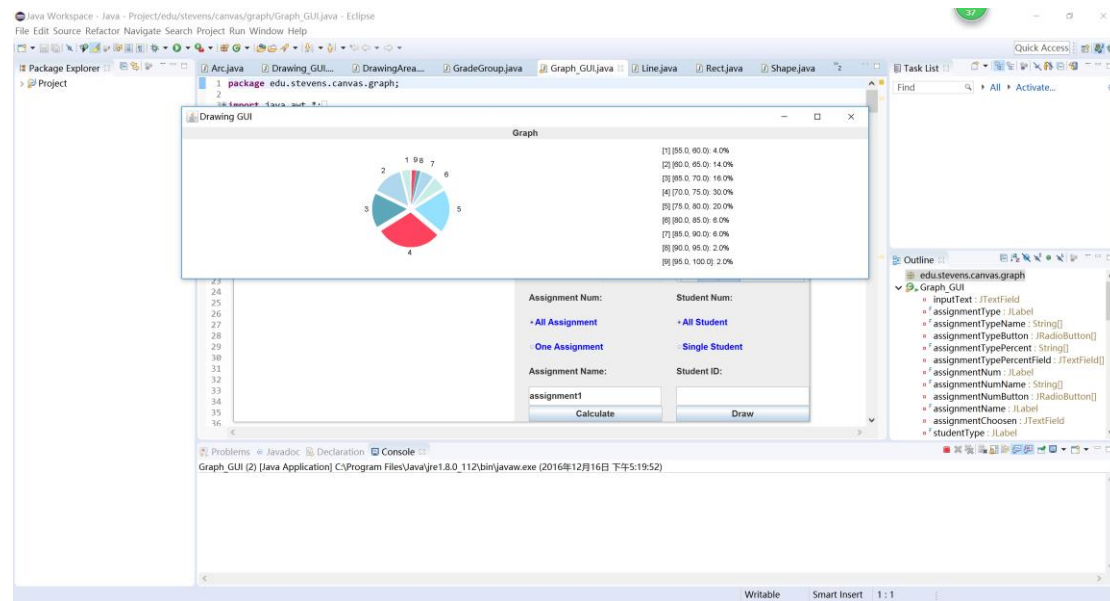
Different Size of Graph.

(We can adjust the size of the Drawing_GUI window, and at the same time, the graph will also change with the same scale)

Histogram:



Pie Chart:



Case 7:

Different weight of assignment.

(We can adjustment the weight of each category of assignment)

Weight: 10%, 10%, 10%, 70%

Graph_GUI:

Graph GUI

File

50 students participate in the exam

Highest score: 96.55000000000001

Lowest score: 51.150000000000006

Average: 76.06000000000002

Variance: 144.18129999999996

Standard Deviation: 12.007551790435882

Median: 77.3

Mode(s): [69, 79, 92]

Assignment Type:

- ☐ Assignment 10
- ☐ Quiz 10
- ☐ Test 10
- ☐ Project 70
- ☒ All 100

Assignment Num:

- ☒ All Assignment
- ☐ One Assignment

Assignment Name:

Graph Type:

- ☐ Histogram
- ☒ Pie Chart

Graph Option:

Width of Group: 5

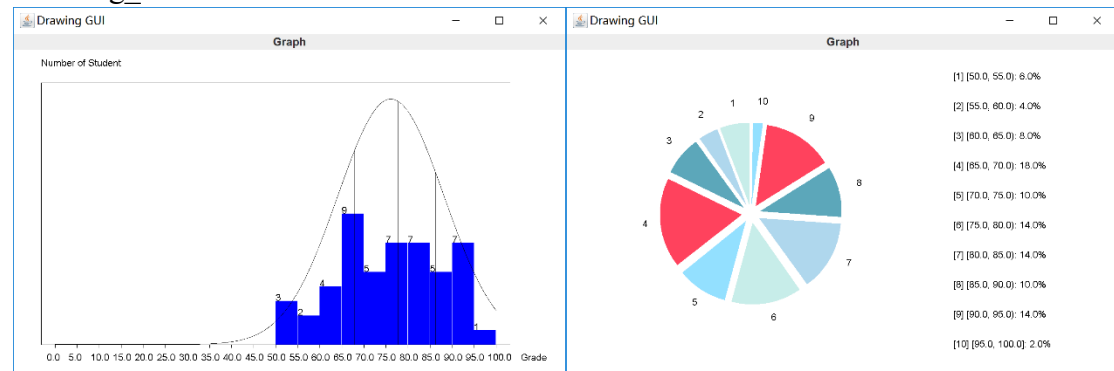
Student Num:

- ☒ All Student
- ☐ Single Student

Student ID:

Calculate Draw

Drawing_GUI:



Graph_GUI:

Weight: 50%, 20%, 20%, 10%

Graph GUI

File

50 students participate in the exam

Highest score: 88.05

Lowest score: 63.050000000000004

Average: 74.778

Variance: 34.027815999999999

Standard Deviation: 5.833336609522888

Median: 75.35

Mode(s): [76]

Assignment Type:

Assignment

50

Quiz

20

Test

20

Project

10

All

100

Assignment Num:

All Assignment

One Assignment

Assignment Name:

Calculate

Graph Type:

Histogram

Pie Chart

Graph Option:

Width of Group: 5

Student Num:

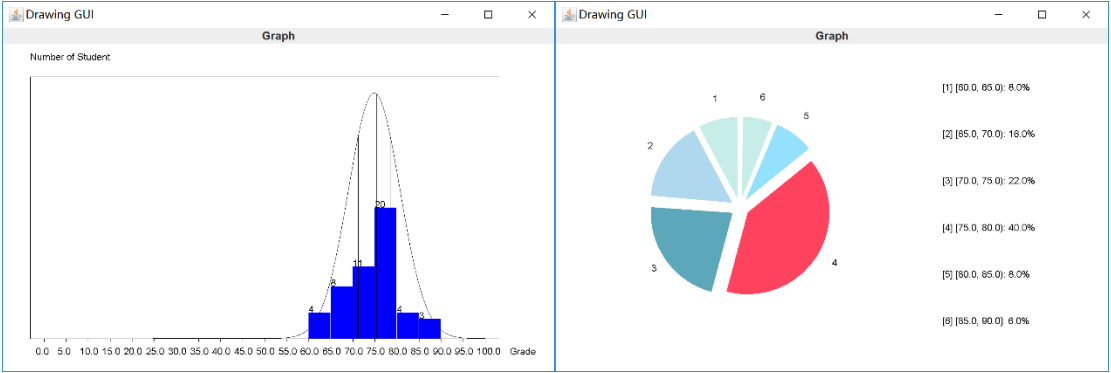
All Student

Single Student

Student ID:

Draw

Drawing_GUI:



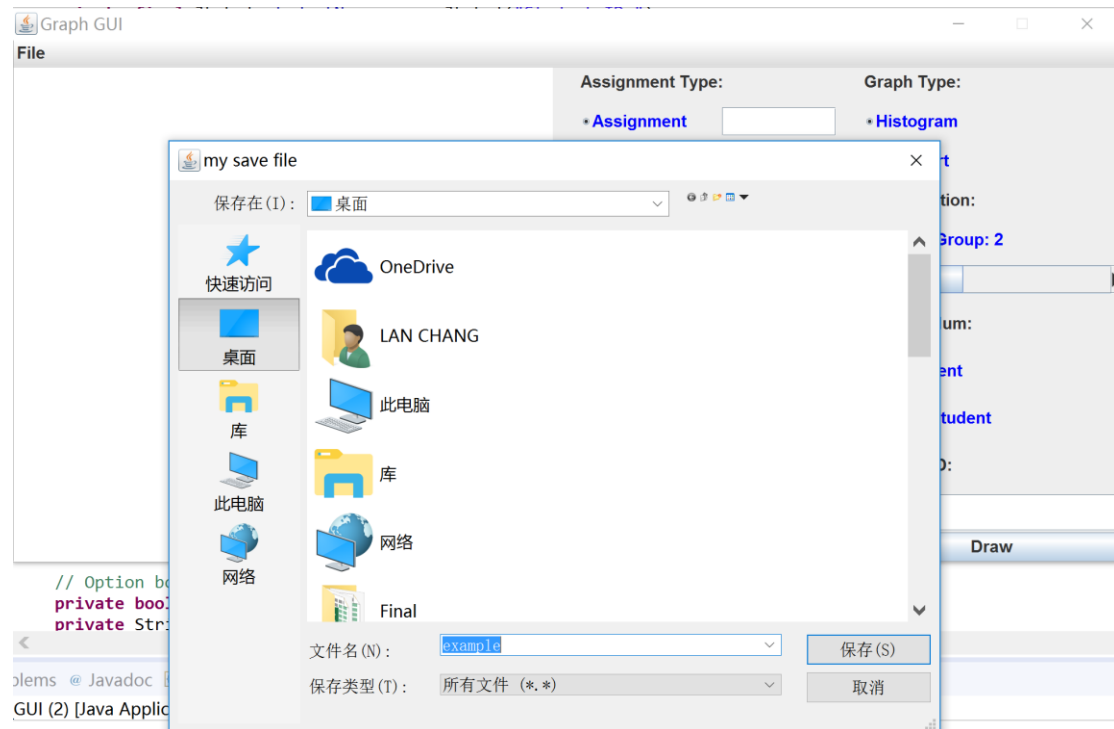
Case 8:

Save the graph.

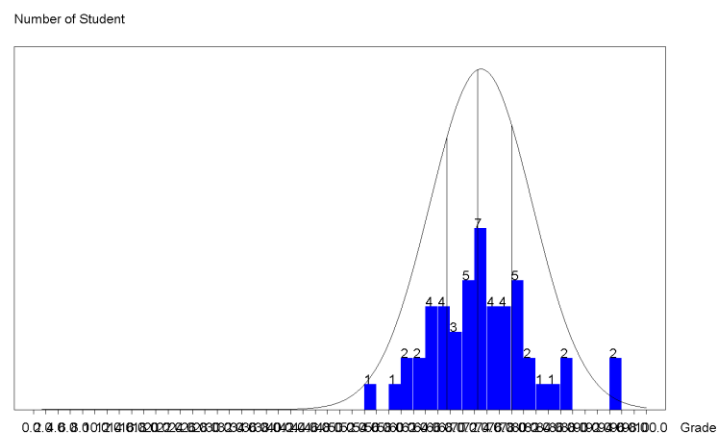
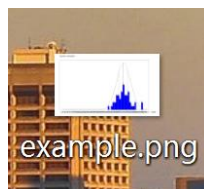
(We can save the graph to designated path with any name)

Click “File” -> Click “Save the graph” -> Find the path you want to save.

For example: path: Desktop, name: example.



“example.png” file on the Desktop.



Case 9:
Showing Error.

The sum of percentage is not 100.

Graph GUI

File

The sum of percentage must be 100!

Assignment Type:	Graph Type:
<input type="radio"/> Assignment 30	<input type="radio"/> Histogram
<input type="radio"/> Quiz 10	<input type="radio"/> Pie Chart
<input type="radio"/> Test 20	Graph Option:
<input type="radio"/> Project 10	Width of Group: 5
<input type="radio"/> All 70	

Assignment Num:	Student Num:
<input type="radio"/> All Assignment	<input type="radio"/> All Student
<input type="radio"/> One Assignment	<input type="radio"/> Single Student

Assignment Name:	Student ID:
	22

Calculate Draw

There is a percentage is less than 0.

Graph GUI

File

Each percentage must not be less than 0!

Assignment Type:	Graph Type:
<input type="radio"/> Assignment -10	<input type="radio"/> Histogram
<input type="radio"/> Quiz 10	<input type="radio"/> Pie Chart
<input type="radio"/> Test 50	Graph Option:
<input type="radio"/> Project 50	Width of Group: 5
<input type="radio"/> All 100	

Assignment Num:	Student Num:
<input type="radio"/> All Assignment	<input type="radio"/> All Student
<input type="radio"/> One Assignment	<input type="radio"/> Single Student

Assignment Name:	Student ID:
	22

Calculate Draw

The width is not good.

Graph GUI

File

Bad width!

Assignment Type:	Graph Type:
<input type="radio"/> Assignment 10	<input type="radio"/> Histogram
<input type="radio"/> Quiz 10	<input type="radio"/> Pie Chart
<input type="radio"/> Test 30	Graph Option:
<input type="radio"/> Project 50	Width of Group: 14
<input type="radio"/> All 100	

Assignment Num:	Student Num:
<input type="radio"/> All Assignment	<input type="radio"/> All Student
<input type="radio"/> One Assignment	<input type="radio"/> Single Student

Assignment Name:	Student ID:
	22

Calculate Draw

No assignment name entering.

The screenshot shows a window titled "Graph GUI" with a menu bar containing "File". The main area on the left displays the message "Please enter the assignment name!". The right side of the window contains several input fields and buttons:

- Assignment Type:** Radio buttons for * Assignment, Quiz, Test, Project, and All. The "All" option is selected, and its corresponding value field shows "0".
- Graph Type:** Radio buttons for Histogram and Pie Chart.
- Graph Option:** A label "Width of Group: 10" and a slider control.
- Assignment Num:** Radio buttons for All Assignment and * One Assignment.
- Student Num:** Radio buttons for * All Student and Single Student.
- Assignment Name:** An empty text input field.
- Student ID:** An empty text input field.
- Buttons:** "Calculate" and "Draw" buttons at the bottom.

No student ID entering.

The screenshot shows the same "Graph GUI" window, but the message in the main area has changed to "Please enter the student ID!". The input fields and buttons on the right remain the same as in the previous screenshot, with the "All" assignment type selected and a value of 100.