

简单的按钮计算器

孙博言 2011756 计算机学院

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本次作业采用了 java swing 图形化编程工具。下面我们首先介绍计算器的原理和功能。

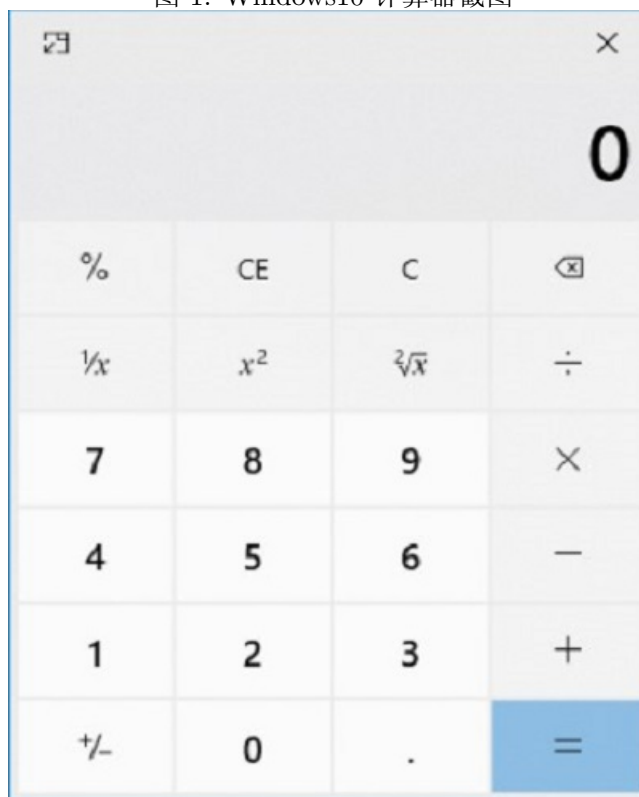
Windows10 内置计算器的标准模式，能够进行一般的日常运算，主要功能包括四则运算，乘方开根号等等。

- 显示运算结果
- 以较高精度进行正确运算
- 归零退格等基本输入编辑功能

上述功能完成的核心，就是要设计好人机交互功能，主要是对按钮的事件响应函数进行编写，并且得到标准清晰的数字输出，向用户呈现。现在，反复研究使用 Winows 计算器，熟悉它的逻辑功能，并且提炼出运行原理。我们不难得出以下特点。

- 计算器内部只存储运算结果和输入结果两个数据域。
- 按键数字输入永远针对输入结果数据进行后缀式添加。
- 运算符分为根据逻辑功能分为以下三类：
 - 单目运算符： $\%$ ， x^2 ， \sqrt{x} ， \pm
 - 双目运算符： $+$ ， $-$ ， \times ， \div
 - 特殊的等号运算符： $=$
- 异常输入运算结果简单式处理。
- 全部清零 C 和表达式清零 CE。

图 1: Windows10 计算器截图



我们新建一个 `calculator` 类，绘制 `Frame`，`button` 等代码在此不再赘述，重点分析运算逻辑。

- `BigDecimal`类型的`result`对象。
- `BigDecimal`类型的`inNum`对象。

分别用来存储计算器中的结果和输入数据。`inNum`通过`StringBuilder`类型的对象为参数进行构造。按下数字按钮时后缀相应的数字。

接下来进行关键的分析：操作焦点切换。

一般情况下，当按下双目运算符时系统的处理动作相同，首先系统要计算上一个运算符对应的运算，操作数为`inNum`和`result`，并且把运算结果存入`result`。`inNum`不变，操作符更新为新按下的运算符。

但是当按下等号之后情况发生了变化。按下等号后执行上一步的运算，不更新运算符，`result`更新，`inNum`的实际数值暂时不变，输入区清零，标

显示结果。之后视用户首次操作产生不同的响应：

- 若用户首先按下的是数字，则整个输入的数字字符串存入`result`当中，`inNum`和运算符不变。
- 若用户首先按下的是双目运算符，则`result`赋值给`inNum`，运算符更新为新按下的运算符。
- 若用户按下的是等号，则执行上一步的运算，运算结果存入`result`，`inNum`不变，重新返回。

这些逻辑在设计初期就被发现，并且完整复现到了程序当中。

下面，要考虑到功能十分特殊的单目运算符的情况，它们的逻辑比较不同寻常，并不会像双目运算符一样按下后暂时存储。

- 若上一步按下的是等号则：作用于运算结果`result`，当前焦点变为`result`。`inNum`和上一步运算符不变。
- 若上一步按下的是数字则：作用`inNum`，不影响`result`，并且进入到类似于按下等号之后的失去输入焦点状态，输入字符串被清零。
- 若上一步按下的是除了等号外的其他双目运算符：运算作用于`result`，但是实际上赋值给`inNum`。
- 若上一步按下的是单目运算符：则作用于所谓的上一步操作影响到的数据域！改变它的值！

另外事实上，% 这一运算符不完全类似于以上任何一种
.....

上一步完成的是的是乘除法运算的话，运算就实际上是除以 100。但如果是加减法运算，就要将第一个加数加上两个加数相乘在除以 100。类似于小费的计算。可能是一种经济学中的习惯。在此之中不可避免地需要用到第三个数据域，因为在进行下列表达式时你会注意到这个必要性。

这些逻辑为个人一步步尝试不同的按键组合得出，其实质是操作焦点的问题，对当下数据域产生何种影响，依据的是那一块数据域，并且对另一块数据域产生不同影响。

比如以下比较特殊的操作，可供比照参考：

$x + y + ===;$ $x \times y ===;$ $x + y = z =;$ $x + y = + ==;$ $x + y \pm \pm =;$
 $x + y \% =;$ $x + y = \%;$ $x + y = \% \%;$ $x + y = \sqrt{} \%;$ $x + y = \% + =;$
 $x + y = \% ==;$

其余操作不再赘述，但是有一些细节

- 除以零或者出现复数显示为非法。
- 表达式清零与全部清零代表不同含义。
- 退格对输入串操作为退格，对结果串操作为清零。
- 结果不是小数不会显示多余的零。
- 但是实验中出现过一些精度无法正确显示的问题，因为字符串不能过长。
-

以下为所有的代码和运行截图：

图 2: 负数开根号

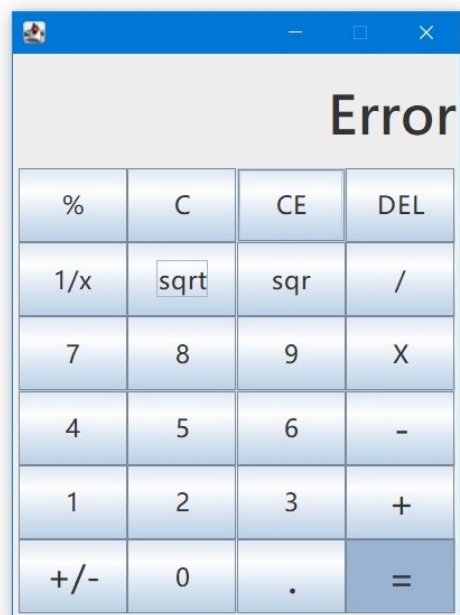
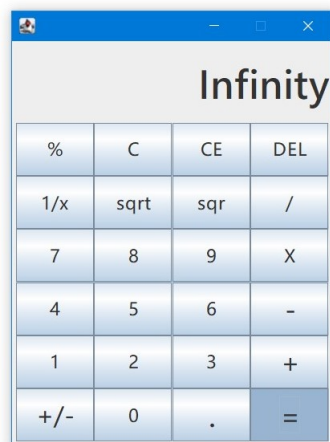
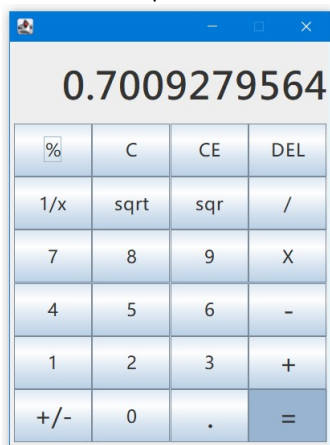
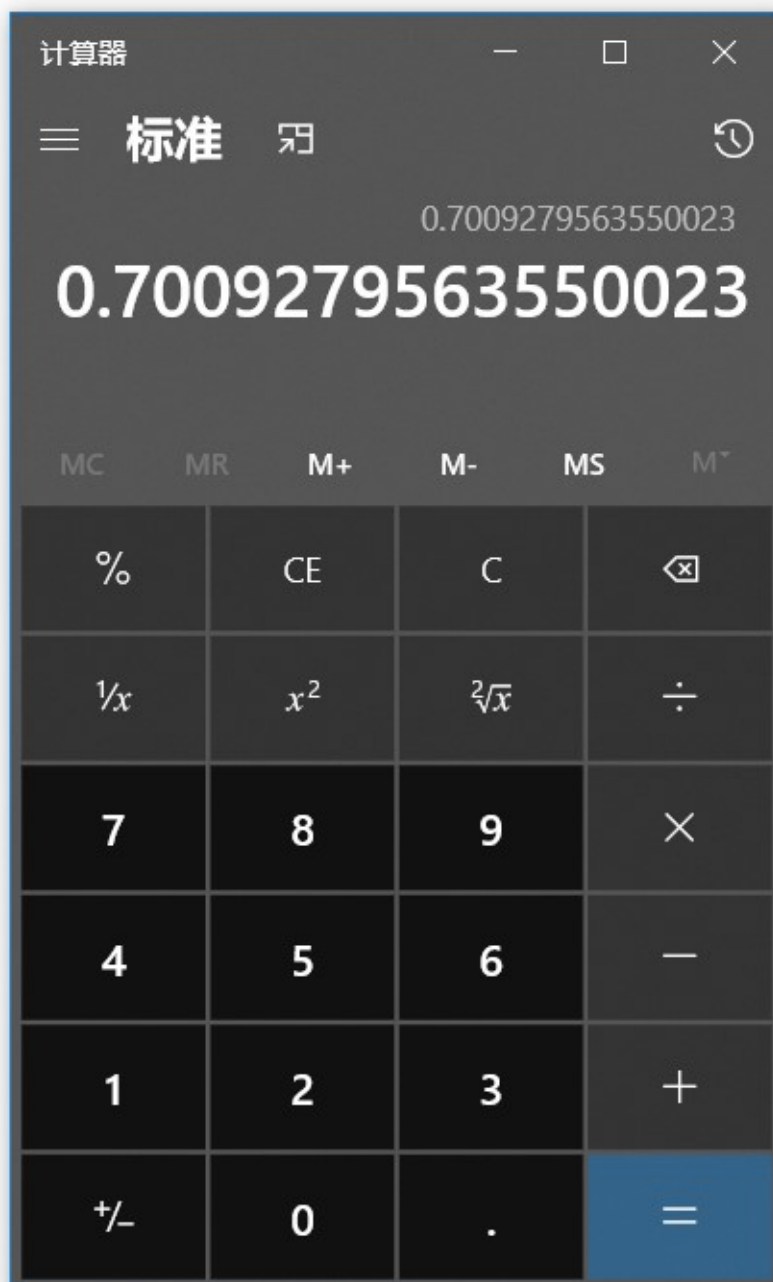


图 3: 除以零

图 4: $8 + 9 = \sqrt{\quad}\%$ 的运算结果

这可能一开始会令人吃惊……

图 5: $8 + 9 = \sqrt{\quad}$ %win10 的运算结果



可直接复制粘贴运行，把 package 名字改掉。源码放在

Listing 1: 冗杂的代码

```

1  package sunboyan;
2
3  import java.awt.BorderLayout;
4  import java.awt.EventQueue;
5  import javax.swing.JFrame;
6  import javax.swing.JPanel;
7  import javax.swing.border.EmptyBorder;
8  import javax.swing.JLabel;
9  import java.awt.Font;
10 import java.awt.GridLayout;
11 import javax.swing.JButton;
12 import javax.swing.SwingConstants;
13 import java.awt.event.MouseAdapter;
14 import java.awt.event.MouseEvent;
15 import java.math.*;
16 import java.awt.SystemColor;
17 import javax.swing.UIManager;
18 public class Calculator extends JFrame {
19
20     private static final long serialVersionUID = 1L;
21     BigDecimal result=new BigDecimal(0);
22     String resultString=new String("0");
23     BigDecimal inNum=new BigDecimal(0);
24     StringBuilder inString=new StringBuilder("0");
25     BigDecimal perTemp=new BigDecimal(0);
26     char operatorString=' ';
27     boolean equaled=false;
28     boolean dotted=false;
29     boolean computed=false;
30     private JPanel contentPane;
31     public JLabel myResultLabel;
32     public static void main(String[] args) {
33         EventQueue.invokeLater(new Runnable() {
34             public void run() {
35                 try {
36                     Calculator frame = new Calculator();
37                     frame.setVisible(true);
38                 } catch (Exception e) {
39                     e.printStackTrace();
40                 }
41             }
42         });
43     }
44     public Calculator() {
45         setResizable(false);
46         setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
47         setBounds(0, 0, 334, 442);
48         contentPane = new JPanel();
49         contentPane.setBackground(SystemColor.control);
50         contentPane.setBorder(new EmptyBorder(2, 3, 2, 3));
51         contentPane.setLayout(new BorderLayout(0, 0));
52         setContentPane(contentPane);
53
54         JPanel downPanel = new JPanel();
55         downPanel.setBorder(new EmptyBorder(0, 0, 0, 0));
56         contentPane.add(downPanel, BorderLayout.CENTER);
57         downPanel.setLayout(new GridLayout(6, 4, 0, 0));
58
59         JButton percentButton = new JButton("%");

```

```

60 percentButton.setFont(new Font("微软雅黑", Font.PLAIN, 18));
61 percentButton.addMouseListener(new MouseAdapter() {
62     @Override
63     public void mouseReleased(MouseEvent e) {
64         if(equaled) {
65             System.out.println(perTemp);
66             System.out.println(inNum);
67             System.out.println(result);
68             if (computed) {
69                 if (operatorString == '+' || operatorString == '-') {
70                     perTemp=result;
71                     result=result.multiply(perTemp).divide(new BigDecimal("100.0"),10,
72                         RoundingMode.HALF_UP);
73                     computed=false;
74                 } else {
75                     result = result.divide(new BigDecimal("100.0"), 10, RoundingMode.
76                         HALF_UP);
77                 }
78                 result.setScale(10, RoundingMode.HALF_UP);
79                 if (result.compareTo(new BigDecimal(result.intValue())) == 0) {
80                     resultString = String.valueOf(result.intValue());
81                 } else {
82                     resultString = result.stripTrailingZeros().toString();
83                 }
84                 inString.delete(0, inString.length());
85                 if (resultString.length() < 14) {
86                     myResultLabel.setText(resultString.toString());
87                 } else {
88                     myResultLabel.setText(resultString.toString().substring(0, 14));
89                 }
90             } else {
91                 if (operatorString == '+' || operatorString == '-') {
92                     result=result.multiply(perTemp).divide(new BigDecimal("100.0"),10,
93                         RoundingMode.HALF_UP);
94                 } else {
95                     result = result.divide(new BigDecimal("100.0"), 10, RoundingMode.
96                         HALF_UP);
97                 }
98                 result.setScale(10, RoundingMode.HALF_UP);
99                 if (result.compareTo(new BigDecimal(result.intValue())) == 0) {
100                     resultString = String.valueOf(result.intValue());
101                 } else {
102                     resultString = result.stripTrailingZeros().toString();
103                 }
104                 inString.delete(0, inString.length());
105                 if (resultString.length() < 14) {
106                     myResultLabel.setText(resultString.toString());
107                 } else {
108                     myResultLabel.setText(resultString.toString().substring(0, 14));
109                 }
110             }
111         } else {
112             if (computed) {
113                 if (operatorString=='+'||operatorString=='-') {
114                     System.out.println(4);
115                     result = perTemp.multiply(result).divide(new BigDecimal("100.0"), 10,
116                         RoundingMode.HALF_UP);
117                 } else {
118                     inNum = result.divide(new BigDecimal("100.0"), 10, RoundingMode.HALF_UP)
119                         ;
120                 }
121                 result.setScale(10, RoundingMode.HALF_UP);
122                 if (result.compareTo(new BigDecimal(result.intValue())) == 0) {

```



```

117         resultString = String.valueOf(result.intValue());
118     } else {
119         resultString = result.stripTrailingZeros().toString();
120     }
121     inString.delete(0, inString.length());
122     if (resultString.length() < 14) {
123         myResultLabel.setText(resultString.toString());
124     } else {
125         myResultLabel.setText(resultString.toString().substring(0, 14));
126     }
127 }else {
128     if (operatorString=='+'||operatorString=='-') {
129         System.out.println(5);
130         inNum = inNum.multiply(result).divide(new BigDecimal("100.0"), 10,
131             RoundingMode.HALF_UP);
132     }else {
133         inNum = inNum.divide(new BigDecimal("100.0"), 10,
134             RoundingMode.HALF_UP);
135     }
136     result.setScale(10, RoundingMode.HALF_UP);
137     if (inNum.compareTo(new BigDecimal(inNum.intValue())) == 0) {
138         resultString = String.valueOf(inNum.intValue());
139     } else {
140         resultString = inNum.stripTrailingZeros().toString();
141     }
142     inString.delete(0, inString.length());
143     if (resultString.length() < 14) {
144         myResultLabel.setText(resultString.toString());
145     } else {
146         myResultLabel.setText(resultString.toString().substring(0, 14));
147     }
148 }
149 }
150 computed=false;
151 }
152 });
153 downPanel.add(percentButton);
154
155 JButton clearButton = new JButton("C");
156 clearButton.setFont(new Font("微软雅黑", Font.PLAIN, 18));
157 clearButton.addMouseListener(new MouseAdapter() {
158     @Override
159     public void mouseReleased(MouseEvent e) {
160         perTemp=new BigDecimal("0");
161         equaled=false;
162         inNum=new BigDecimal("0");
163         result=new BigDecimal("0");
164         inString.replace(0,inString.length(),"0");
165         resultString="0";
166         dotted=false;
167         operatorString=' ';
168         myResultLabel.setText("0");
169     }
170 });
171 downPanel.add(clearButton);
172
173 JButton cClearButton = new JButton("CE");
174 cClearButton.setFont(new Font("微软雅黑", Font.PLAIN, 18));
175 cClearButton.addMouseListener(new MouseAdapter() {
176     @Override
177     public void mouseReleased(MouseEvent e) {
178         perTemp=new BigDecimal("0");
179         if(equaled) {

```

```

180         inString.delete(0, inString.length());
181         myResultLabel.setText("0");
182         result = new BigDecimal("0");
183         dotted=false;
184     }else {
185         inString.delete(0, inString.length());
186         myResultLabel.setText("0");
187         inNum=new BigDecimal("0");
188         dotted=false;
189     }
190 }
191 });
192 downPanel.add(cClearButton);
193
194 JButton backButton = new JButton("DEL");
195 backButton.setFont(new Font("微软雅黑", Font.PLAIN, 18));
196 backButton.addMouseListener(new MouseAdapter() {
197     @Override
198     public void mouseReleased(MouseEvent e) {
199         if(euqaled) {
200             ;
201         }else {
202             if(inString.length()>1) {
203                 if(inString.charAt(inString.length()-1)=='.')
204                 {
205                     inString.delete(inString.length()-1, inString.length());
206                 }
207                 inString.delete(inString.length()-1, inString.length());
208                 inNum=new BigDecimal(inString.toString());
209                 if(inNum.compareTo(new BigDecimal(inNum.intValue()))==0){
210                     resultString=String.valueOf(inNum.intValue());
211                 }else {
212                     resultString = inNum.stripTrailingZeros().toString();
213                 }
214                 if (resultString.length()<14) {
215                     myResultLabel.setText(resultString.toString());
216                 }else {
217                     myResultLabel.setText(resultString.toString().substring(0,14));
218                 }
219             }else {
220                 inString.replace(0, 1, "0");
221                 inNum=new BigDecimal(inString.toString());
222                 if(inNum.compareTo(new BigDecimal(inNum.intValue()))==0){
223                     resultString=String.valueOf(inNum.intValue());
224                 }else {
225                     resultString = inNum.stripTrailingZeros().toString();
226                 }
227                 if (resultString.length()<14) {
228                     myResultLabel.setText(resultString.toString());
229                 }else {
230                     myResultLabel.setText(resultString.toString().substring(0,14));
231                 }
232             }
233         }
234     }
235 });
236 downPanel.add(backButton);
237
238 JButton dButton = new JButton("1/x");
239 dButton.setFont(new Font("微软雅黑", Font.PLAIN, 18));
240 dButton.addMouseListener(new MouseAdapter() {
241     @Override
242     public void mouseReleased(MouseEvent e) {

```

```

243         if(equaled) {
244             if(result.equals(new BigDecimal("0"))) {
245                 resultString="Infinity";
246                 //pause
247             }else {
248                 perTemp=new BigDecimal(result.toString());
249                 result = new BigDecimal("1").divide(result,10, RoundingMode.HALF_DOWN);
250                 result.setScale(10,RoundingMode.HALF_UP);
251                 if(result.compareTo(new BigDecimal(result.intValue()))==0){
252                     resultString=String.valueOf(result.intValue());
253                 }else {
254                     resultString = result.stripTrailingZeros().toString();
255                 }
256             }
257             computed=true;
258             inString.delete(0, inString.length());
259             if (resultString.length()<14) {
260                 myResultLabel.setText(resultString.toString());
261             }else {
262                 myResultLabel.setText(resultString.toString().substring(0,14));
263             }
264         }else {
265             if (computed) {
266                 if (inNum.equals(new BigDecimal("0"))) {
267                     resultString = "Infinity";
268                     //pause
269                 } else {
270                     perTemp=new BigDecimal(result.toString());
271                     inNum = new BigDecimal("1").divide(result, 10, RoundingMode.HALF_DOWN);
272                     inNum.setScale(10, RoundingMode.HALF_UP);
273                     if (inNum.compareTo(new BigDecimal(inNum.intValue())) == 0) {
274                         resultString = String.valueOf(inNum.intValue());
275                     } else {
276                         resultString = inNum.stripTrailingZeros().toString();
277                     }
278                 }
279                 inString.delete(0, inString.length());
280                 if (resultString.length() < 14) {
281                     myResultLabel.setText(resultString.toString());
282                 } else {
283                     myResultLabel.setText(resultString.toString().substring(0, 14));
284                 }
285             }else {
286                 if (inNum.equals(new BigDecimal("0"))) {
287                     resultString = "Infinity";
288                     backButton.setEnabled(false);
289                 } else {
290                     perTemp=new BigDecimal(inNum.toString());
291                     inNum = new BigDecimal("1").divide(inNum, 10, RoundingMode.HALF_DOWN);
292                     inNum.setScale(10, RoundingMode.HALF_UP);
293                     if (inNum.compareTo(new BigDecimal(inNum.intValue())) == 0) {
294                         resultString = String.valueOf(inNum.intValue());
295                     } else {
296                         resultString = inNum.stripTrailingZeros().toString();
297                     }
298                 }
299                 inString.delete(0, inString.length());
300                 if (resultString.length() < 14) {
301                     myResultLabel.setText(resultString.toString());
302                 } else {
303                     myResultLabel.setText(resultString.toString().substring(0, 14));
304                 }
305             }

```

```

306     }
307     computed=false;
308 }
309 });
310 downPanel.add(dButton);
311 JButton squareButton = new JButton("sqrt");
312 squareButton.setFont(new Font("微软雅黑", Font.PLAIN, 18));
313 squareButton.addMouseListener(new MouseAdapter() {
314     @Override
315     public void mouseReleased(MouseEvent e) {
316         if(euqaled) {
317             try {
318                 perTemp=new BigDecimal(result.toString());
319                 result = result.sqrt(MathContext.DECIMAL64);
320             } catch (Exception e2) {
321                 myResultLabel.setText("Error");
322                 return;
323             }
324             result.setScale(10, RoundingMode.HALF_UP);
325             if(result.compareTo(new BigDecimal(result.intValue()))==0){
326                 resultString=String.valueOf(result.intValue());
327             }else {
328                 resultString = result.stripTrailingZeros().toString();
329             }
330             inString.delete(0, inString.length());
331             if (resultString.length()<14) {
332                 myResultLabel.setText(resultString.toString());
333             }else {
334                 myResultLabel.setText(resultString.toString().substring(0,14));
335             }
336         }else {
337             if (computed) {
338                 try {
339                     perTemp=new BigDecimal(result.toString());
340                     inNum = result.sqrt(MathContext.DECIMAL64);
341                 } catch (Exception e2) {
342                     myResultLabel.setText("Error");
343                     return;
344                 }
345                 result.setScale(10, RoundingMode.HALF_UP);
346                 if (inNum.compareTo(new BigDecimal(result.intValue())) == 0) {
347                     resultString = String.valueOf(inNum.intValue());
348                 } else {
349                     resultString = inNum.stripTrailingZeros().toString();
350                 }
351                 inString.delete(0, inString.length());
352                 if (resultString.length() < 14) {
353                     myResultLabel.setText(resultString.toString());
354                 } else {
355                     myResultLabel.setText(resultString.toString().substring(0, 14));
356                 }
357             }else {
358                 try {
359                     perTemp=new BigDecimal(inNum.toString());
360                     inNum = inNum.sqrt(MathContext.DECIMAL64);
361                 } catch (Exception e2) {
362                     myResultLabel.setText("Error");
363                     return;
364                 }
365                 result.setScale(10, RoundingMode.HALF_UP);
366                 if (inNum.compareTo(new BigDecimal(inNum.intValue())) == 0) {
367                     resultString = String.valueOf(inNum.intValue());
368                 } else {

```

```

369         resultString = inNum.stripTrailingZeros().toString();
370     }
371     inString.delete(0, inString.length());
372     if (resultString.length() < 14) {
373         myResultLabel.setText(resultString.toString());
374     } else {
375         myResultLabel.setText(resultString.toString().substring(0, 14));
376     }
377 }
378 }
379 computed=false;
380 }
381
382 });
383 downPanel.add(squareButton);
384
385 JButton sqrtButton = new JButton("sqr");
386 sqrtButton.setFont(new Font("微软雅黑", Font.PLAIN, 18));
387 sqrtButton.addMouseListener(new MouseAdapter() {
388     @Override
389     public void mouseReleased(MouseEvent e) {
390         if(equaled) {
391             perTemp=new BigDecimal(result.toString());
392             result=result.pow(2);
393             result.setScale(10, RoundingMode.HALF_UP);
394             if(result.compareTo(new BigDecimal(result.intValue()))==0){
395                 resultString=String.valueOf(result.intValue());
396             }else {
397                 resultString = result.stripTrailingZeros().toString();
398             }
399             inString.delete(0, inString.length());
400             if (resultString.length()<14) {
401                 myResultLabel.setText(resultString.toString());
402             }else {
403                 myResultLabel.setText(resultString.toString().substring(0,14));
404             }
405         }else {
406             if (computed) {
407                 perTemp=new BigDecimal(result.toString());
408                 inNum = result.pow(2);
409                 result.setScale(10, RoundingMode.HALF_UP);
410                 if (inNum.compareTo(new BigDecimal(inNum.intValue())) == 0) {
411                     resultString = String.valueOf(inNum.intValue());
412                 } else {
413                     resultString = inNum.stripTrailingZeros().toString();
414                 }
415                 inString.delete(0, inString.length());
416                 if (resultString.length() < 14) {
417                     myResultLabel.setText(resultString.toString());
418                 } else {
419                     myResultLabel.setText(resultString.toString().substring(0, 14));
420                 }
421             }else {
422                 perTemp=new BigDecimal(inNum.toString());
423                 inNum = inNum.pow(2);
424                 result.setScale(10, RoundingMode.HALF_UP);
425                 if (inNum.compareTo(new BigDecimal(inNum.intValue())) == 0) {
426                     resultString = String.valueOf(inNum.intValue());
427                 } else {
428                     resultString = inNum.stripTrailingZeros().toString();
429                 }
430                 inString.delete(0, inString.length());
431                 if (resultString.length() < 14) {

```

```

432         myResultLabel.setText(resultString.toString());
433     } else {
434         myResultLabel.setText(resultString.toString().substring(0, 14));
435     }
436 }
437 }
438     computed=false;
439 }
440 });
441 downPanel.add(sqrtButton);
442
443 JButton divideButton = new JButton("/");
444 divideButton.setFont(new Font("微软雅黑", Font.PLAIN, 18));
445 divideButton.addMouseListener(new MouseAdapter() {
446     @Override
447     public void mouseReleased(MouseEvent e) {
448         perTemp=new BigDecimal("0");
449         if(equaled) {
450             inNum = new BigDecimal(result.toString());
451             inString.delete(0, inString.length());
452             operatorString='/';
453             equaled=false;
454             if (resultString.length()<14) {
455                 myResultLabel.setText(resultString.toString());
456             }else {
457                 myResultLabel.setText(resultString.toString().substring(0,14));
458             }
459         }else {
460             compute();
461             inString.delete(0, inString.length());
462             operatorString='/';
463             if (resultString.length()<14) {
464                 myResultLabel.setText(resultString.toString());
465             }else {
466                 myResultLabel.setText(resultString.toString().substring(0,14));
467             }
468         }
469     }
470 });
471 downPanel.add(divideButton);
472
473 JButton sevenButton = new JButton("7");
474 sevenButton.setFont(new Font("微软雅黑", Font.PLAIN, 18));
475 sevenButton.addMouseListener(new MouseAdapter() {
476     @Override
477     public void mouseReleased(MouseEvent e) {
478         perTemp=new BigDecimal("0");
479         computed=false;
480         if(inString.length()==1&&inString.charAt(0)=='0') {
481             inString.delete(0, 1);
482         }
483         inString.append('7');
484         if (equaled) {
485             result = new BigDecimal(inString.toString());
486         } else {
487             inNum=new BigDecimal(inString.toString());
488         }
489         if (inString.length() < 14) {
490             myResultLabel.setText(inString.toString());
491         }
492     }
493 }
494 });

```

```

495         downPanel.add(sevenButton);
496
497         JButton eightButton = new JButton("8");
498         eightButton.addMouseListener(new MouseAdapter() {
499             @Override
500             public void mouseReleased(MouseEvent e) {
501                 perTemp=new BigDecimal("0");
502                 computed=false;
503                 if (inString.length()==1&&inString.charAt(0)=='0') {
504                     inString.delete(0, 1);
505                 }
506                 inString.append('8');
507                 if (equals) {
508                     result = new BigDecimal(inString.toString());
509                 } else {
510                     inNum=new BigDecimal(inString.toString());
511                 }
512                 if (inString.length()<14) {
513                     myResultLabel.setText(inString.toString());
514                 }
515             }
516
517         });
518         downPanel.add(eightButton);
519         eightButton.setFont(new Font("微软雅黑", Font.PLAIN, 18));
520
521         JButton nineButton = new JButton("9");
522         nineButton.addMouseListener(new MouseAdapter() {
523             @Override
524             public void mouseReleased(MouseEvent e) {
525                 perTemp=new BigDecimal("0");
526                 computed=false;
527                 if (inString.length()==1&&inString.charAt(0)=='0') {
528                     inString.delete(0, 1);
529                 }
530                 inString.append('9');
531                 if (equals) {
532                     result = new BigDecimal(inString.toString());
533                 } else {
534                     inNum=new BigDecimal(inString.toString());
535                 }
536                 if (inString.length()<14) {
537                     myResultLabel.setText(inString.toString());
538                 }
539             }
540
541         });
542         nineButton.setFont(new Font("微软雅黑", Font.PLAIN, 18));
543         downPanel.add(nineButton);
544
545         JButton multiButton = new JButton("X");
546         multiButton.addMouseListener(new MouseAdapter() {
547             @Override
548             public void mouseReleased(MouseEvent e) {
549                 perTemp=new BigDecimal("0");
550                 if (equals) {
551                     inNum = new BigDecimal(result.toString());
552                     System.out.println("11");
553                     inString.delete(0, inString.length());
554                     operatorString='*';
555                     equals=false;
556                     if (resultString.length()<14) {
557                         myResultLabel.setText(resultString.toString());

```

```

558         }else {
559             myResultLabel.setText(resultString.toString().substring(0,14));
560         }
561     }else {
562         compute();
563         inString.delete(0, inString.length());
564         operatorString='*';
565         if (resultString.length()<14) {
566             myResultLabel.setText(resultString.toString());
567         }else {
568             myResultLabel.setText(resultString.toString().substring(0,14));
569         }
570     }
571 }
572 });
573 multiButton.setFont(new Font("微软雅黑", Font.PLAIN, 18));
574 downPanel.add(multiButton);
575
576 JButton fourButton = new JButton("4");
577 fourButton.addMouseListener(new MouseAdapter() {
578     @Override
579     public void mouseReleased(MouseEvent e) {
580         perTemp=new BigDecimal("0");
581         computed=false;
582         if (inString.length()==1&&inString.charAt(0)=='0') {
583             inString.delete(0, 1);
584         }
585         inString.append('4');
586         if (equals) {
587             result = new BigDecimal(inString.toString());
588         } else {
589             inNum=new BigDecimal(inString.toString());
590         }
591         if (inString.length()<14) {
592             myResultLabel.setText(inString.toString());
593         }
594     }
595 });
596
597 fourButton.setFont(new Font("微软雅黑", Font.PLAIN, 18));
598 downPanel.add(fourButton);
599
600 JButton fiveButton = new JButton("5");
601 fiveButton.addMouseListener(new MouseAdapter() {
602     @Override
603     public void mouseReleased(MouseEvent e) {
604         perTemp=new BigDecimal("0");
605         computed=false;
606         if (inString.length()==1&&inString.charAt(0)=='0') {
607             inString.delete(0, 1);
608         }
609         inString.append('5');
610         if (equals) {
611             result = new BigDecimal(inString.toString());
612         } else {
613             inNum=new BigDecimal(inString.toString());
614         }
615         if (inString.length()<14) {
616             myResultLabel.setText(inString.toString());
617         }
618     }
619 });
620

```



```

621 fiveButton.setFont(new Font("微软雅黑", Font.PLAIN, 18));
622 downPanel.add(fiveButton);
623
624 JButton sixButton = new JButton("6");
625 sixButton.addMouseListener(new MouseAdapter() {
626     @Override
627     public void mouseReleased(MouseEvent e) {
628         perTemp=new BigDecimal("0");
629         computed=false;
630         if(inString.length()==1&&inString.charAt(0)=='0' {
631             inString.delete(0, 1);
632         }
633         inString.append('6');
634         if (equals) {
635             result = new BigDecimal(inString.toString());
636         } else {
637             inNum=new BigDecimal(inString.toString());
638         }
639         if (inString.length()<14) {
640             myResultLabel.setText(inString.toString());
641         }
642     }
643 });
644
645 sixButton.setFont(new Font("微软雅黑", Font.PLAIN, 18));
646 downPanel.add(sixButton);
647
648 JButton minusButton = new JButton("-");
649 minusButton.addMouseListener(new MouseAdapter() {
650     @Override
651     public void mouseReleased(MouseEvent e) {
652         perTemp=new BigDecimal("0");
653         if (equals) {
654             inNum = new BigDecimal(result.toString());
655             inString.delete(0, inString.length());
656             operatorString='-';
657             equals=false;
658             if (resultString.length()<14) {
659                 myResultLabel.setText(resultString.toString());
660             }else {
661                 myResultLabel.setText(resultString.toString().substring(0,14));
662             }
663         }else {
664             compute();
665             inString.delete(0, inString.length());
666             operatorString='-';
667             if (resultString.length()<14) {
668                 myResultLabel.setText(resultString.toString());
669             }else {
670                 myResultLabel.setText(resultString.toString().substring(0,14));
671             }
672         }
673     }
674 });
675 minusButton.setFont(new Font("微软雅黑", Font.PLAIN, 26));
676 downPanel.add(minusButton);
677
678 JButton oneButton = new JButton("1");
679 oneButton.addMouseListener(new MouseAdapter() {
680     @Override
681     public void mouseReleased(MouseEvent e) {
682         perTemp=new BigDecimal("0");
683         computed=false;

```

```

684         if(inString.length()==1&&inString.charAt(0)=='0') {
685             inString.delete(0, 1);
686         }
687         inString.append('1');
688         if (equals) {
689             result = new BigDecimal(inString.toString());
690         } else {
691             inNum=new BigDecimal(inString.toString());
692         }
693         if (inString.length()<14) {
694             myResultLabel.setText(inString.toString());
695         }
696     }
697
698 });
699 oneButton.setFont(new Font("微软雅黑", Font.PLAIN, 18));
700 downPanel.add(oneButton);
701
702 JButton twoButton = new JButton("2");
703 twoButton.addMouseListener(new MouseAdapter() {
704     @Override
705     public void mouseReleased(MouseEvent e) {
706         perTemp=new BigDecimal("0");
707         computed=false;
708         if(inString.length()==1&&inString.charAt(0)=='0') {
709             inString.delete(0, 1);
710         }
711         inString.append('2');
712         if (equals) {
713             result = new BigDecimal(inString.toString());
714         } else {
715             inNum=new BigDecimal(inString.toString());
716         }
717         if (inString.length()<14) {
718             myResultLabel.setText(inString.toString());
719         }
720     }
721
722 });
723 twoButton.setFont(new Font("微软雅黑", Font.PLAIN, 18));
724 downPanel.add(twoButton);
725
726 JButton threeButton = new JButton("3");
727 threeButton.addMouseListener(new MouseAdapter() {
728     @Override
729     public void mouseReleased(MouseEvent e) {
730         perTemp=new BigDecimal("0");
731         computed=false;
732         if(inString.length()==1&&inString.charAt(0)=='0') {
733             inString.delete(0, 1);
734         }
735         inString.append('3');
736         if (equals) {
737             result = new BigDecimal(inString.toString());
738         } else {
739             inNum=new BigDecimal(inString.toString());
740         }
741         if (inString.length()<14) {
742             myResultLabel.setText(inString.toString());
743         }
744     }
745
746 });

```

```

747 threeButton.setFont(new Font("微软雅黑", Font.PLAIN, 18));
748 downPanel.add(threeButton);
749
750
751 JButton addButton = new JButton("+");
752 addButton.addMouseListener(new MouseAdapter() {
753     @Override
754     public void mouseReleased(MouseEvent e) {
755         perTemp=new BigDecimal("0");
756         if(equaled) {
757             inNum = new BigDecimal(result.toString());
758             inString.delete(0, inString.length());
759             operatorString='+';
760             equaled=false;
761             if (resultString.length()<14) {
762                 myResultLabel.setText(resultString.toString());
763             }else {
764                 myResultLabel.setText(resultString.toString().substring(0,14));
765             }
766         }else {
767             compute();
768             inString.delete(0, inString.length());
769             operatorString='+';
770             if (resultString.length()<14) {
771                 myResultLabel.setText(resultString.toString());
772             }else {
773                 myResultLabel.setText(resultString.toString().substring(0,14));
774             }
775         }
776     }
777 });
778 addButton.setFont(new Font("微软雅黑", Font.PLAIN, 26));
779 downPanel.add(addButton);
780
781 JButton oppoButton = new JButton("+/-");
782 oppoButton.setSelectedIcon(null);
783 oppoButton.addMouseListener(new MouseAdapter() {
784     @Override
785     public void mouseReleased(MouseEvent e) {
786         if(equaled) {
787             perTemp=new BigDecimal(result.toString());
788             result=result.negate();
789             result.setScale(10, RoundingMode.HALF_UP);
790             if(result.compareTo(new BigDecimal(result.intValue()))==0){
791                 resultString=String.valueOf(result.intValue());
792             }else {
793                 resultString = result.stripTrailingZeros().toString();
794             }
795             inString.delete(0, inString.length());
796             if (resultString.length()<14) {
797                 myResultLabel.setText(resultString.toString());
798             }else {
799                 myResultLabel.setText(resultString.toString().substring(0,14));
800             }
801         }else {
802             if (computed) {
803                 perTemp=new BigDecimal(result.toString());
804                 inNum = result.negate();
805                 result.setScale(10, RoundingMode.HALF_UP);
806                 if (inNum.compareTo(new BigDecimal(inNum.intValue())) == 0) {
807                     resultString = String.valueOf(inNum.intValue());
808                 } else {
809                     resultString = inNum.stripTrailingZeros().toString();

```

```

810         }
811         inString.delete(0, inString.length());
812         if (resultString.length() < 14) {
813             myResultLabel.setText(resultString.toString());
814         } else {
815             myResultLabel.setText(resultString.toString().substring(0, 14));
816         }
817     } else {
818         perTemp=new BigDecimal(inNum.toString());
819         inNum = inNum.negate();
820         if (inNum.compareTo(new BigDecimal(inNum.intValue())) == 0) {
821             resultString = String.valueOf(inNum.intValue());
822         } else {
823             resultString = inNum.stripTrailingZeros().toString();
824         }
825         inString.delete(0, inString.length());
826         if (resultString.length() < 14) {
827             myResultLabel.setText(resultString.toString());
828         } else {
829             myResultLabel.setText(resultString.toString().substring(0, 14));
830         }
831     }
832 }
833 computed=false;
834 }
835 });
836 oppoButton.setFont(new Font("微软雅黑", Font.PLAIN, 24));
837 downPanel.add(oppoButton);
838
839 JButton zeroButton = new JButton("0");
840 zeroButton.setSelectedIcon(null);
841 zeroButton.addMouseListener(new MouseAdapter() {
842     @Override
843     public void mouseReleased(MouseEvent e) {
844         perTemp=new BigDecimal("0");
845         computed=false;
846         if(inString.length()==1&&inString.charAt(0)=='0') {
847             inString.delete(0, 1);
848         }
849         inString.append('0');
850         if (equals) {
851             result = new BigDecimal(inString.toString());
852         } else {
853             inNum=new BigDecimal(inString.toString());
854         }
855         if (inString.length()<14) {
856             myResultLabel.setText(inString.toString());
857         }
858     }
859 });
860 zeroButton.setFont(new Font("微软雅黑", Font.PLAIN, 18));
861 downPanel.add(zeroButton);
862 JButton dotButton = new JButton(".");
863 dotButton.setSelectedIcon(null);
864 dotButton.addMouseListener(new MouseAdapter() {
865     @Override
866     public void mouseReleased(MouseEvent e) {
867         perTemp=new BigDecimal("0");
868         if(dotted) {
869             return;
870         }
871         if(inString.isEmpty()) {
872             inString.append("0");

```

```

873         }dotted=true;
874         inString.append('.');
875         inNum=new BigDecimal(inString.toString());
876         if (inString.length()<14) {
877             myResultLabel.setText(inString.toString());
878         }
879     }
880 });
881 dotButton.setFont(new Font("微软雅黑", Font.PLAIN, 30));
882 downPanel.add(dotButton);
883
884 JButton equalButton = new JButton("=");
885 equalButton.setBackground(SystemColor.activeCaption);
886 equalButton.setSelectedIcon(null);
887 equalButton.addMouseListener(new MouseAdapter() {
888     @Override
889     public void mouseReleased(MouseEvent e) {
890         if (computed) {
891             perTemp = new BigDecimal("0");
892             compute();
893             equaled = true;
894             inString.delete(0, inString.length());
895             if (resultString.length() < 14) {
896                 myResultLabel.setText(resultString.toString());
897             } else {
898                 myResultLabel.setText(resultString.toString().substring(0, 14));
899             }
900         } else {
901             perTemp = new BigDecimal("0");
902             compute();
903             computed=true;
904             equaled = true;
905             inString.delete(0, inString.length());
906             if (resultString.length() < 14) {
907                 myResultLabel.setText(resultString.toString());
908             } else {
909                 myResultLabel.setText(resultString.toString().substring(0, 14));
910             }
911         }
912     }
913 });
914 equalButton.setFont(new Font("微软雅黑", Font.PLAIN, 26));
915 downPanel.add(equalButton);
916
917 JPanel upPanel = new JPanel();
918 contentPane.add(upPanel, BorderLayout.NORTH);
919 upPanel.setLayout(new BorderLayout(0, 0));
920
921 JLabel blankLabel = new JLabel(" ");
922 blankLabel.setFont(new Font("Consolas", Font.PLAIN, 12));
923 upPanel.add(blankLabel, BorderLayout.NORTH);
924
925 JLabel resultLabel = new JLabel("0");
926 resultLabel.setFont(new Font("微软正黑体", Font.BOLD, 38));
927 myResultLabel=resultLabel;
928 resultLabel.setHorizontalAlignment(SwingConstants.RIGHT);
929 upPanel.add(resultLabel, BorderLayout.CENTER);
930
931 JLabel BlankLabel1 = new JLabel(" ");
932 BlankLabel1.setFont(new Font("宋体", Font.PLAIN, 10));
933 upPanel.add(BlankLabel1, BorderLayout.SOUTH);
934 }
935 public void compute() {

```

```

936     switch(operatorString) {
937     case '+':
938         result=result.add(inNum);
939         result.setScale(10,RoundingMode.HALF_UP);
940         if(result.compareTo(new BigDecimal(result.intValue()))==0){
941             resultString=String.valueOf(result.intValue());
942         }else {
943             resultString = result.stripTrailingZeros().toString();
944         }
945         break;
946     case '-':
947         result=result.subtract(inNum);
948         result.setScale(10,RoundingMode.HALF_UP);
949         if(result.compareTo(new BigDecimal(result.intValue()))==0){
950             resultString=String.valueOf(result.intValue());
951         }else {
952             resultString = result.stripTrailingZeros().toString();
953         }
954         break;
955     case '*':
956         System.out.println(inNum);
957         System.out.println(result);
958         result=result.multiply(inNum);
959         result.setScale(10,RoundingMode.HALF_UP);
960         if(result.compareTo(new BigDecimal(result.intValue()))==0){
961             resultString=String.valueOf(result.intValue());
962         }else {
963             resultString = result.stripTrailingZeros().toString();
964         }
965         break;
966     case '/':
967         if(inNum.equals(new BigDecimal("0"))) {
968             resultString="Infinity";
969             //pause
970         }else {
971             result = result.divide(inNum,10,RoundingMode.HALF_DOWN);
972             result.setScale(10,RoundingMode.HALF_UP);
973             if(result.compareTo(new BigDecimal(result.intValue()))==0){
974                 resultString=String.valueOf(result.intValue());
975             }else {
976                 resultString = result.stripTrailingZeros().toString();
977             }
978         }
979         break;
980     case '|':
981         BigDecimal zeroBigDecimal= new BigDecimal("0");
982         result=zeroBigDecimal.subtract(inNum);
983         inNum=result;
984         result.setScale(10,RoundingMode.HALF_UP);
985         if(result.compareTo(new BigDecimal(result.intValue()))==0){
986             resultString=String.valueOf(result.intValue());
987         }else {
988             resultString = result.stripTrailingZeros().toString();
989         }
990         break;
991     case ' ':
992         result=new BigDecimal(inString.toString());
993         result.setScale(10,RoundingMode.HALF_UP);
994         if(result.compareTo(new BigDecimal(result.intValue()))==0){
995             resultString=String.valueOf(result.intValue());
996         }else {
997             resultString = result.stripTrailingZeros().toString();
998         }

```

```
999         break;
1000     default:
1001         equaled=false;
1002         dotted=false;
1003         computed=true;
1004     }
1005 }
1006 }
```