Using an Integrated Development Environment

Integrated Development Environments

- An Integrated Development Environment, or IDE, permits you to edit, compile, test, and debug a program using a single program.
  - There are several IDEs for Java.
  - We will look at one of them, jGRASP, today.

Objectives

- You will be able to use the jGRASP IDE to edit, compile, test, and debug Java programs.

Installing jGRASP

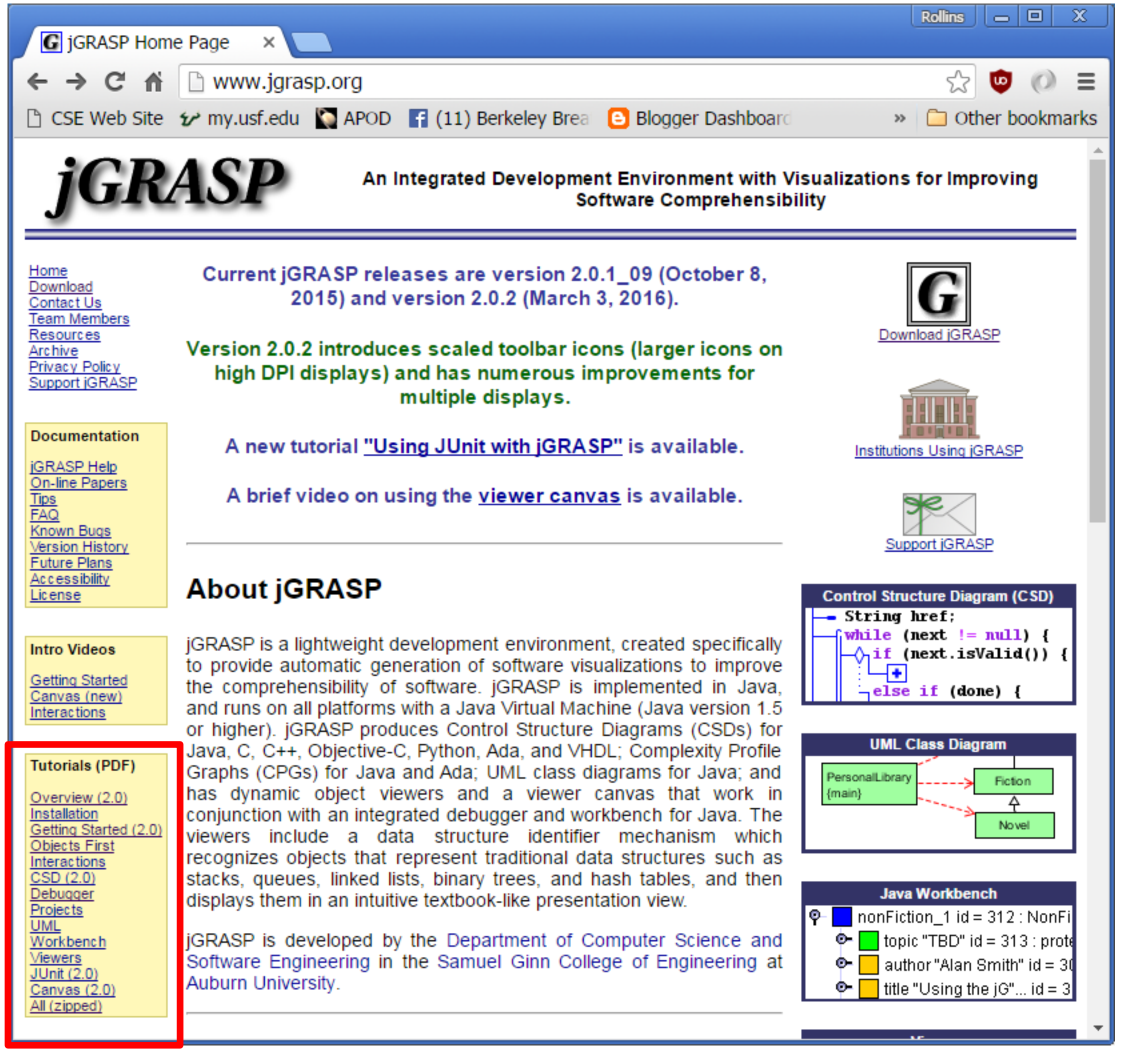
- jGRASP is available on lab computers.

- To install it on your own computer, see
  - http://www.csee.usf.edu/~turnerr/Programming_Concepts/120_Installing_jGRASP.pdf

- Versions are available for
  - Windows
  - Mac
  - Linux

jGRASP Tutorials

There is an extensive set of jGRASP tutorials, with links on the start page:



jGRASP Home Page

www.jgrasp.org

CSE Web Site · my.usf.edu · APOD · (11) Berkeley Brea · Blogger Dashboard · Other bookmarks

jGRASP

An Integrated Development Environment with Visualizations for Improving Software Comprehensibility

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Intro Videos

Getting Started
Canvas (new)
Interactions

Tutorials (PDF)

Overview (2.0)
Installation
Getting Started (2.0)
Objects First
Interactions
CSD (2.0)
Debugger
Projects
UML
Workbench
Viewers
JUnit (2.0)
Canvas (2.0)
All (zipped)

Current jGRASP releases are version 2.0.1_09 (October 8, 2015) and version 2.0.2 (March 3, 2016).

Version 2.0.2 introduces scaled toolbar icons (larger icons on high DPI displays) and has numerous improvements for multiple displays.

A new tutorial "Using JUnit with jGRASP" is available.

A brief video on using the viewer canvas is available.

About jGRASP

jGRASP is a lightweight development environment, created specifically to provide automatic generation of software visualizations to improve the comprehensibility of software. jGRASP is implemented in Java, and runs on all platforms with a Java Virtual Machine (Java version 1.5 or higher). jGRASP produces Control Structure Diagrams (CSDs) for Java, C, C++, Objective-C, Python, Ada, and VHDL; Complexity Profile Graphs (CPGs) for Java and Ada; UML class diagrams for Java; and has dynamic object viewers and a viewer canvas that work in conjunction with an integrated debugger and workbench for Java. The viewers include a data structure identifier mechanism which recognizes objects that represent traditional data structures such as stacks, queues, linked lists, binary trees, and hash tables, and then displays them in an intuitive textbook-like presentation view.

jGRASP is developed by the Department of Computer Science and Software Engineering in the Samuel Ginn College of Engineering at Auburn University.

Download jGRASP

Institutions Using jGRASP

Support jGRASP

Control Structure Diagram (CSD)

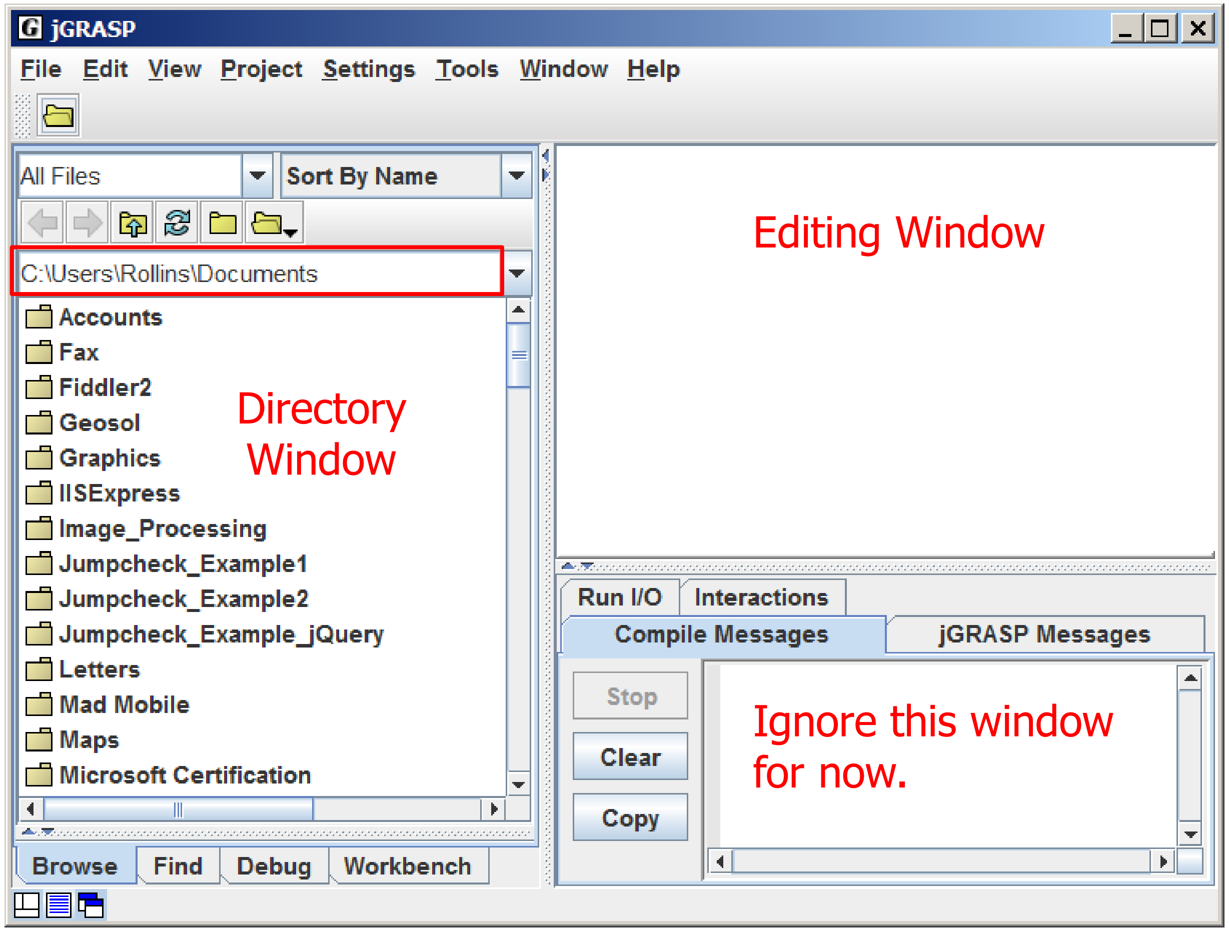
```
String href;
while (next != null) {
   if (next.isValid()) {
   else if (done) {
```

UML Class Diagram

Java Workbench

```
nonFiction_1 id = 312 : NonFi
   topic "TBD" id = 313 : prot
   author "Alan Smith" id = 3
   title "Using the jG"... id = 3
```

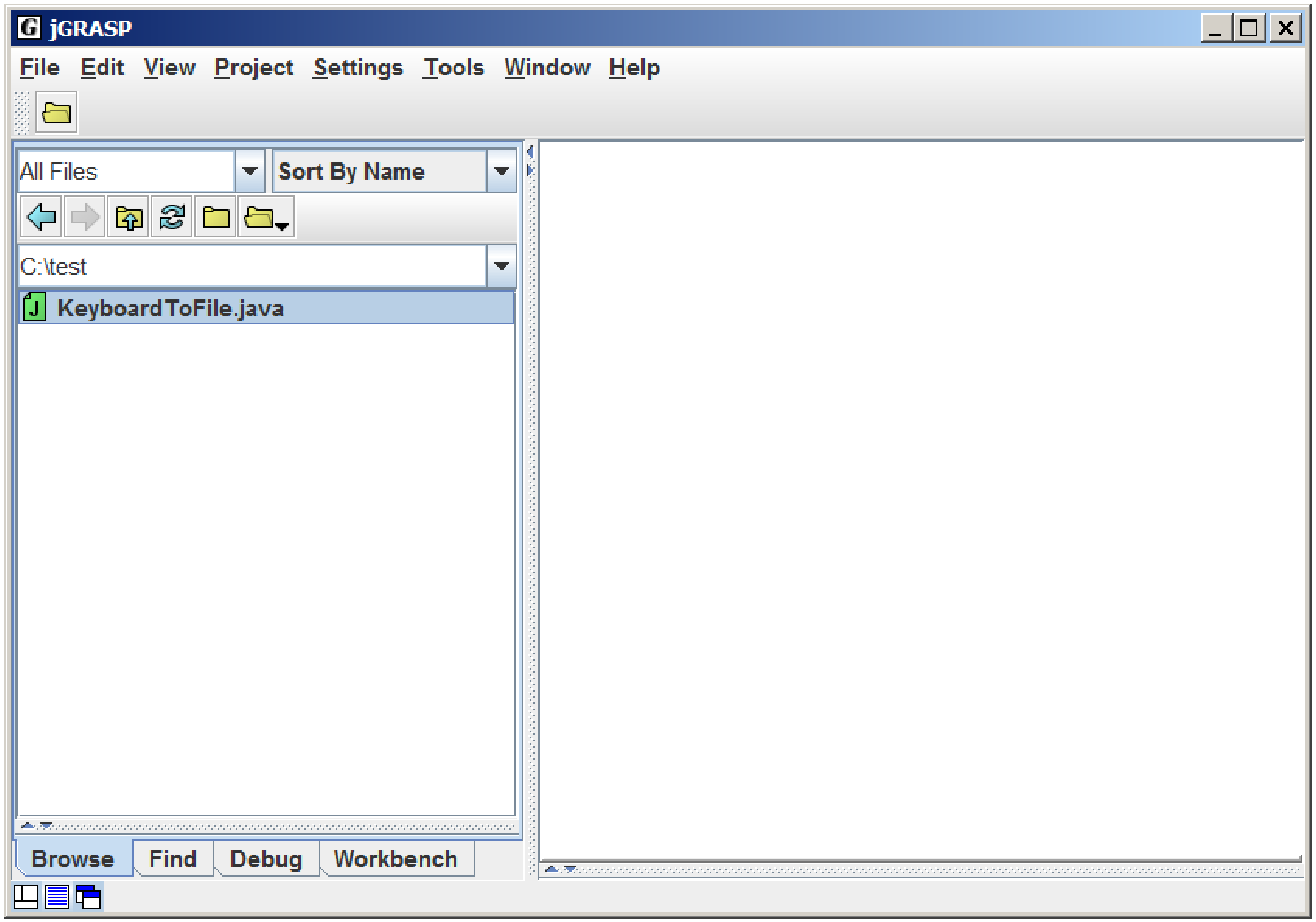
Using jGRASP



Start page.

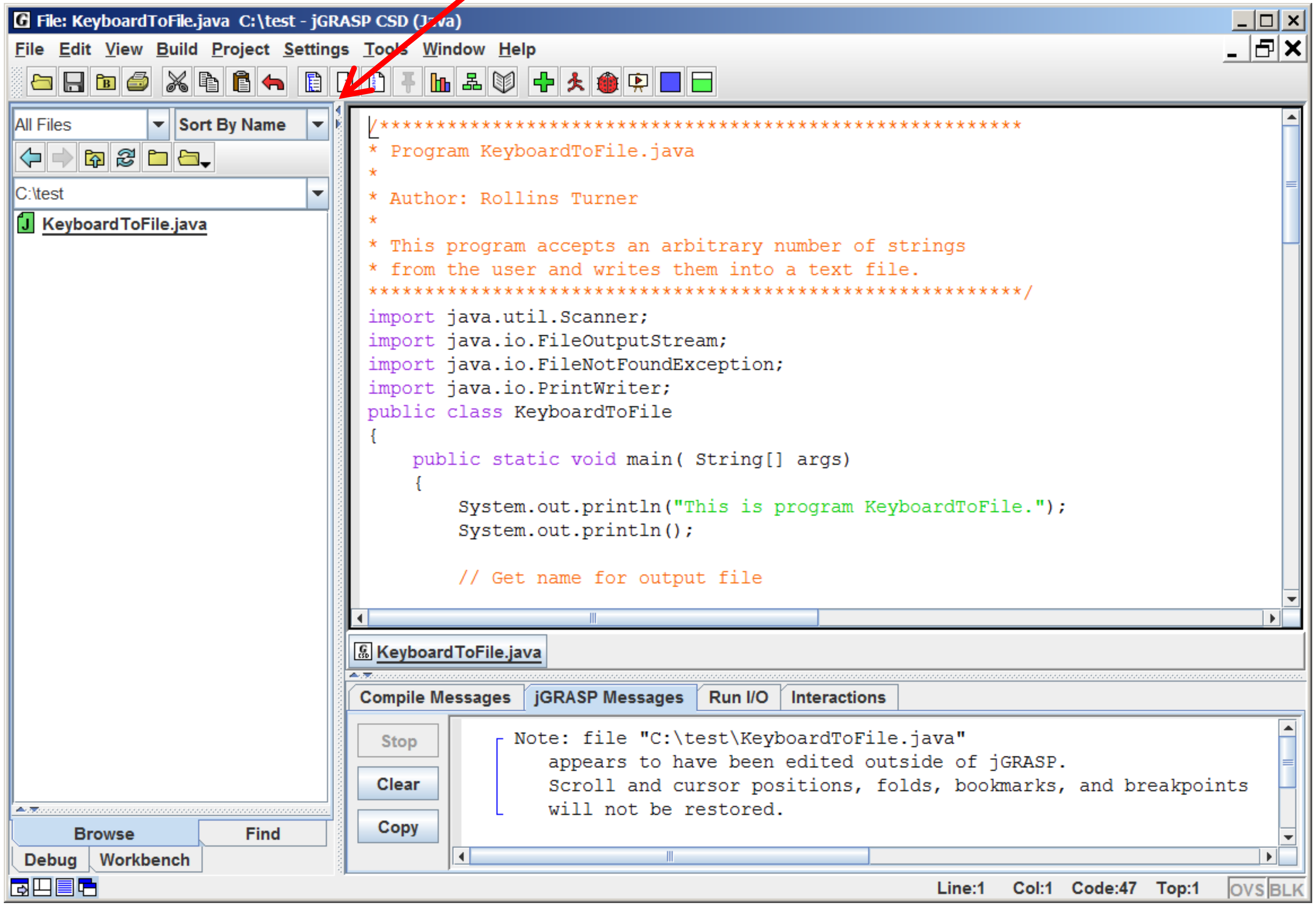
Navigate to Your Test Directory

Double click on file name to open file in editing window.



Source File Open in Editing Window

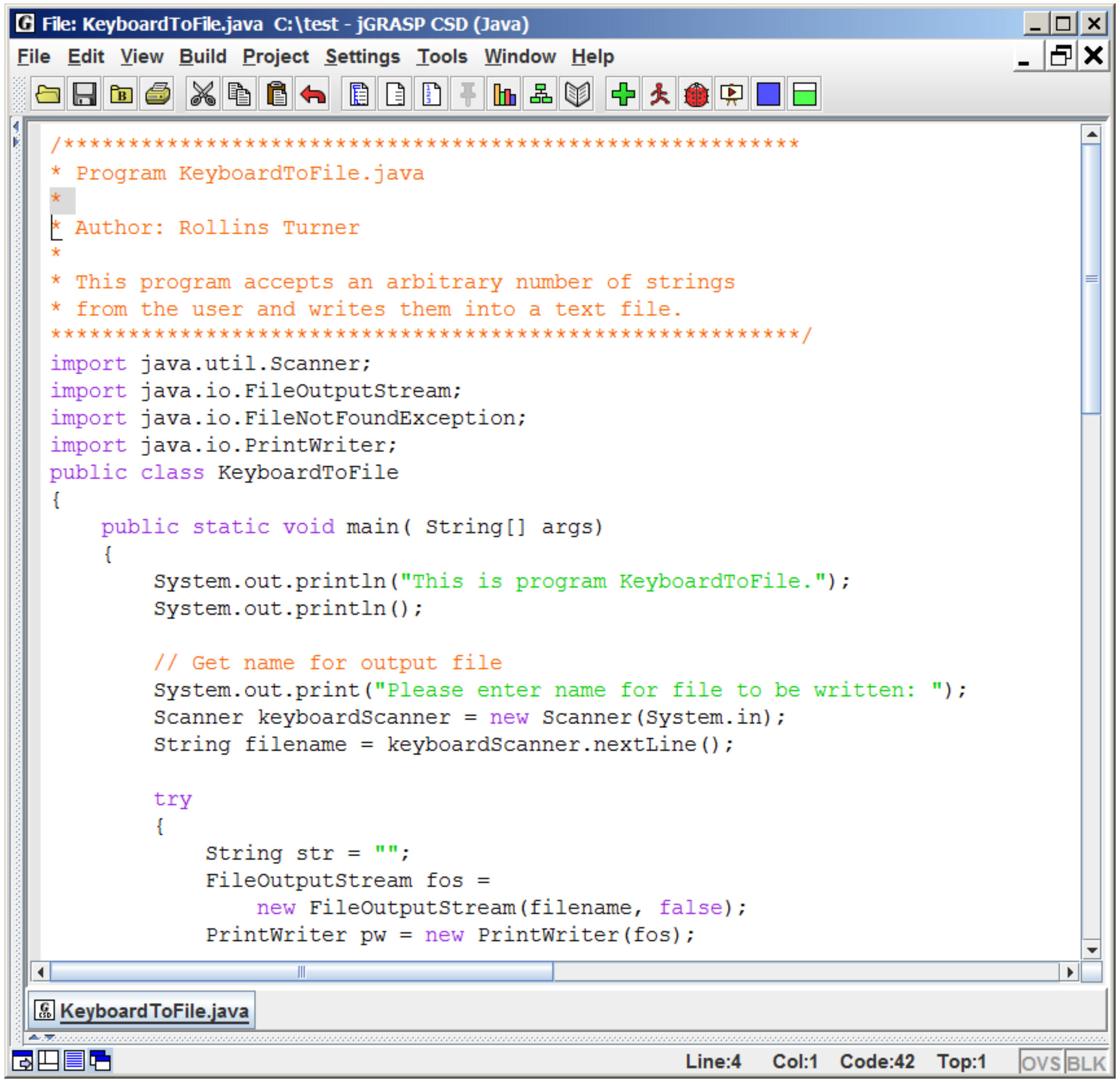
Click here to maximize editing window.



```
/*************************************************************
* Program KeyboardToFile.java
*
* Author: Rollins Turner
*
* This program accepts an arbitrary number of strings
* from the user and writes them into a text file.
*************************************************************/
import java.util.Scanner;
import java.io.FileOutputStream;
import java.io.FileNotFoundException;
import java.io.PrintWriter;
public class KeyboardToFile
{
    public static void main( String[] args)
    {
        System.out.println("This is program KeyboardToFile.");
        System.out.println();

        // Get name for output file
```

```
Note: file "C:\test\KeyboardToFile.java"
   appears to have been edited outside of jGRASP.
   Scroll and cursor positions, folds, bookmarks, and breakpoints
   will not be restored.
```

Editing Window


File: KeyboardToFile.java C:\test - jGRASP CSD (Java)
File Edit View Build Project Settings Tools Window Help
KeyboardToFile.java
Line:4 Col:1 Code:42 Top:1 OVS BLK

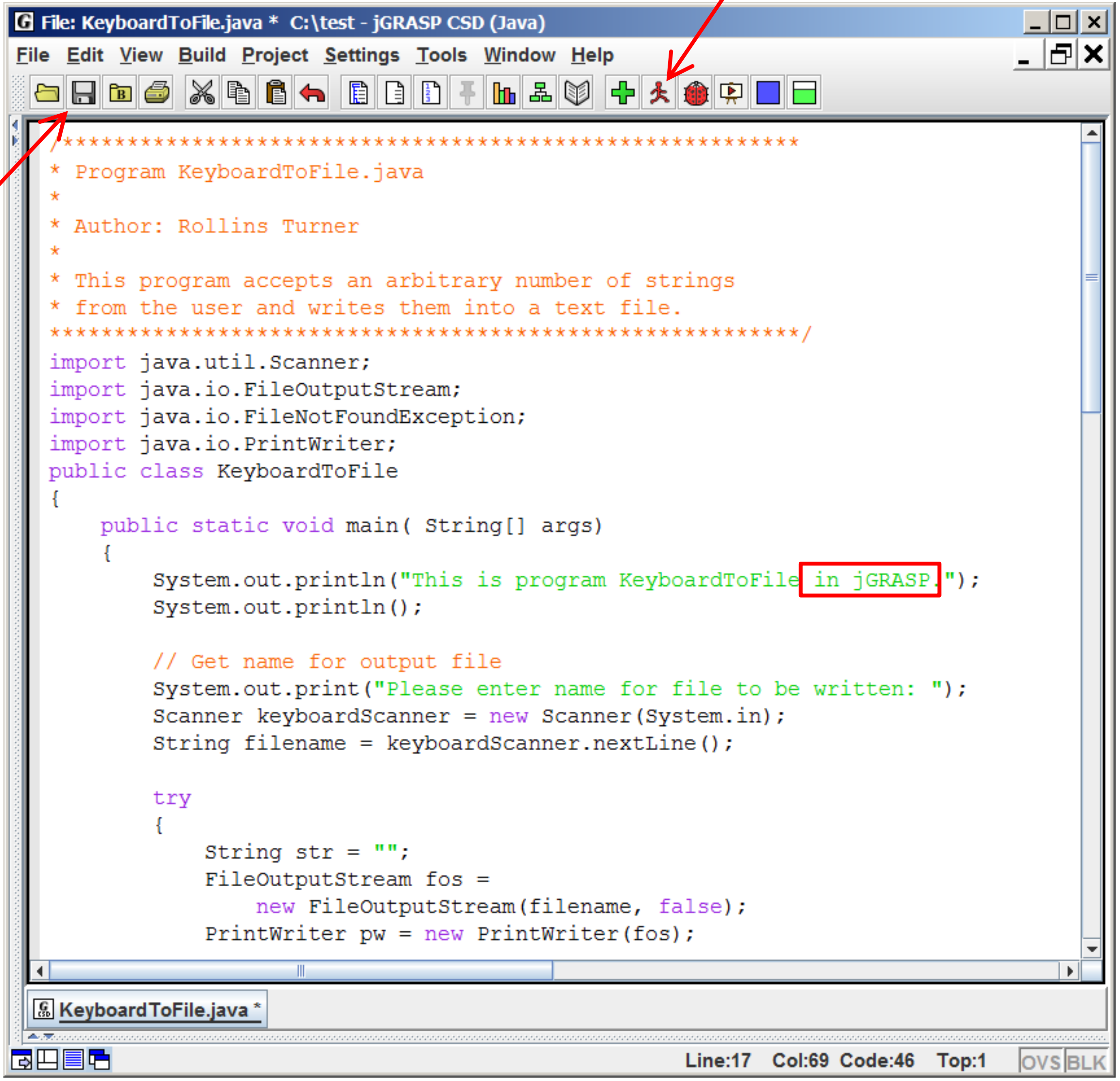
```
/******************************************************************
* Program KeyboardToFile.java
*
* Author: Rollins Turner
*
* This program accepts an arbitrary number of strings
* from the user and writes them into a text file.
******************************************************************/
import java.util.Scanner;
import java.io.FileOutputStream;
import java.io.FileNotFoundException;
import java.io.PrintWriter;
public class KeyboardToFile
{
    public static void main( String[] args)
    {
        System.out.println("This is program KeyboardToFile.");
        System.out.println();

        // Get name for output file
        System.out.print("Please enter name for file to be written: ");
        Scanner keyboardScanner = new Scanner(System.in);
        String filename = keyboardScanner.nextLine();

        try
        {
            String str = "";
            FileOutputStream fos =
                new FileOutputStream(filename, false);
            PrintWriter pw = new PrintWriter(fos);
```

Editing Window

Click here to run program.

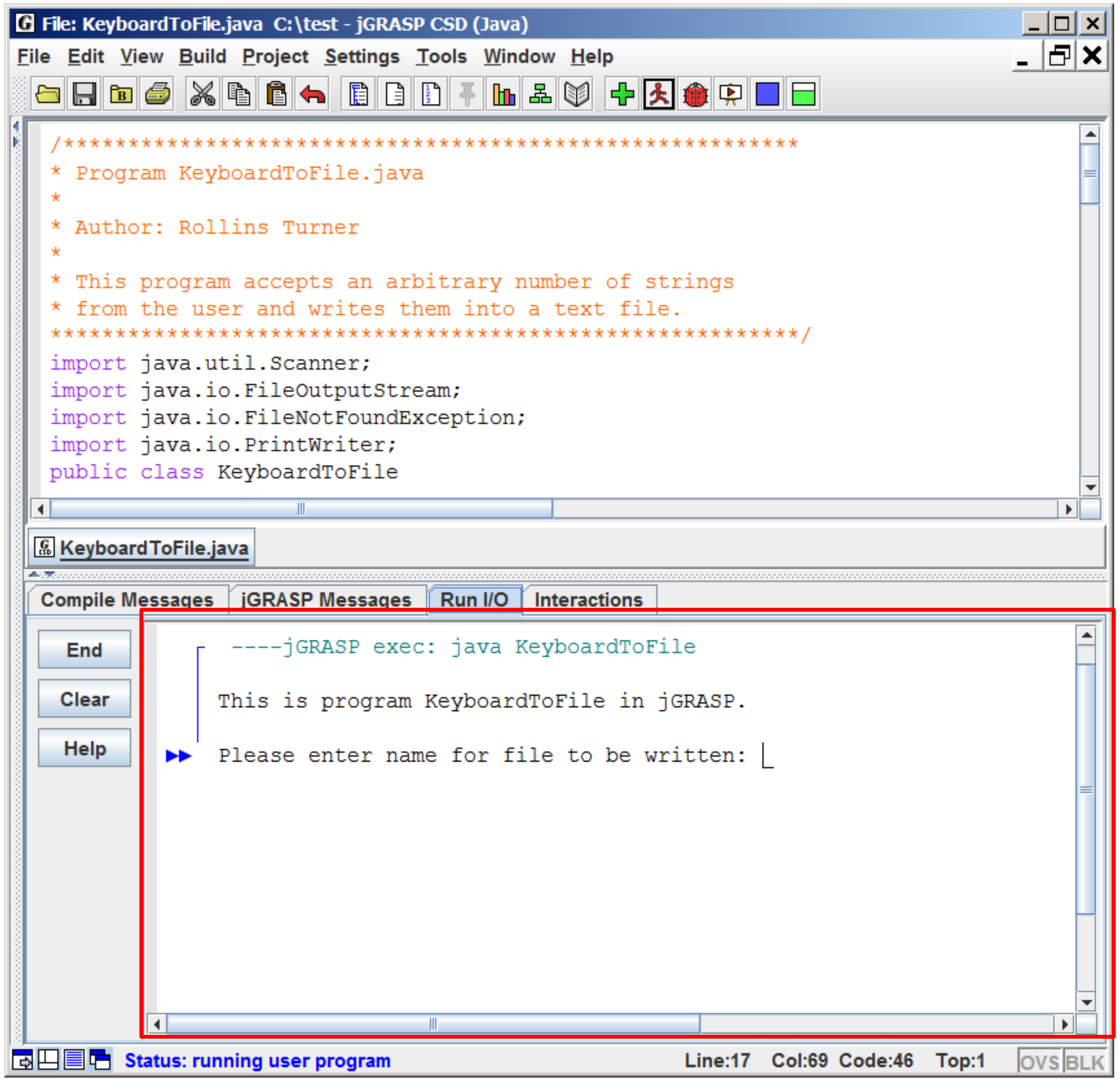
Click here to save.

Make a change.


File: KeyboardToFile.java * C:\test - jGRASP CSD (Java)
File Edit View Build Project Settings Tools Window Help
KeyboardToFile.java *
Line:17 Col:69 Code:46 Top:1
OVS BLK

```
/****************************************************************
 * Program KeyboardToFile.java
 *
 * Author: Rollins Turner
 *
 * This program accepts an arbitrary number of strings
 * from the user and writes them into a text file.
 *****************************************************************/
import java.util.Scanner;
import java.io.FileOutputStream;
import java.io.FileNotFoundException;
import java.io.PrintWriter;
public class KeyboardToFile
{
    public static void main( String[] args)
    {
        System.out.println("This is program KeyboardToFile in jGRASP.");
        System.out.println();

        // Get name for output file
        System.out.print("Please enter name for file to be written: ");
        Scanner keyboardScanner = new Scanner(System.in);
        String filename = keyboardScanner.nextLine();

        try
        {
            String str = "";
            FileOutputStream fos =
                new FileOutputStream(filename, false);
            PrintWriter pw = new PrintWriter(fos);
```

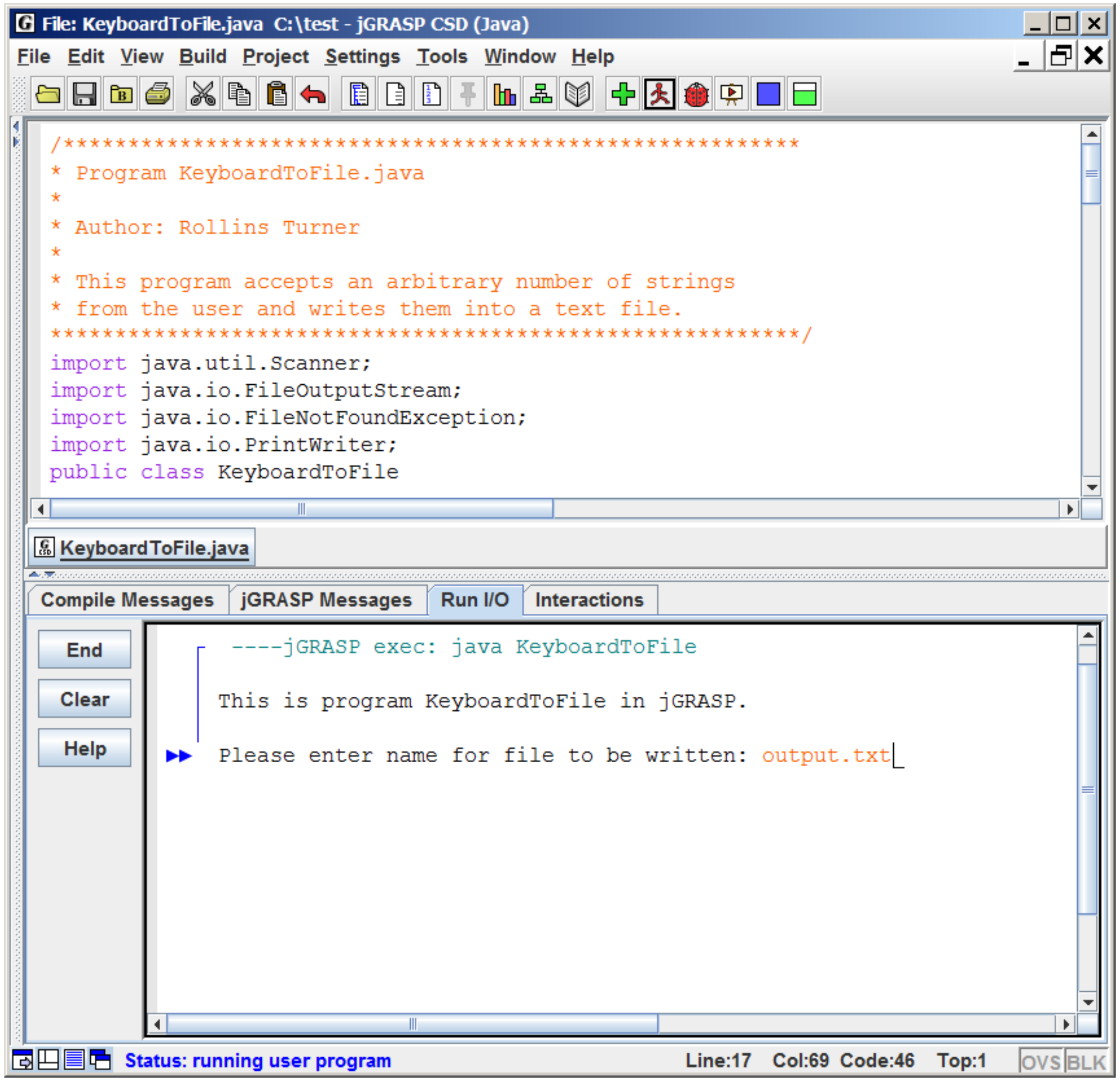
Program Running


File: KeyboardToFile.java C:\test - jGRASP CSD (Java)
File Edit View Build Project Settings Tools Window Help
KeyboardToFile.java
Compile Messages
jGRASP Messages
Run I/O
Interactions
End
Clear
Help
Status: running user program
Line:17 Col:69 Code:46 Top:1
OVS BLK

```
/*************************************************************
* Program KeyboardToFile.java
*
* Author: Rollins Turner
*
* This program accepts an arbitrary number of strings
* from the user and writes them into a text file.
*************************************************************/
import java.util.Scanner;
import java.io.FileOutputStream;
import java.io.FileNotFoundException;
import java.io.PrintWriter;
public class KeyboardToFile
```

```
 ----jGRASP exec: java KeyboardToFile

This is program KeyboardToFile in jGRASP.

Please enter name for file to be written:
```

Console Window

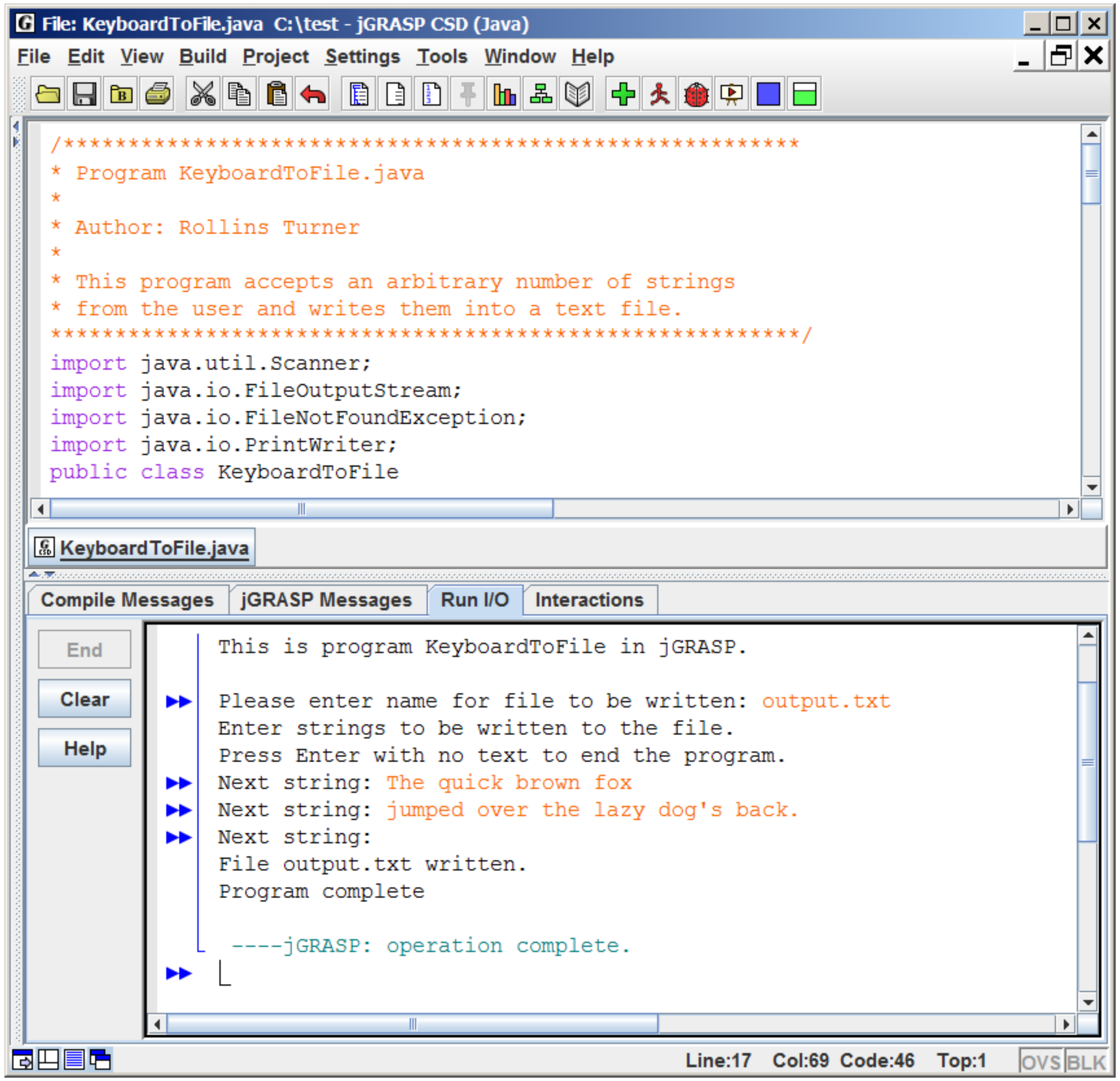

File: KeyboardToFile.java C:\test - jGRASP CSD (Java)
File Edit View Build Project Settings Tools Window Help

```java
/*************************************************************
* Program KeyboardToFile.java
*
* Author: Rollins Turner
*
* This program accepts an arbitrary number of strings
* from the user and writes them into a text file.
*************************************************************/
import java.util.Scanner;
import java.io.FileOutputStream;
import java.io.FileNotFoundException;
import java.io.PrintWriter;
public class KeyboardToFile
```

KeyboardToFile.java
Compile Messages
jGRASP Messages
Run I/O
Interactions
End
Clear
Help

```
 ----jGRASP exec: java KeyboardToFile

This is program KeyboardToFile in jGRASP.

Please enter name for file to be written: output.txt
```

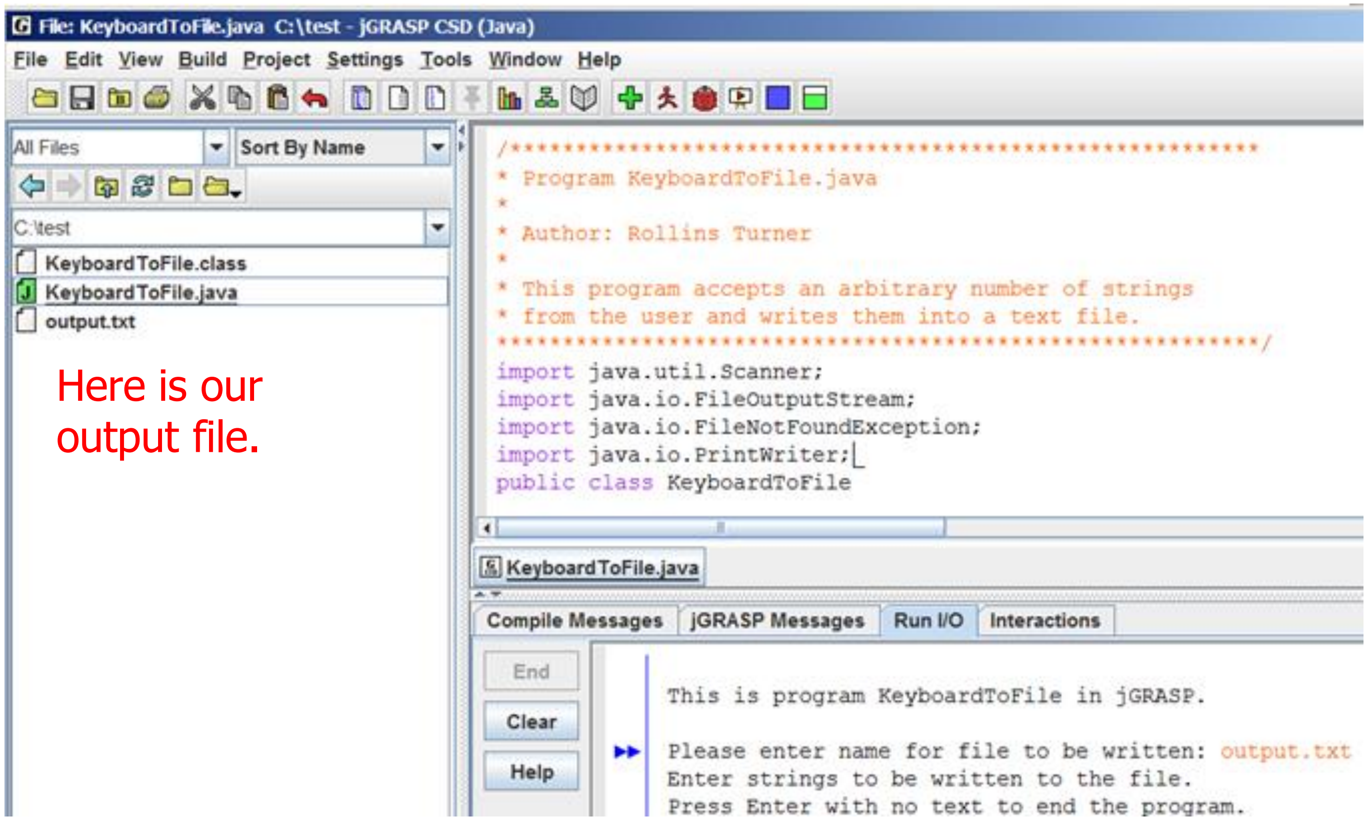
Program Running


File: KeyboardToFile.java C:\test - jGRASP CSD (Java)
File Edit View Build Project Settings Tools Window Help
KeyboardToFile.java
Compile Messages jGRASP Messages Run I/O Interactions
End
Clear
Help
Line:17 Col:69 Code:46 Top:1 OVS BLK

```
/**********************************************************
* Program KeyboardToFile.java
*
* Author: Rollins Turner
*
* This program accepts an arbitrary number of strings
* from the user and writes them into a text file.
**********************************************************/
import java.util.Scanner;
import java.io.FileOutputStream;
import java.io.FileNotFoundException;
import java.io.PrintWriter;
public class KeyboardToFile
```

```
This is program KeyboardToFile in jGRASP.

Please enter name for file to be written: output.txt
Enter strings to be written to the file.
Press Enter with no text to end the program.
Next string: The quick brown fox
Next string: jumped over the lazy dog's back.
Next string:
File output.txt written.
Program complete

 ----jGRASP: operation complete.
```

Expand and Refresh Directory Window



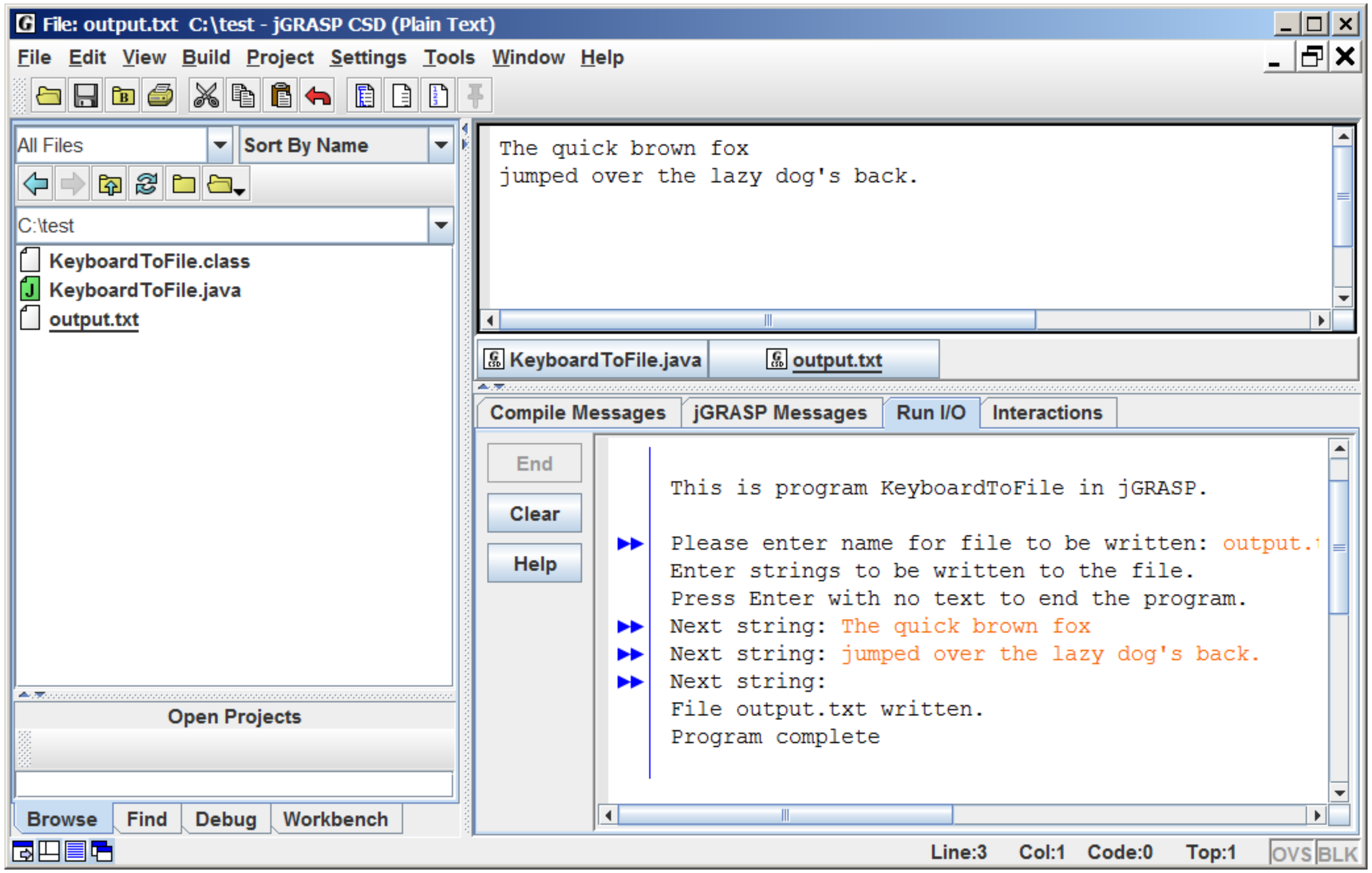
```
/*********************************************************
* Program KeyboardToFile.java
*
* Author: Rollins Turner
*
* This program accepts an arbitrary number of strings
* from the user and writes them into a text file.
**********************************************************/
import java.util.Scanner;
import java.io.FileOutputStream;
import java.io.FileNotFoundException;
import java.io.PrintWriter;
public class KeyboardToFile
```

```
This is program KeyboardToFile in jGRASP.

Please enter name for file to be written: output.txt
Enter strings to be written to the file.
Press Enter with no text to end the program.
```

Here is our output file.

Double click file name to display the file.

Output File Contents

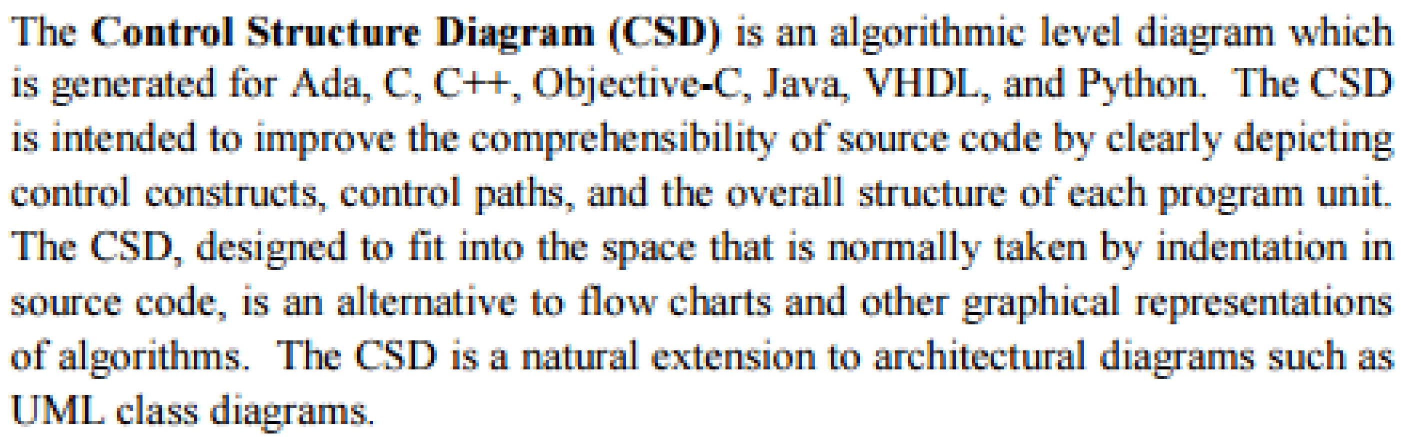

File: output.txt C:\test - jGRASP CSD (Plain Text)
File Edit View Build Project Settings Tools Window Help
All Files
Sort By Name
C:\test
KeyboardToFile.class
KeyboardToFile.java
output.txt
Open Projects
Browse Find Debug Workbench
KeyboardToFile.java
output.txt
Compile Messages jGRASP Messages Run I/O Interactions
End
Clear
Help
Line:3 Col:1 Code:0 Top:1 OVS BLK

```
The quick brown fox
jumped over the lazy dog's back.
```

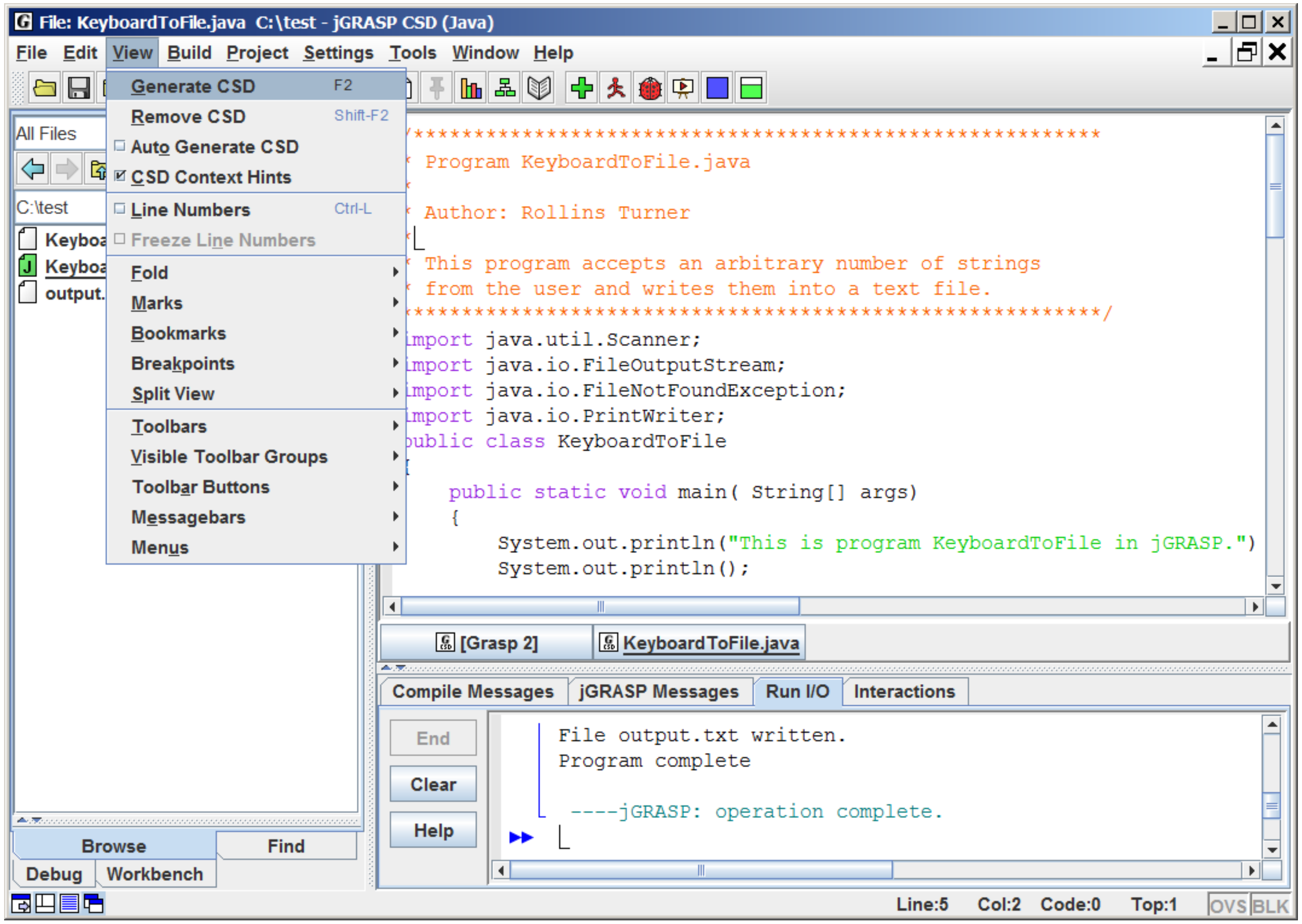
```
 This is program KeyboardToFile in jGRASP.

▶▶ Please enter name for file to be written: output.t
 Enter strings to be written to the file.
 Press Enter with no text to end the program.
▶▶ Next string: The quick brown fox
▶▶ Next string: jumped over the lazy dog's back.
▶▶ Next string:
 File output.txt written.
 Program complete
```

Control Structure Diagrams

From the Overview tutorial:


The **Control Structure Diagram (CSD)** is an algorithmic level diagram which is generated for Ada, C, C++, Objective-C, Java, VHDL, and Python. The CSD is intended to improve the comprehensibility of source code by clearly depicting control constructs, control paths, and the overall structure of each program unit. The CSD, designed to fit into the space that is normally taken by indentation in source code, is an alternative to flow charts and other graphical representations of algorithms. The CSD is a natural extension to architectural diagrams such as UML class diagrams.

Genrating a Control Structure Diagram



```
/*****************************************************************
 * Program KeyboardToFile.java
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 * Author: Rollins Turner
 *
 * This program accepts an arbitrary number of strings
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 ******************************************************************/
import java.util.Scanner;
import java.io.FileOutputStream;
import java.io.FileNotFoundException;
import java.io.PrintWriter;
public class KeyboardToFile
{
   public static void main( String[] args)
   {
      System.out.println("This is program KeyboardToFile in jGRASP.")
      System.out.println();
```
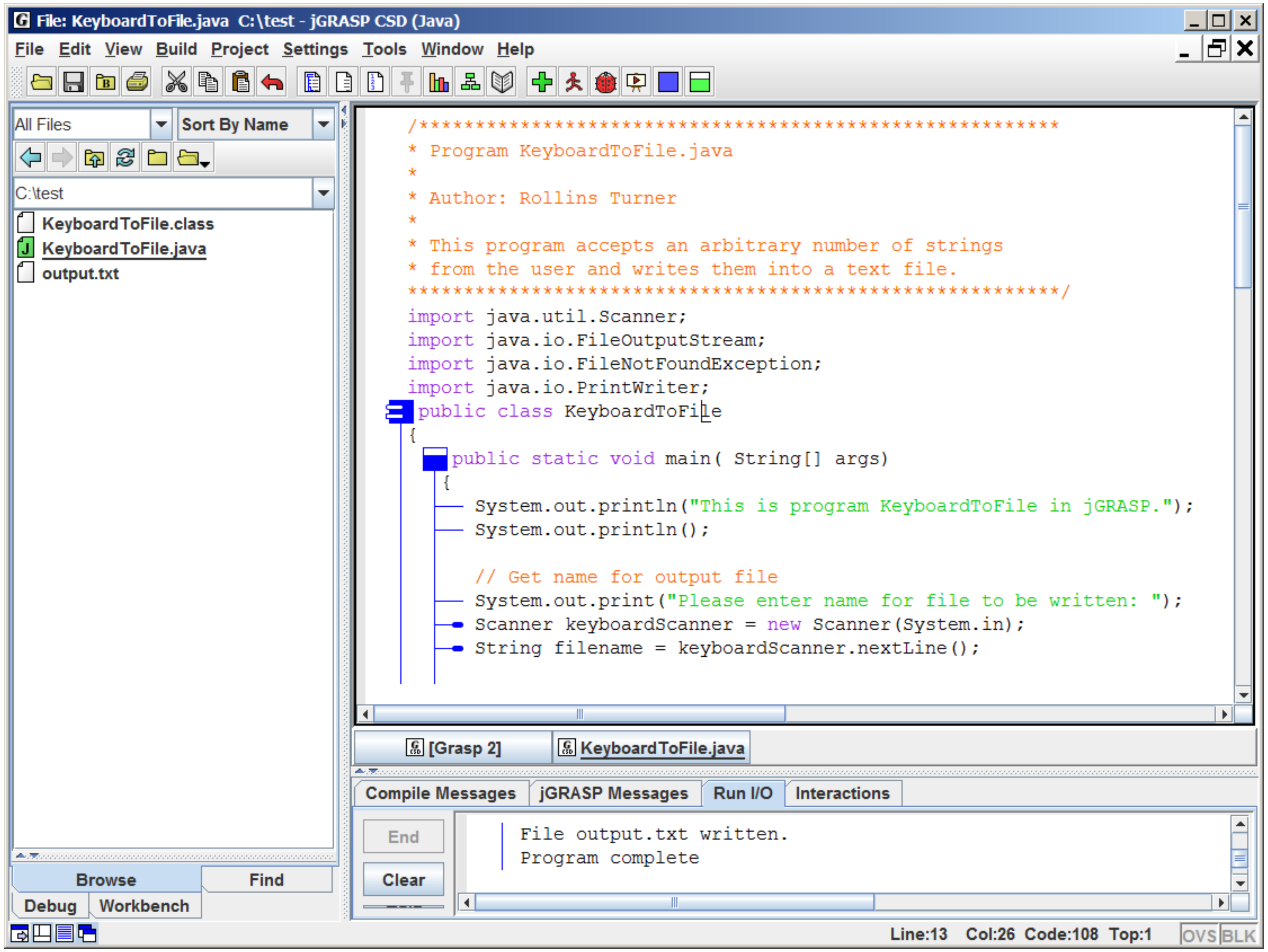

```
File output.txt written.
Program complete

 ----jGRASP: operation complete.
```



```
/*************************************************************
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 *
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 *************************************************************/
import java.util.Scanner;
import java.io.FileOutputStream;
import java.io.FileNotFoundException;
import java.io.PrintWriter;
public class KeyboardToFile
{
   public static void main( String[] args)
   {
      System.out.println("This is program KeyboardToFile in jGRASP.");
      System.out.println();

      // Get name for output file
      System.out.print("Please enter name for file to be written: ");
      Scanner keyboardScanner = new Scanner(System.in);
      String filename = keyboardScanner.nextLine();
```
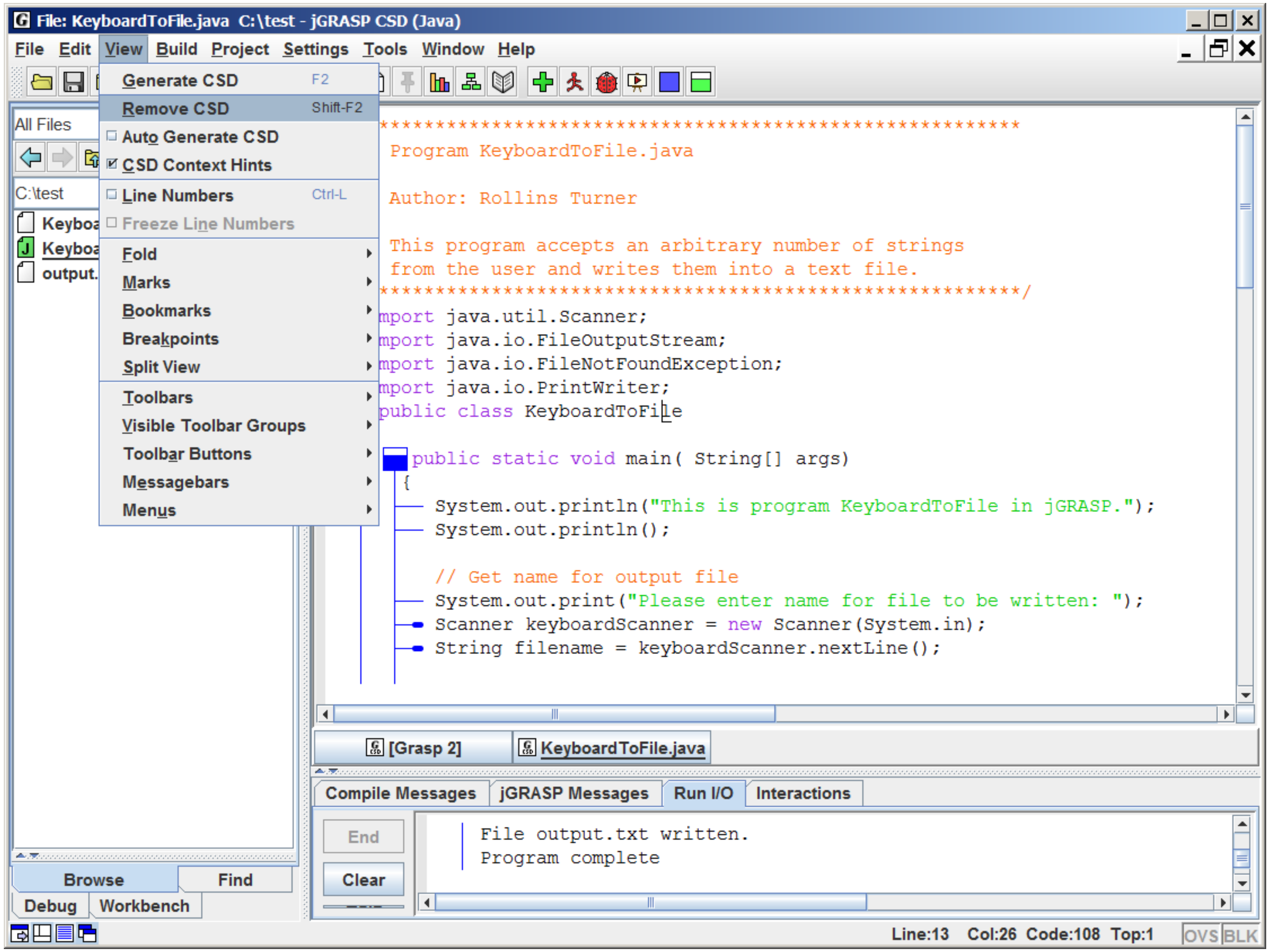

```
File output.txt written.
Program complete
```

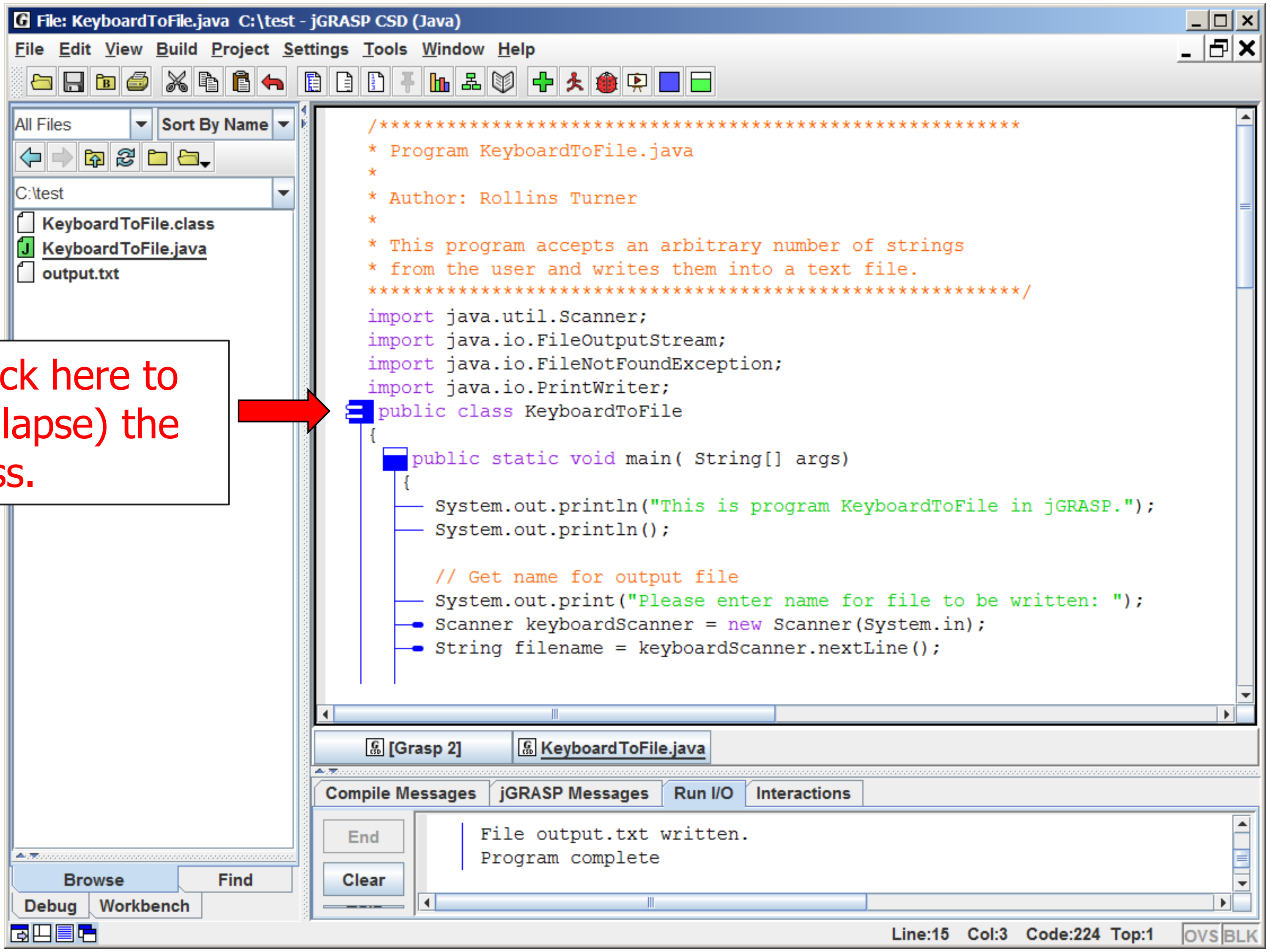
If you want to remove the CSD



```
***********************************************************
 Program KeyboardToFile.java

 Author: Rollins Turner

 This program accepts an arbitrary number of strings
 from the user and writes them into a text file.
***********************************************************/
mport java.util.Scanner;
mport java.io.FileOutputStream;
mport java.io.FileNotFoundException;
mport java.io.PrintWriter;
public class KeyboardToFile

   public static void main( String[] args)
   {
      System.out.println("This is program KeyboardToFile in jGRASP.");
      System.out.println();

      // Get name for output file
      System.out.print("Please enter name for file to be written: ");
      Scanner keyboardScanner = new Scanner(System.in);
      String filename = keyboardScanner.nextLine();
```

```
File output.txt written.
Program complete
```

Folding a Program Element



```
/************************************************************
 * Program KeyboardToFile.java
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 * Author: Rollins Turner
 *
 * This program accepts an arbitrary number of strings
 * from the user and writes them into a text file.
 ************************************************************/
import java.util.Scanner;
import java.io.FileOutputStream;
import java.io.FileNotFoundException;
import java.io.PrintWriter;
public class KeyboardToFile
{
   public static void main( String[] args)
   {
      System.out.println("This is program KeyboardToFile in jGRASP.");
      System.out.println();

      // Get name for output file
      System.out.print("Please enter name for file to be written: ");
      Scanner keyboardScanner = new Scanner(System.in);
      String filename = keyboardScanner.nextLine();
```
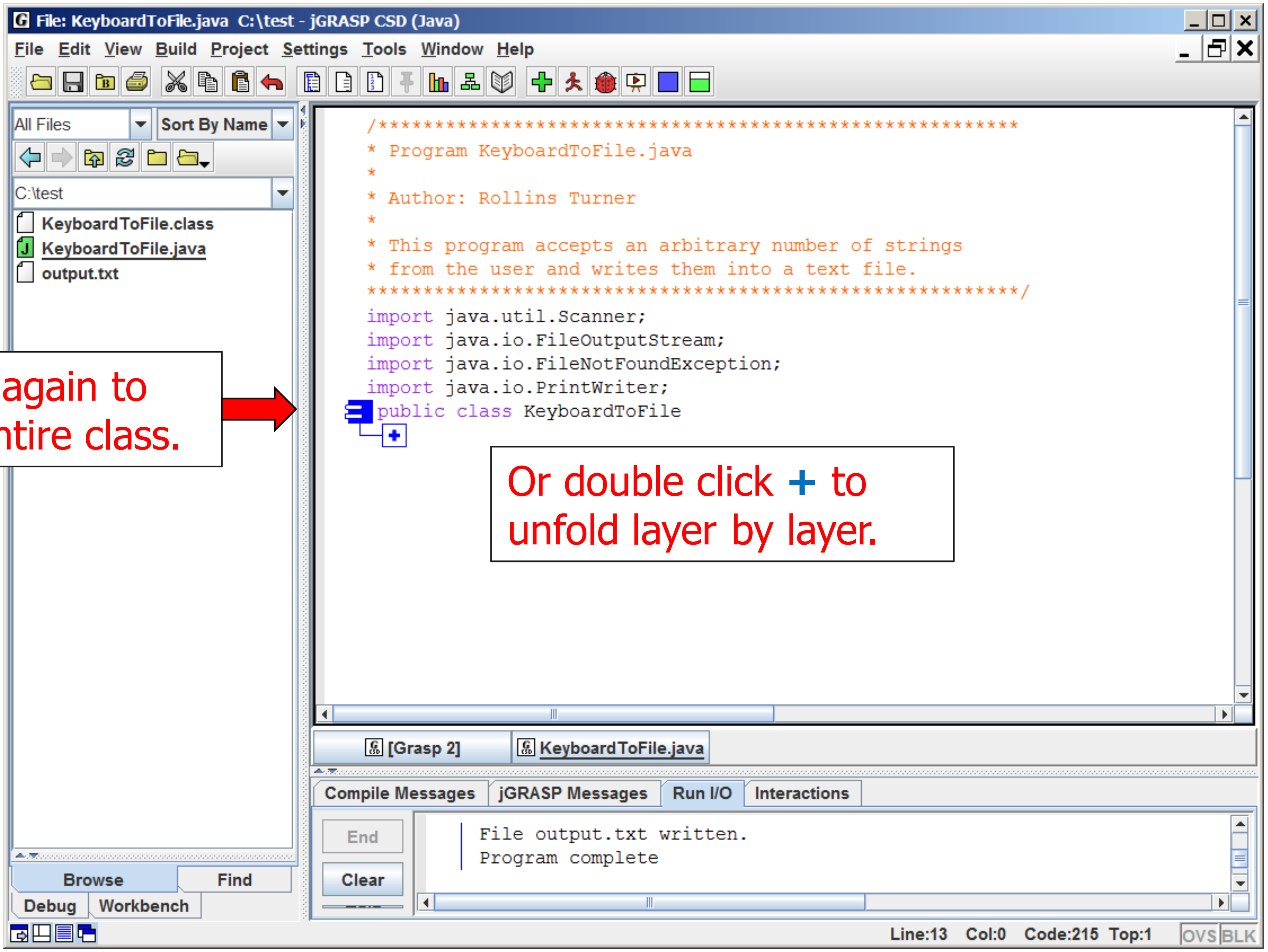

```
File output.txt written.
Program complete
```

Double click here to "fold" (collapse) the entire class.



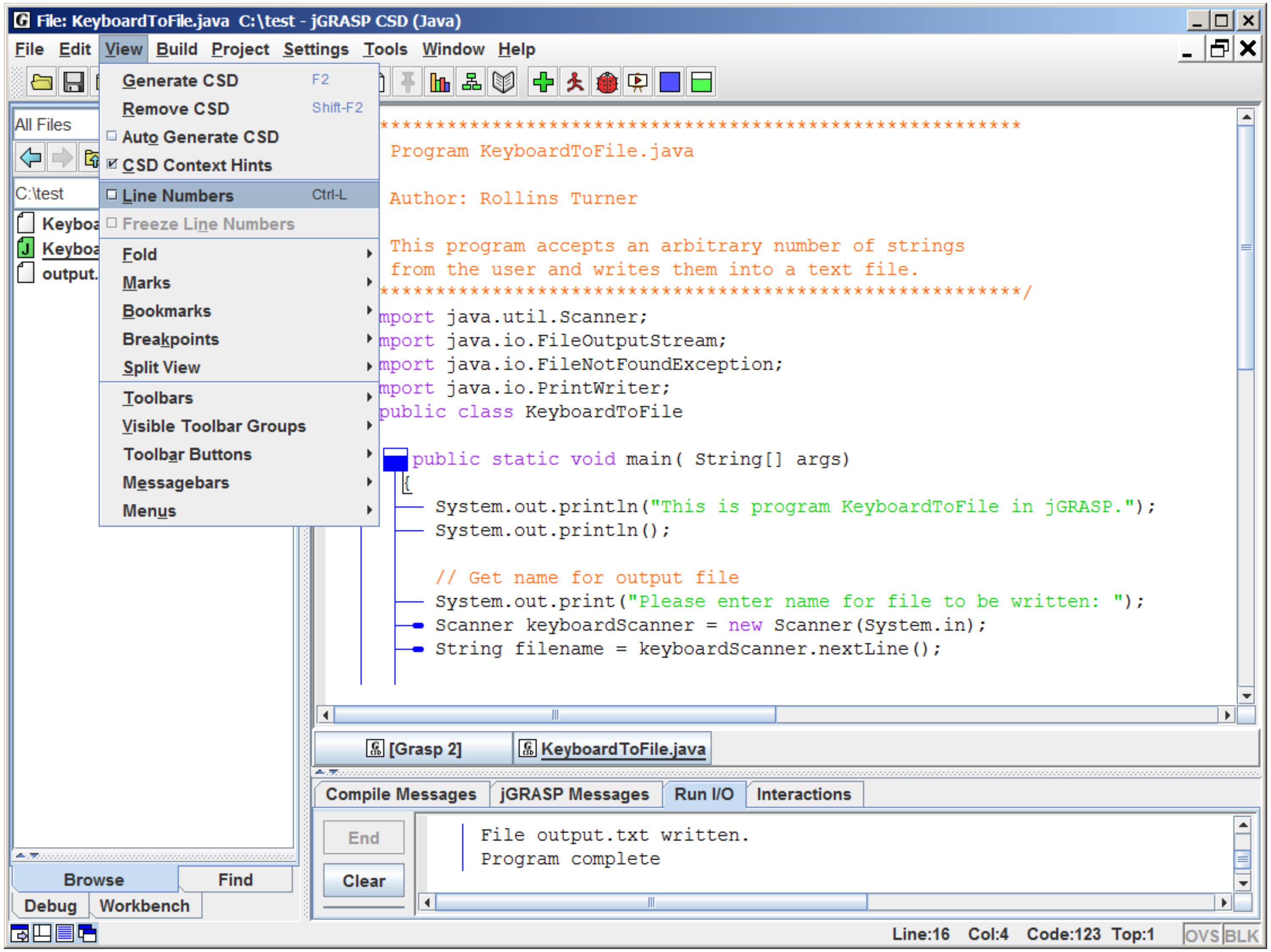
```
/*************************************************************
 * Program KeyboardToFile.java
 *
 * Author: Rollins Turner
 *
 * This program accepts an arbitrary number of strings
 * from the user and writes them into a text file.
 *************************************************************/
import java.util.Scanner;
import java.io.FileOutputStream;
import java.io.FileNotFoundException;
import java.io.PrintWriter;
public class KeyboardToFile
```

```
File output.txt written.
Program complete
```

Double click again to unfold the entire class.

Or double click + to unfold layer by layer.

Showing Line Numbers

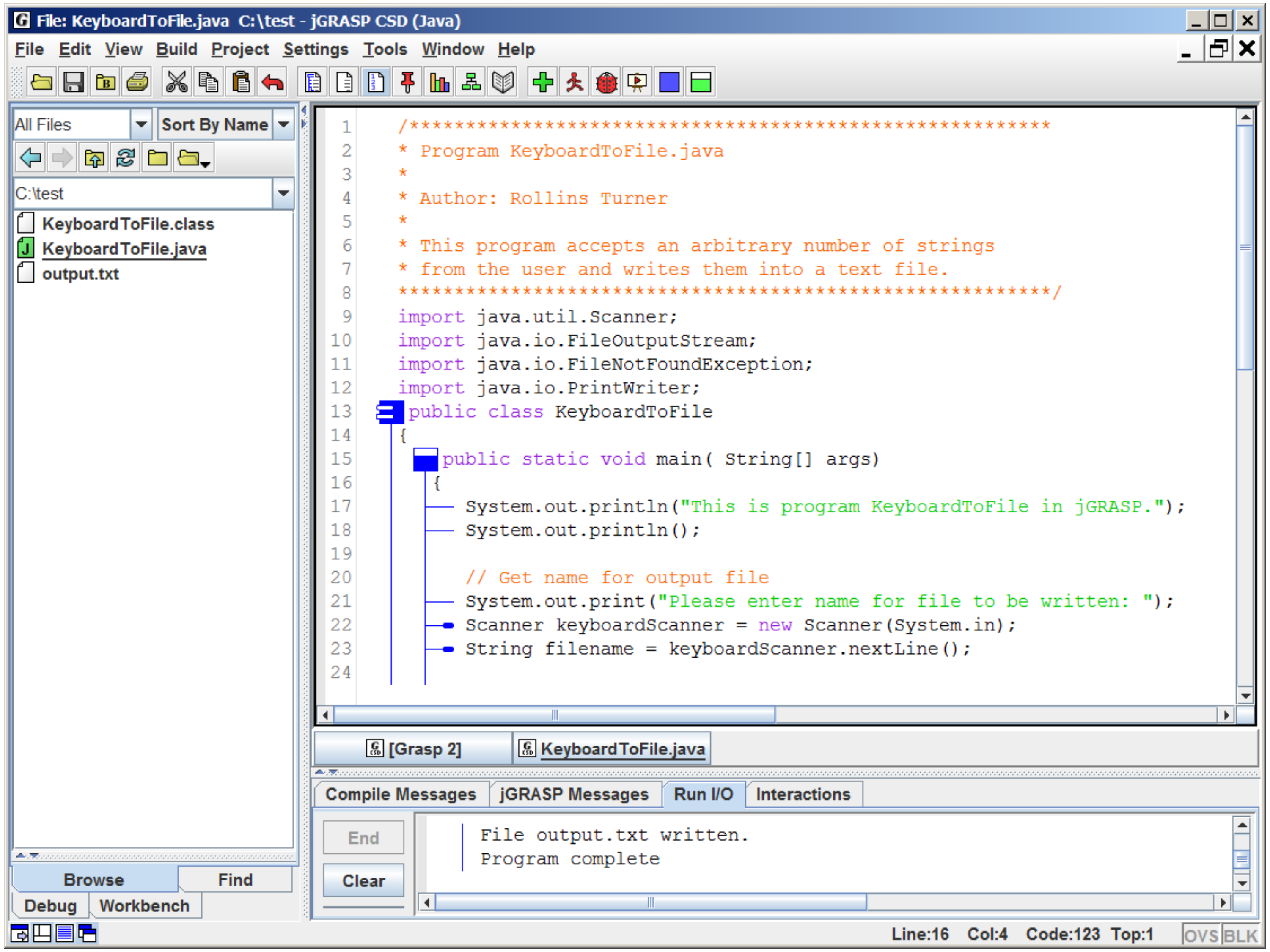


☑ CSD Context Hints

```
*************************************************************
 Program KeyboardToFile.java

 Author: Rollins Turner

 This program accepts an arbitrary number of strings
 from the user and writes them into a text file.
*************************************************************/
mport java.util.Scanner;
mport java.io.FileOutputStream;
mport java.io.FileNotFoundException;
mport java.io.PrintWriter;
public class KeyboardToFile

   public static void main( String[] args)
   {
      System.out.println("This is program KeyboardToFile in jGRASP.");
      System.out.println();

      // Get name for output file
      System.out.print("Please enter name for file to be written: ");
      Scanner keyboardScanner = new Scanner(System.in);
      String filename = keyboardScanner.nextLine();
```

```
File output.txt written.
Program complete
```

Line Numbers Shown



```java
/************************************************************
* Program KeyboardToFile.java
*
* Author: Rollins Turner
*
* This program accepts an arbitrary number of strings
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************************************************************/
import java.util.Scanner;
import java.io.FileOutputStream;
import java.io.FileNotFoundException;
import java.io.PrintWriter;
public class KeyboardToFile
{
   public static void main( String[] args)
   {
      System.out.println("This is program KeyboardToFile in jGRASP.");
      System.out.println();

      // Get name for output file
      System.out.print("Please enter name for file to be written: ");
      Scanner keyboardScanner = new Scanner(System.in);
      String filename = keyboardScanner.nextLine();

```
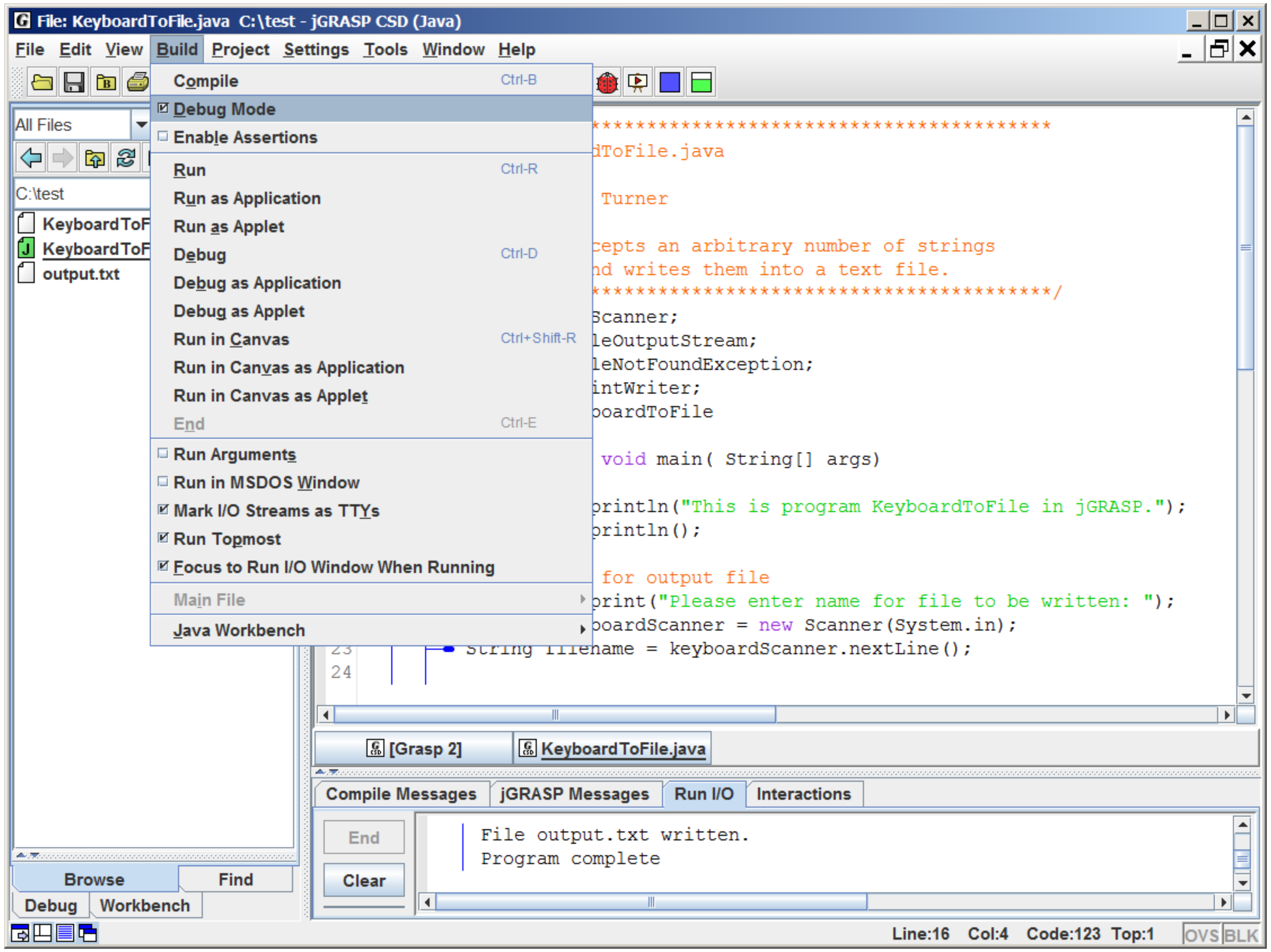

```
File output.txt written.
Program complete
```

Using the Debugger

- The debugger permits us to set *breakpoints* in our source code.
  - One of the most useful features of an IDE.
- When a running program reaches a breakpoint it will stop (prior to executing the statement).
- We can examine variables.
- We can single-step, or continue from the breakpoint.

Using the Debugger

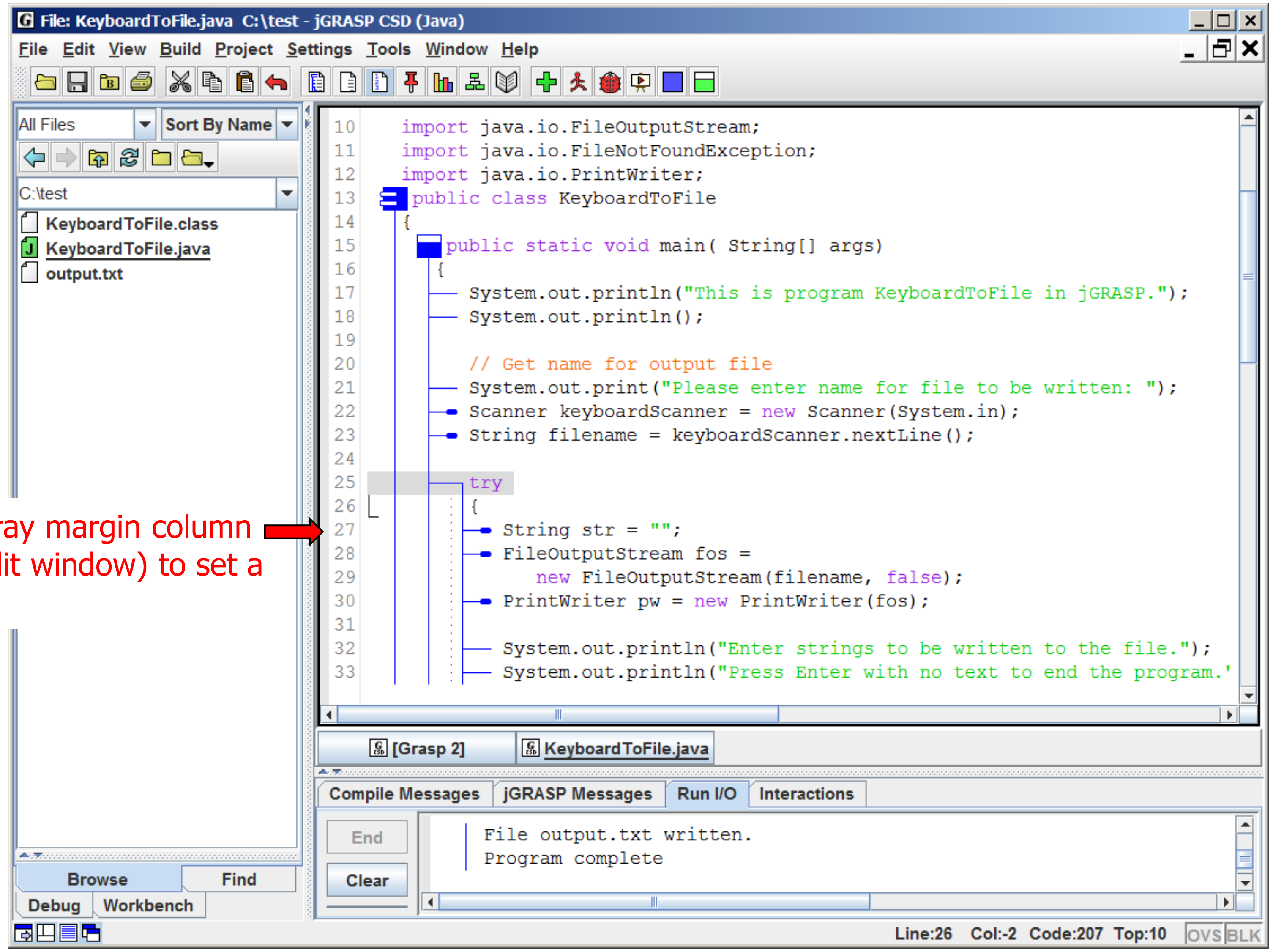
Be sure Debug Mode is enabled in the Build menu.



```
*****************************************
dToFile.java

 Turner

cepts an arbitrary number of strings
nd writes them into a text file.
*****************************************/
Scanner;
leOutputStream;
leNotFoundException;
intWriter;
boardToFile

 void main( String[] args)

println("This is program KeyboardToFile in jGRASP.");
println();

 for output file
print("Please enter name for file to be written: ");
boardScanner = new Scanner(System.in);
      String filename = keyboardScanner.nextLine();
```

```
File output.txt written.
Program complete
```

Setting a Breakpoint



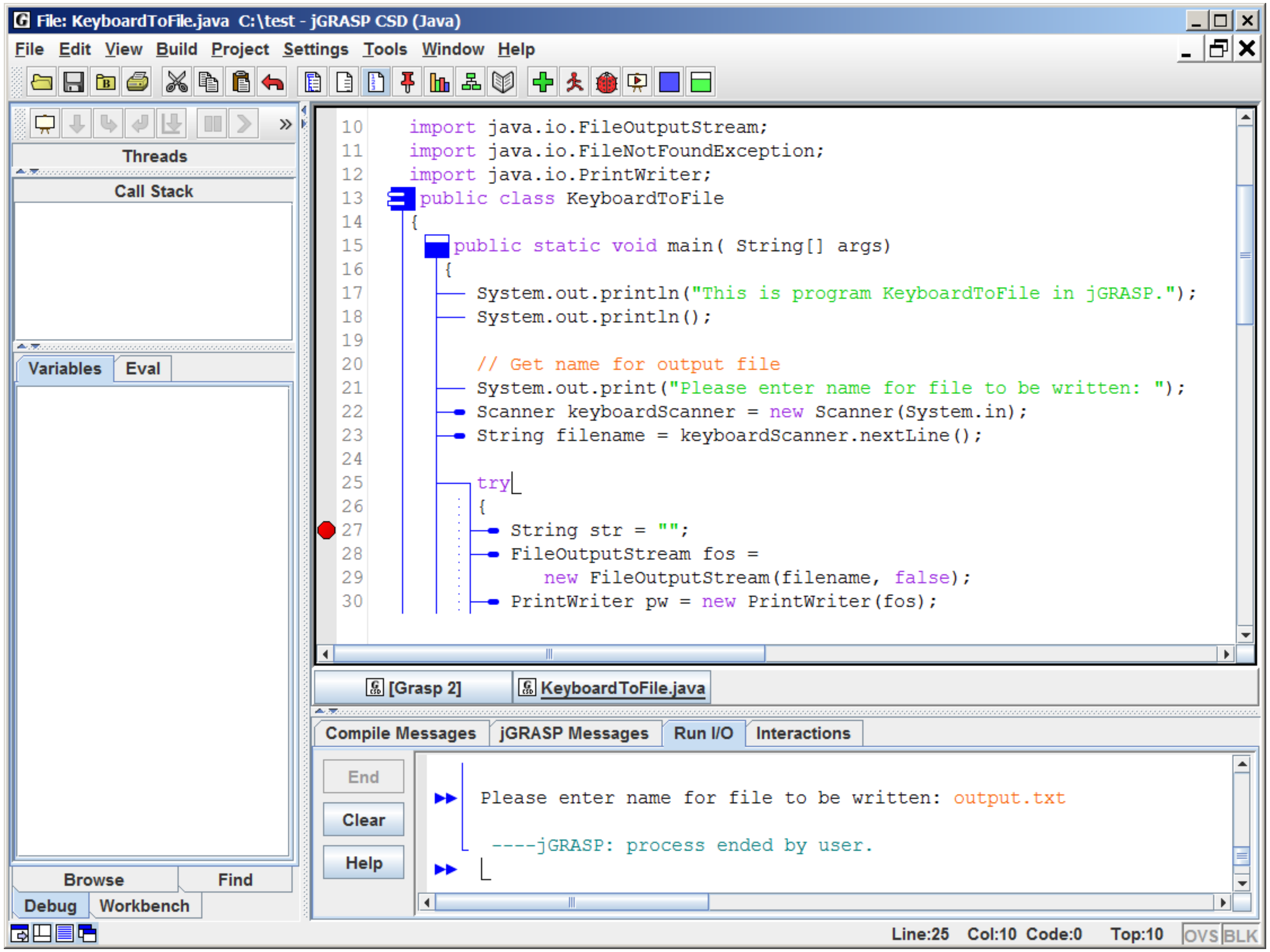
```
import java.io.FileOutputStream;
import java.io.FileNotFoundException;
import java.io.PrintWriter;
public class KeyboardToFile
{
   public static void main( String[] args)
   {
      System.out.println("This is program KeyboardToFile in jGRASP.");
      System.out.println();

      // Get name for output file
      System.out.print("Please enter name for file to be written: ");
      Scanner keyboardScanner = new Scanner(System.in);
      String filename = keyboardScanner.nextLine();

      try
      {
         String str = "";
         FileOutputStream fos =
            new FileOutputStream(filename, false);
         PrintWriter pw = new PrintWriter(fos);

         System.out.println("Enter strings to be written to the file.");
         System.out.println("Press Enter with no text to end the program.'
```

```
File output.txt written.
Program complete
```

Click in the gray margin column (inside the edit window) to set a breakpoint.

26

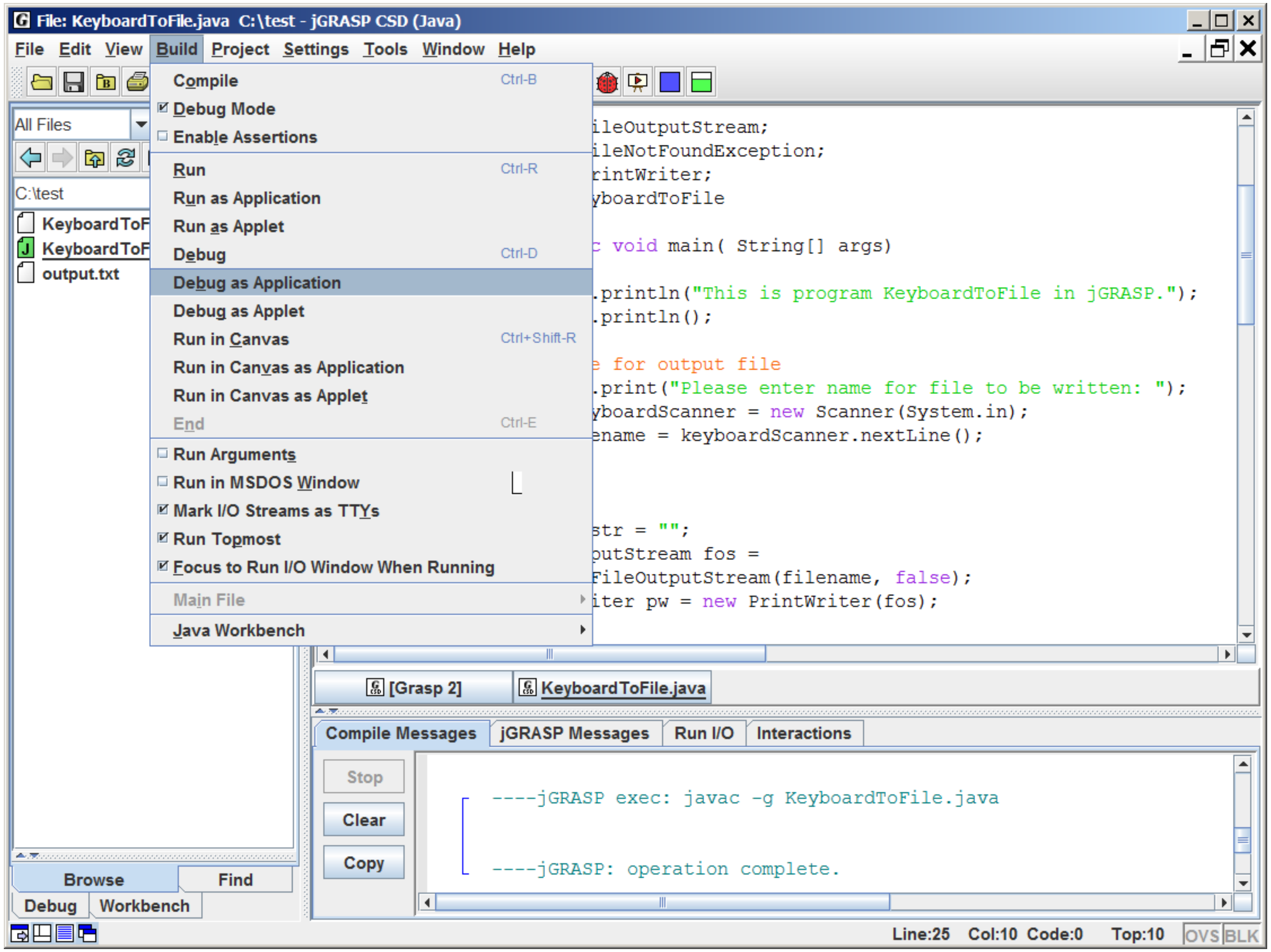
Breakpoint Set


File: KeyboardToFile.java C:\test - jGRASP CSD (Java)
File Edit View Build Project Settings Tools Window Help
Threads
Call Stack
Variables Eval
Browse Find
Debug Workbench
[Grasp 2] KeyboardToFile.java
Compile Messages jGRASP Messages Run I/O Interactions
End
Clear
Help
Line:25 Col:10 Code:0 Top:10 OVS BLK

```
import java.io.FileOutputStream;
import java.io.FileNotFoundException;
import java.io.PrintWriter;
public class KeyboardToFile
{
   public static void main( String[] args)
   {
      System.out.println("This is program KeyboardToFile in jGRASP.");
      System.out.println();

      // Get name for output file
      System.out.print("Please enter name for file to be written: ");
      Scanner keyboardScanner = new Scanner(System.in);
      String filename = keyboardScanner.nextLine();

      try
      {
         String str = "";
         FileOutputStream fos =
            new FileOutputStream(filename, false);
         PrintWriter pw = new PrintWriter(fos);
```

```
Please enter name for file to be written: output.txt

 ----jGRASP: process ended by user.
```

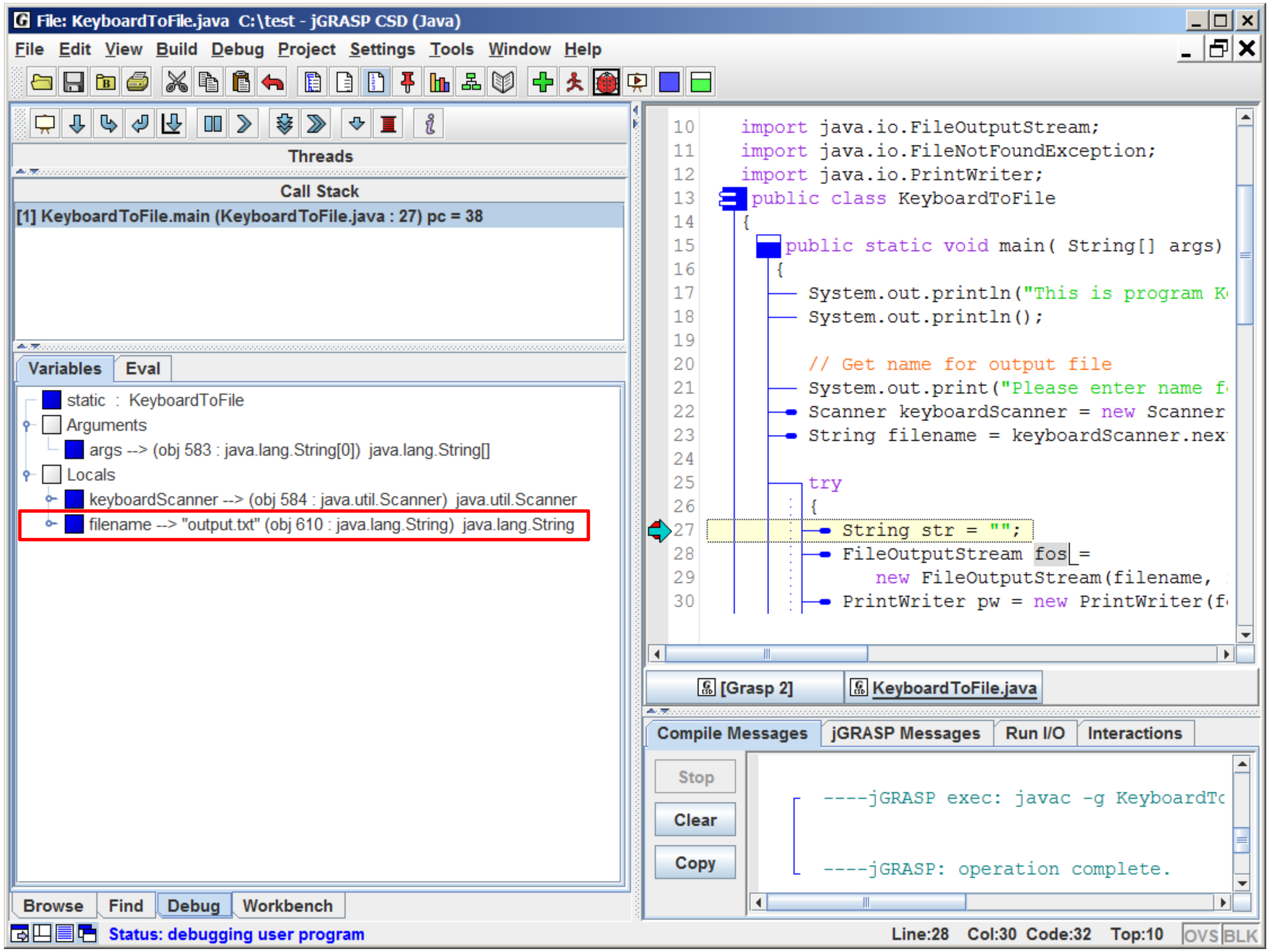
Start Debugging



```
ileOutputStream;
ileNotFoundException;
rintWriter;
yboardToFile

c void main( String[] args)

.println("This is program KeyboardToFile in jGRASP.");
.println();

e for output file
.print("Please enter name for file to be written: ");
yboardScanner = new Scanner(System.in);
ename = keyboardScanner.nextLine();



str = "";
putStream fos =
FileOutputStream(filename, false);
iter pw = new PrintWriter(fos);
```

```
----jGRASP exec: javac -g KeyboardToFile.java

----jGRASP: operation complete.
```

Variables in the Debug Tab


File: KeyboardToFile.java C:\test - jGRASP CSD (Java)

File Edit View Build Debug Project Settings Tools Window Help
Threads
Call Stack
Variables Eval
Browse Find Debug Workbench
[Grasp 2] KeyboardToFile.java
Compile Messages jGRASP Messages Run I/O Interactions
Stop
Clear
Copy

[1] KeyboardToFile.main (KeyboardToFile.java : 27) pc = 38

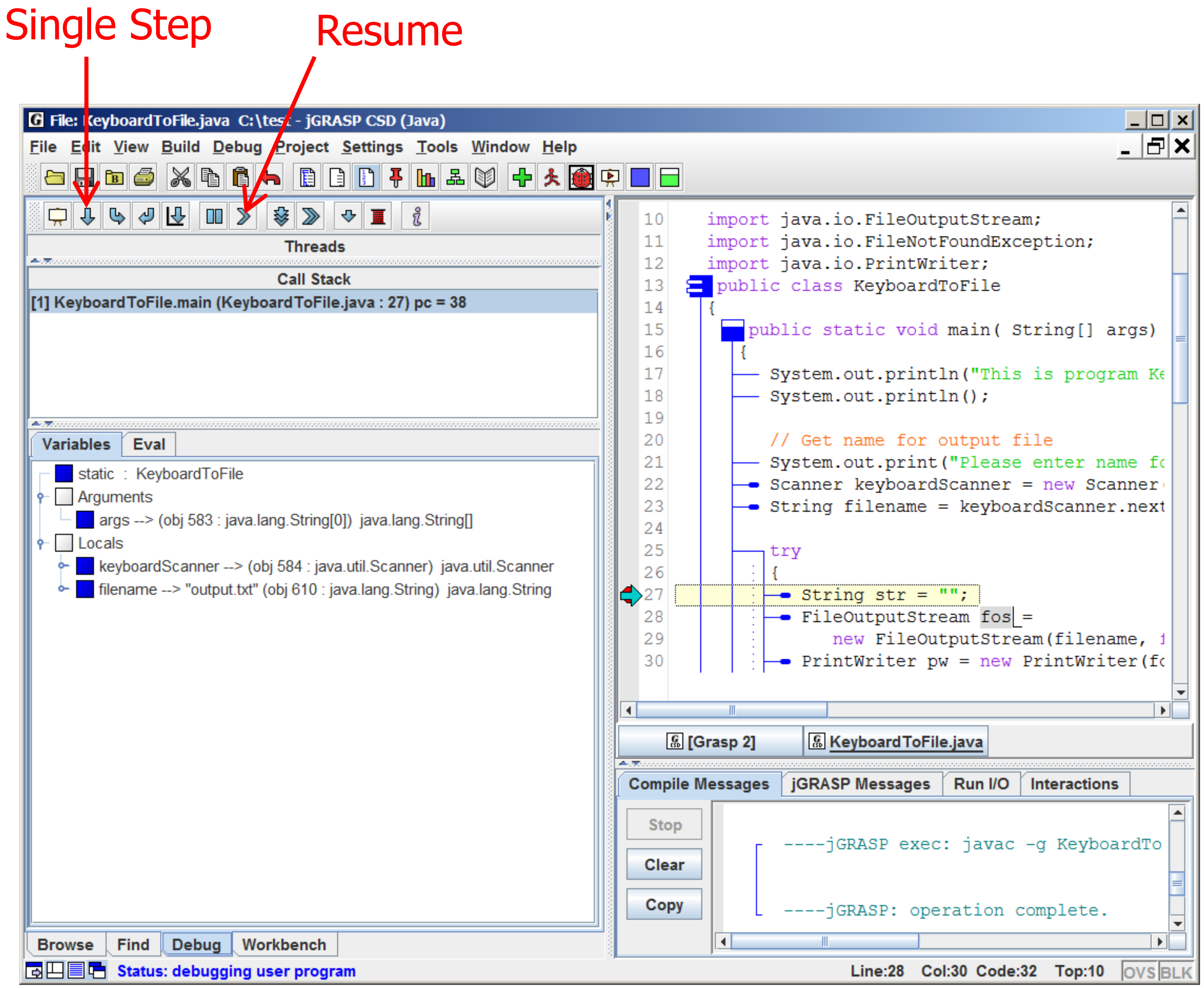
```
static : KeyboardToFile
Arguments
   args --> (obj 583 : java.lang.String[0]) java.lang.String[]
Locals
   keyboardScanner --> (obj 584 : java.util.Scanner) java.util.Scanner
   filename --> "output.txt" (obj 610 : java.lang.String) java.lang.String
```

```
import java.io.FileOutputStream;
import java.io.FileNotFoundException;
import java.io.PrintWriter;
public class KeyboardToFile
{
   public static void main( String[] args)
   {
      System.out.println("This is program K
      System.out.println();

      // Get name for output file
      System.out.print("Please enter name f
      Scanner keyboardScanner = new Scanner
      String filename = keyboardScanner.nex

      try
      {
         String str = "";
         FileOutputStream fos =
            new FileOutputStream(filename,
         PrintWriter pw = new PrintWriter(f
```

```
----jGRASP exec: javac -g KeyboardTo

----jGRASP: operation complete.
```

Status: debugging user program   Line:28 Col:30 Code:32 Top:10 OVS BLK

Continuing from Breakpoint


Single Step
Resume
File: KeyboardToFile.java C:\test - jGRASP CSD (Java)
File Edit View Build Debug Project Settings Tools Window Help
Threads
Call Stack
Variables Eval
[Grasp 2] KeyboardToFile.java
Compile Messages jGRASP Messages Run I/O Interactions
Stop
Clear
Copy
Browse Find Debug Workbench

[1] KeyboardToFile.main (KeyboardToFile.java : 27) pc = 38

```
static : KeyboardToFile
Arguments
  args --> (obj 583 : java.lang.String[0]) java.lang.String[]
Locals
  keyboardScanner --> (obj 584 : java.util.Scanner) java.util.Scanner
  filename --> "output.txt" (obj 610 : java.lang.String) java.lang.String
```

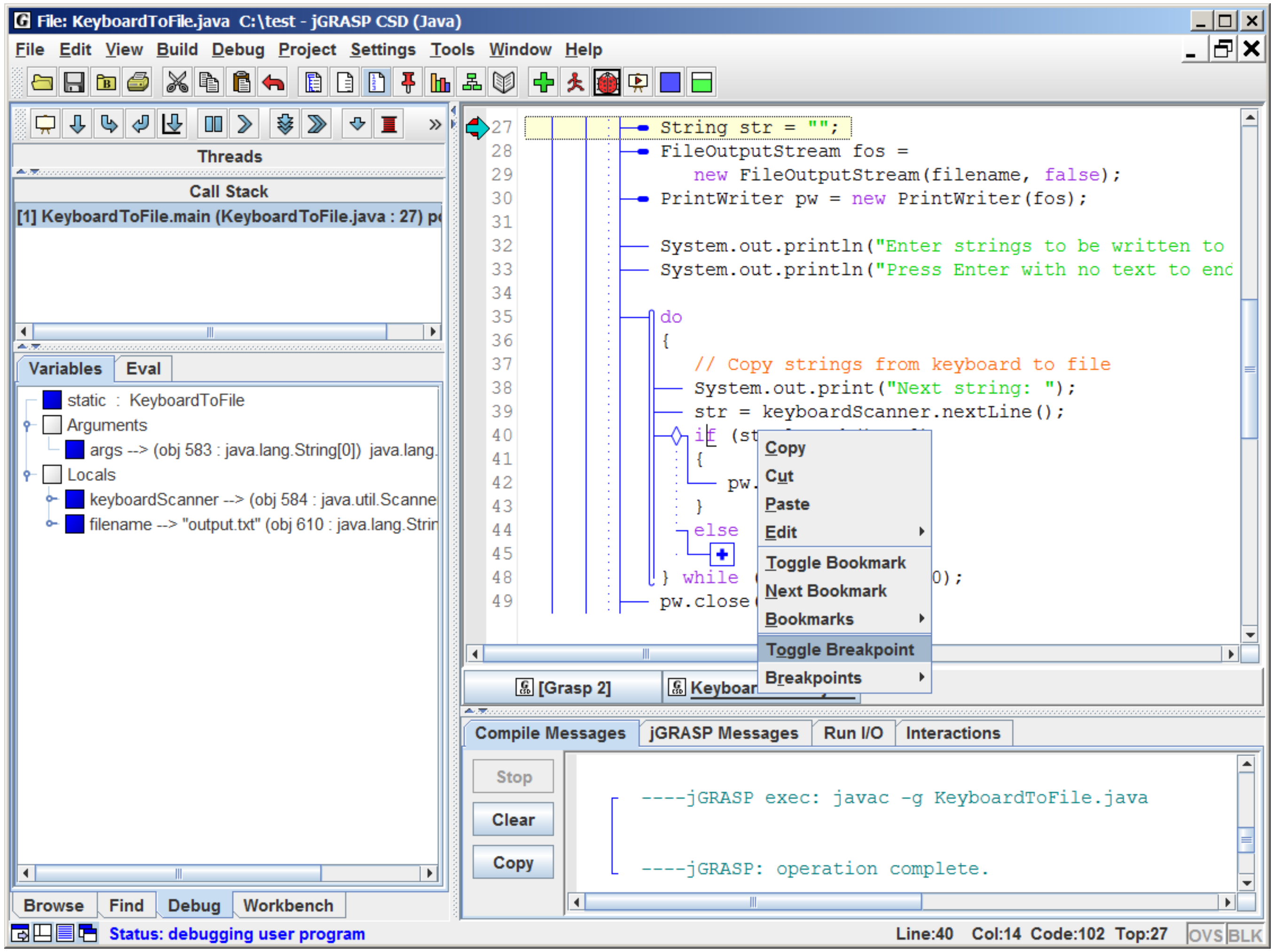
```
import java.io.FileOutputStream;
import java.io.FileNotFoundException;
import java.io.PrintWriter;
public class KeyboardToFile
{
   public static void main( String[] args)
   {
      System.out.println("This is program Ke
      System.out.println();

      // Get name for output file
      System.out.print("Please enter name fo
      Scanner keyboardScanner = new Scanner(
      String filename = keyboardScanner.next

      try
      {
         String str = "";
         FileOutputStream fos =
            new FileOutputStream(filename, t
         PrintWriter pw = new PrintWriter(fo
```

```
----jGRASP exec: javac -g KeyboardTo

----jGRASP: operation complete.
```

Status: debugging user program   Line:28 Col:30 Code:32 Top:10 OVS BLK

Another Way to Set a Breakpoint

Left click on an executable statement, then right click and select Toggle Breakpoint.



[1] KeyboardToFile.main (KeyboardToFile.java : 27) p

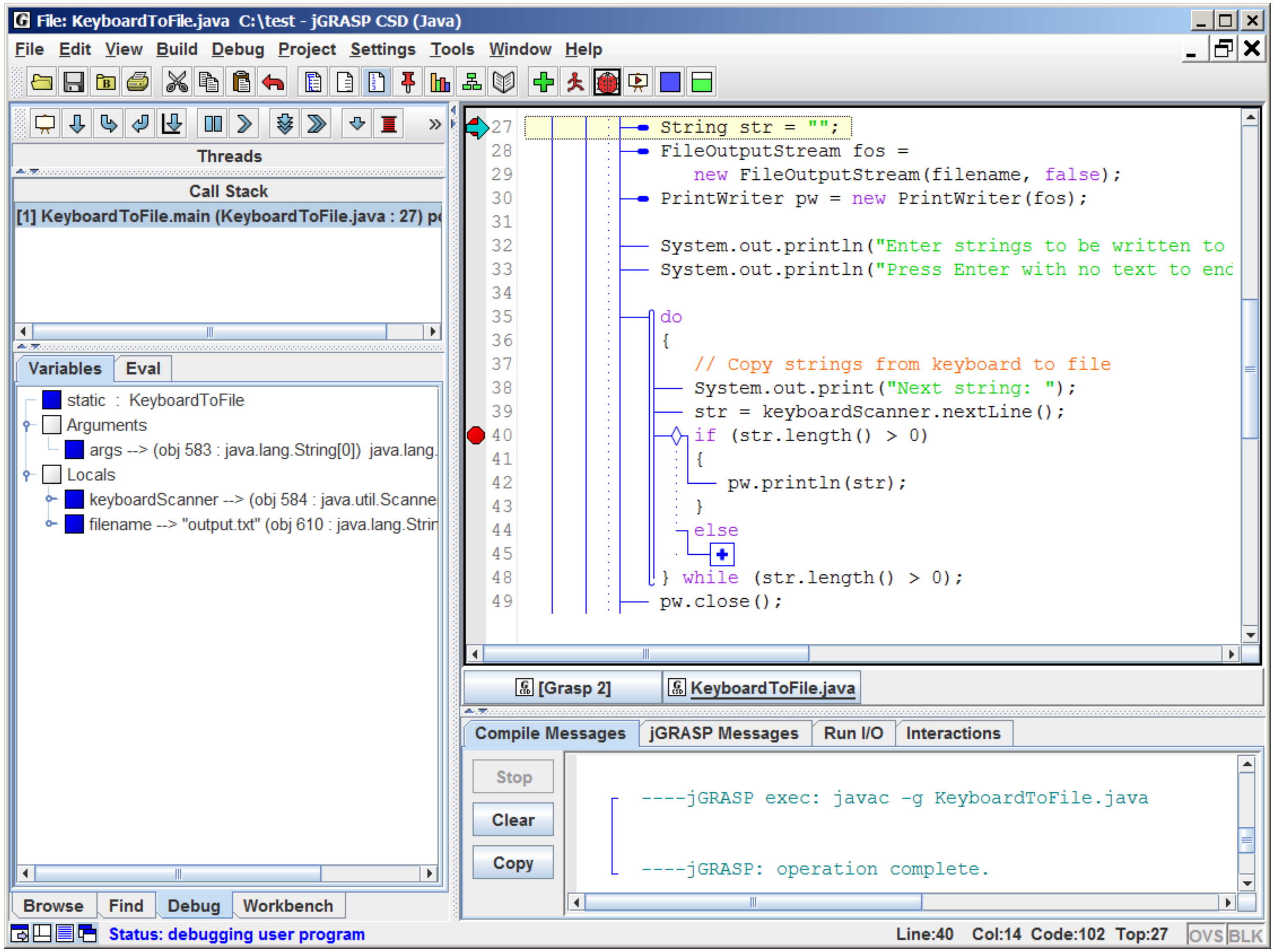
static : KeyboardToFile
Arguments
args --> (obj 583 : java.lang.String[0]) java.lang.
Locals
keyboardScanner --> (obj 584 : java.util.Scanne
filename --> "output.txt" (obj 610 : java.lang.Strin

```
String str = "";
FileOutputStream fos =
   new FileOutputStream(filename, false);
PrintWriter pw = new PrintWriter(fos);

System.out.println("Enter strings to be written to
System.out.println("Press Enter with no text to enc

do
{
   // Copy strings from keyboard to file
   System.out.print("Next string: ");
   str = keyboardScanner.nextLine();
   if (st
   {
      pw.
   }
   else

} while (                    0);
pw.close(
```

```
----jGRASP exec: javac -g KeyboardToFile.java


----jGRASP: operation complete.
```

Status: debugging user program   Line:40 Col:14 Code:102 Top:27

Breakpoint Set



```
[1] KeyboardToFile.main (KeyboardToFile.java : 27) p
```

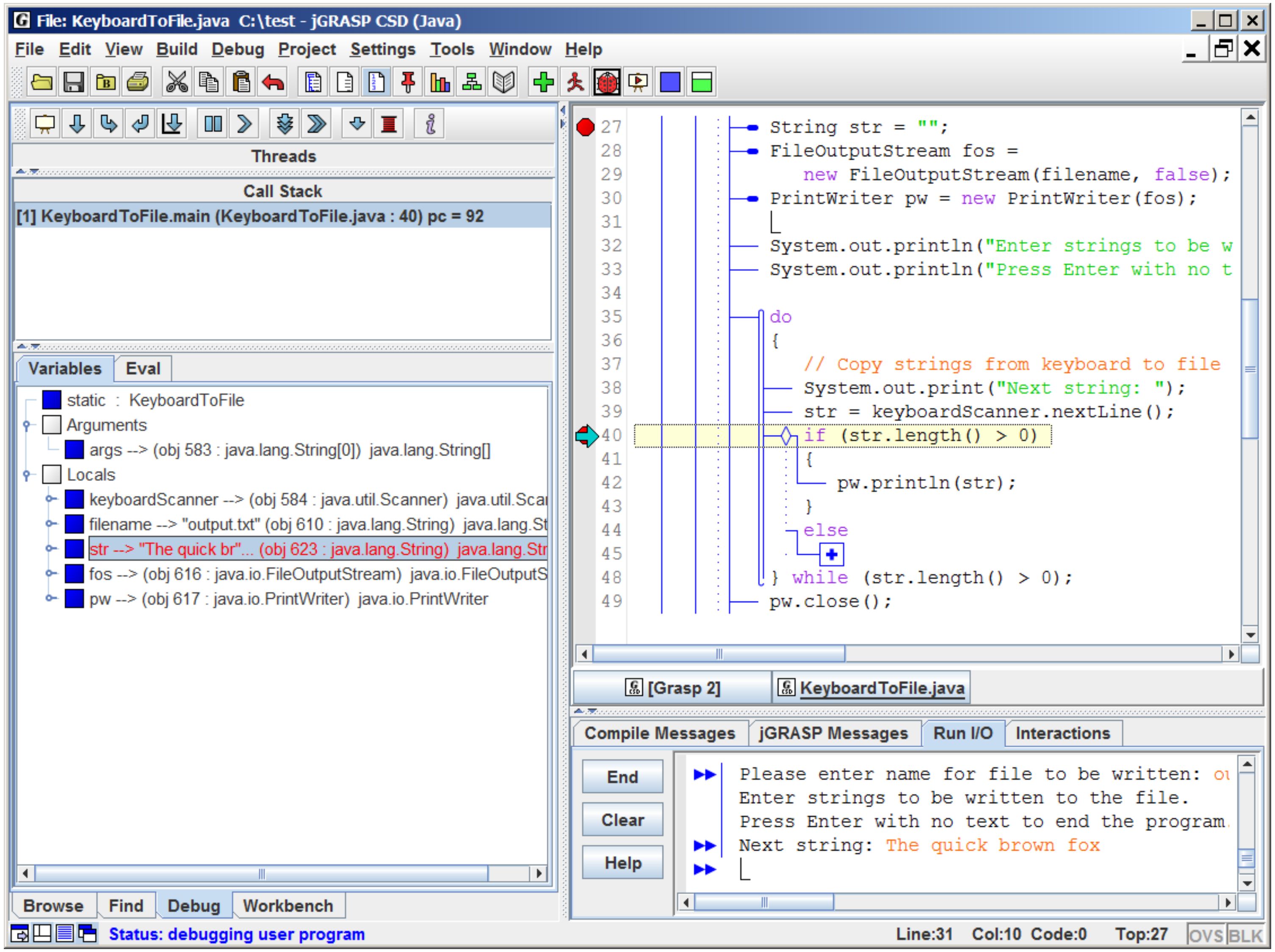
```
static  :  KeyboardToFile
Arguments
   args --> (obj 583 : java.lang.String[0])  java.lang.
Locals
   keyboardScanner --> (obj 584 : java.util.Scanne
   filename --> "output.txt" (obj 610 : java.lang.Strin
```

```
      String str = "";
      FileOutputStream fos =
         new FileOutputStream(filename, false);
      PrintWriter pw = new PrintWriter(fos);

      System.out.println("Enter strings to be written to
      System.out.println("Press Enter with no text to enc

      do
      {
         // Copy strings from keyboard to file
         System.out.print("Next string: ");
         str = keyboardScanner.nextLine();
         if (str.length() > 0)
         {
            pw.println(str);
         }
         else
      } while (str.length() > 0);
      pw.close();
```

```
----jGRASP exec: javac -g KeyboardToFile.java

----jGRASP: operation complete.
```

Status: debugging user program   Line:40 Col:14 Code:102 Top:27 OVS BLK

Stopped at Breakpoint



File: KeyboardToFile.java C:\test - jGRASP CSD (Java)
File Edit View Build Debug Project Settings Tools Window Help
Threads
Call Stack
Variables Eval
[Grasp 2] KeyboardToFile.java
Compile Messages jGRASP Messages Run I/O Interactions
End
Clear
Help
Browse Find Debug Workbench

```
[1] KeyboardToFile.main (KeyboardToFile.java : 40) pc = 92
```

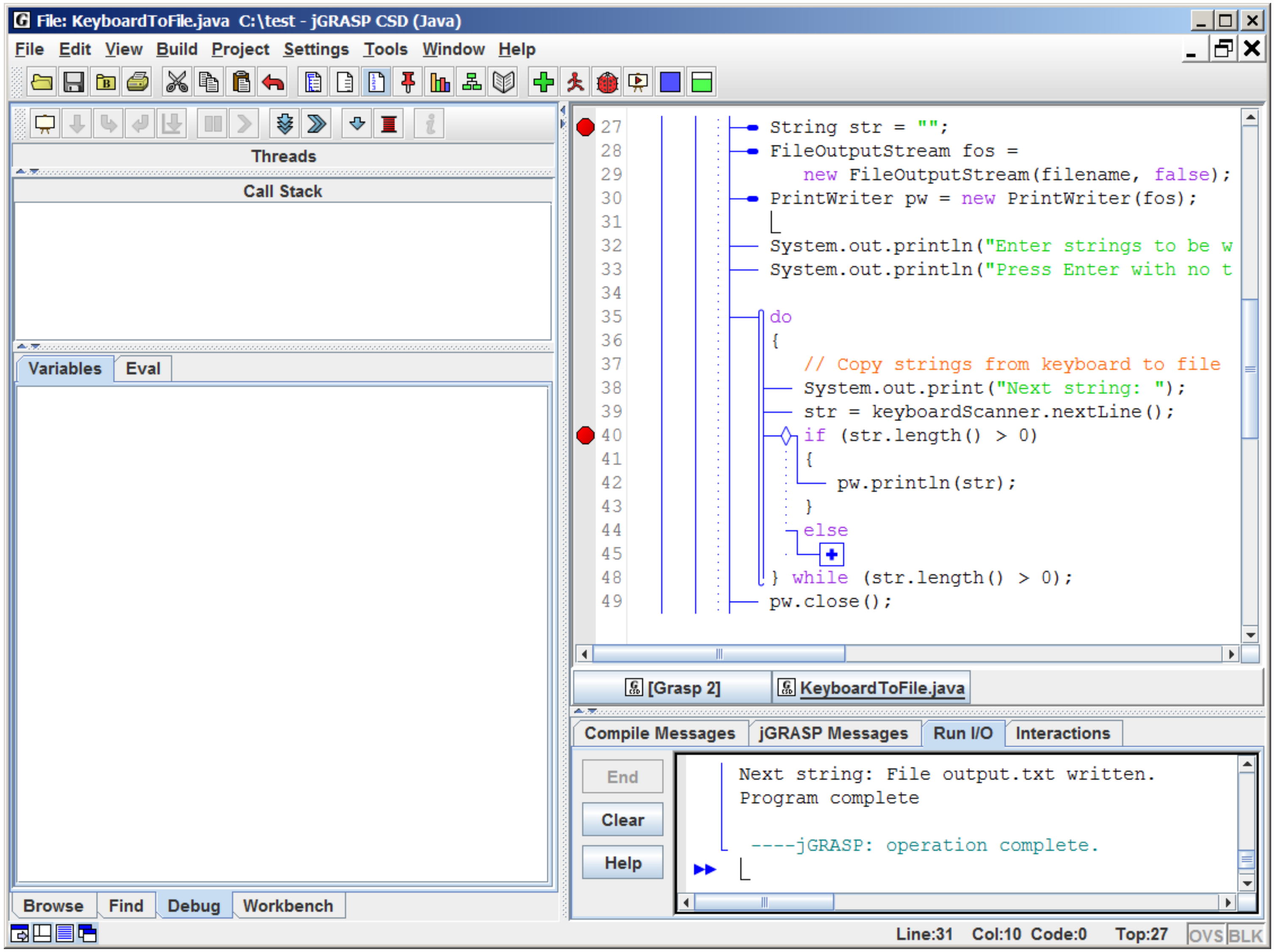
```
static : KeyboardToFile
Arguments
  args --> (obj 583 : java.lang.String[0]) java.lang.String[]
Locals
  keyboardScanner --> (obj 584 : java.util.Scanner) java.util.Scai
  filename --> "output.txt" (obj 610 : java.lang.String) java.lang.St
  str --> "The quick br"... (obj 623 : java.lang.String) java.lang.Str
  fos --> (obj 616 : java.io.FileOutputStream) java.io.FileOutputS
  pw --> (obj 617 : java.io.PrintWriter) java.io.PrintWriter
```

```java
      String str = "";
      FileOutputStream fos =
         new FileOutputStream(filename, false);
      PrintWriter pw = new PrintWriter(fos);

      System.out.println("Enter strings to be w
      System.out.println("Press Enter with no t

      do
      {
         // Copy strings from keyboard to file
         System.out.print("Next string: ");
         str = keyboardScanner.nextLine();
         if (str.length() > 0)
         {
            pw.println(str);
         }
         else
      } while (str.length() > 0);
      pw.close();
```

```
Please enter name for file to be written: ou
Enter strings to be written to the file.
Press Enter with no text to end the program.
Next string: The quick brown fox
```

Status: debugging user program   Line:31 Col:10 Code:0 Top:27 OVS BLK

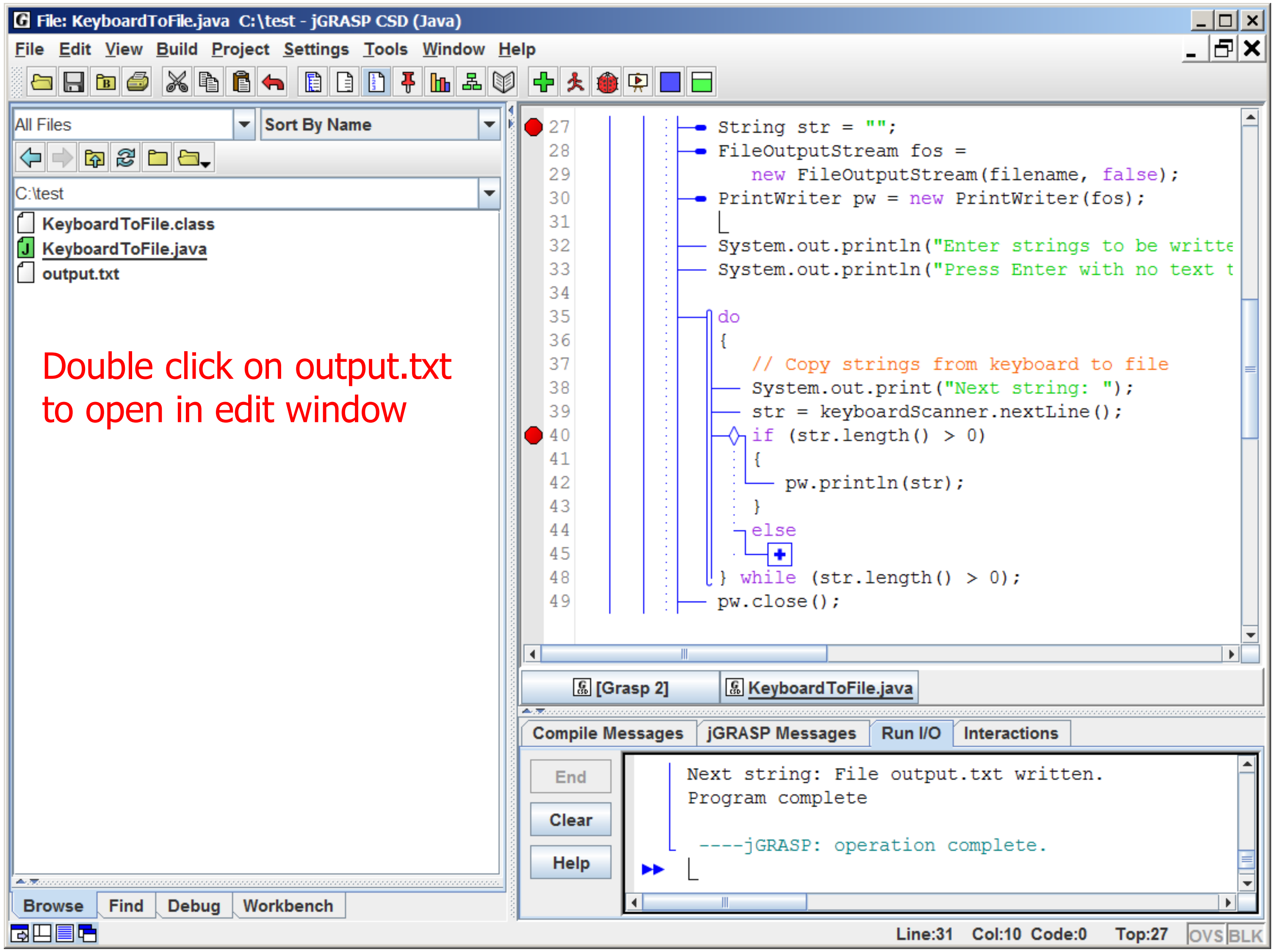
Program Complete


File: KeyboardToFile.java C:\test - jGRASP CSD (Java)
File Edit View Build Project Settings Tools Window Help
Threads
Call Stack
Variables Eval
Browse Find Debug Workbench
[Grasp 2] KeyboardToFile.java
Compile Messages jGRASP Messages Run I/O Interactions
End
Clear
Help
Line:31 Col:10 Code:0 Top:27 OVS BLK

```
String str = "";
FileOutputStream fos =
   new FileOutputStream(filename, false);
PrintWriter pw = new PrintWriter(fos);

System.out.println("Enter strings to be w
System.out.println("Press Enter with no t

do
{
   // Copy strings from keyboard to file
   System.out.print("Next string: ");
   str = keyboardScanner.nextLine();
   if (str.length() > 0)
   {
      pw.println(str);
   }
   else
      
} while (str.length() > 0);
pw.close();
```

```
Next string: File output.txt written.
Program complete

 ----jGRASP: operation complete.
```

Back to Browse Tab

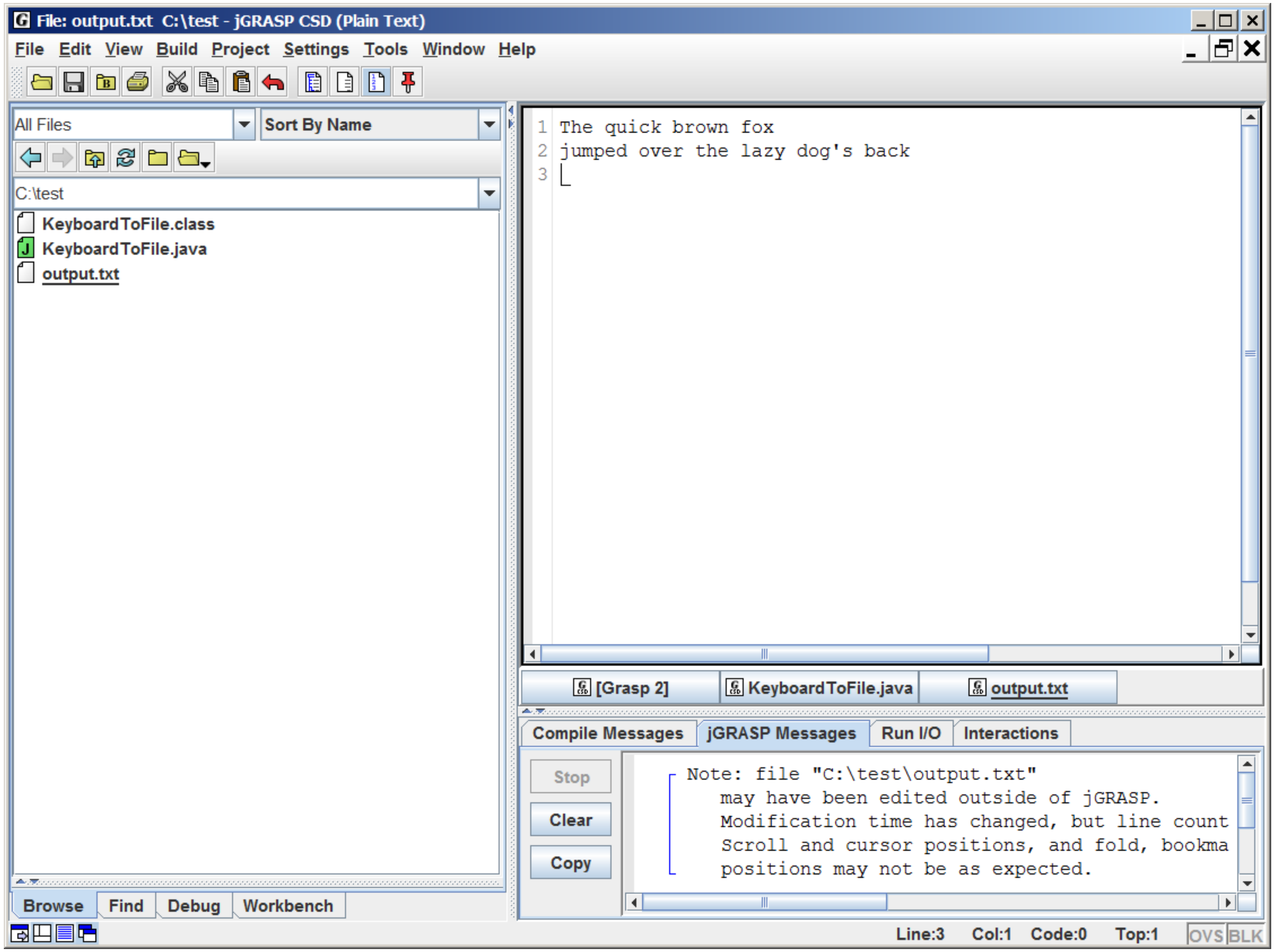


Double click on output.txt to open in edit window

```
String str = "";
FileOutputStream fos =
   new FileOutputStream(filename, false);
PrintWriter pw = new PrintWriter(fos);

System.out.println("Enter strings to be writte
System.out.println("Press Enter with no text t

do
{
   // Copy strings from keyboard to file
   System.out.print("Next string: ");
   str = keyboardScanner.nextLine();
   if (str.length() > 0)
   {
      pw.println(str);
   }
   else

} while (str.length() > 0);
pw.close();
```

```
Next string: File output.txt written.
Program complete

 ----jGRASP: operation complete.
```

Output File

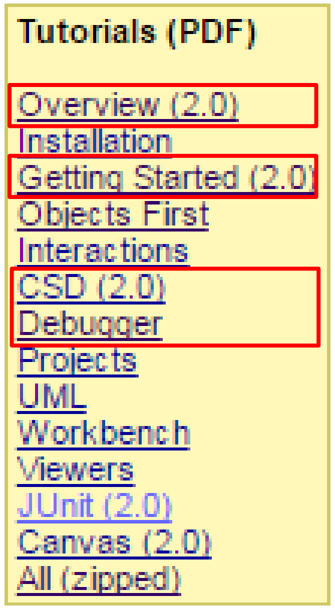


```
The quick brown fox
jumped over the lazy dog's back
```

```
Note: file "C:\test\output.txt"
   may have been edited outside of jGRASP.
   Modification time has changed, but line count
   Scroll and cursor positions, and fold, bookma
   positions may not be as expected.
```

Assignment

- Reading
  - Go to the jGRASP web site
  - http://www.jgrasp.org/
  - Read tutorials:
    - Overview (2.0)
    - Getting Started (2.0)
    - CSD (2.0)
    - Debugger



- Lab
  - Project 12 Cars from Files