Checker Framework Tutorial

Previous Getting Started

Validating User Input

This part of the tutorial shows how the Checker Framework can detect and help correct missing input validation.

Assignment Project Exam Help

Outline

https://powcoder.com

Add WeChat powcoder

1. The RegexExample program

If you have not already done so, download the source files for the tutorial.

The RegexExample.java program is called with two arguments: a regular expression and a string. The program prints the text from the string that matches the first capturing group in the regular expression. **Compile the program**:

```
$ javac RegexExample.java
```

2. Run the RegexExample program

Run the program with a **valid** regular expression and a matching string:

```
$ java RegexExample '[01]?\d-([0123]?\d)-\d{4}+' '01-24-2013'
Group 1: 24
```

Run the program with an **invalid** regular expression and any string:

```
$ java RegexExample '[01]?[\d-[0123]?\d-\d{4}+' '01-24-2013'
Exception in thread "main" java.util.regex.PatternSyntaxException: Unclosed
character class near index 24
[01]?[d-[0123]?d-d{4}+
                     ^
        at java.util.regex.Pattern.error(Pattern.java:1924)
        at java.util.regex.Pattern.clazz(Pattern.java:2493)
        at java.util.regex.Pattern.sequence(Pattern.java:2030)
        at java.util.regex.Pattern.expr(Pattern.java:1964)
        at java.util.regex.Pattern.compile(Pattern.java:1665)
        at java.util.regex.Pattern.<init>(Pattern.java:1337)
        at java.util.regex.Pattern.compile(Pattern.java:1022)
        at RegexExample.main(RegexExample.java:13)
```

Good programming style dictates that the user should not see a stack trace, even if the user supplies invalid output.

3. Run the Regex Checker

The Regex Checker prevents, at compile time, use of syntactically invalid regular expressions and access of invalid capturing groups. In other words, it prevents you from writing code that would throw certain exceptions at run time. Next **run the Regex Checker** to see how it could have spotted this issue at compile time.

```
$ javacheck -processor org.checkerframework.checker.regex.RegexChecker
RegexExample.java
RegexExample.java:13: error: [argument.type.incompatible] incompatible types in
argument.
        Pattern pat = Pattern.compile(regex);
                                      ^
  found   : String
  required: @Regex String
1 errors
```

Assignment Project Exam Help

The "incompatible types" warning indicates that variable `regex` is not of type `@Regex String` which is required for strings passed to `Pattern.compile()`.

4. Fix the Code

https://powcoder.com

The right way to fix the problems is for the code to issue a user-friendly message at run time. It should **verify the user input** using the `RegexUtil.isRegex(String, int)` method. If the string is not a valid regular expression, it should **print an error message and halt**. If it is a valid regular expression, perform as before.

Add WeChat powcoder

You need to make two changes to `RegexExample.java` to correctly handle invalid user input. At the top of the file, add

```
import org.checkerframework.checker.regex.RegexUtil;
```

After variable `regex` is defined but before it is used (that is, before `Pattern pat = Pattern.compile(regex);`), add

```
    if (!RegexUtil.isRegex(regex, 1)) {
        System.out.println("Input is not a regular expression \"" + regex
            + "\": " + RegexUtil.regexException(regex).getMessage());
        System.exit(1);
    }
```

5. Re-run the Regex Checker

```
$ javacheck -processor org.checkerframework.checker.regex.RegexChecker
RegexExample.java
```

There should be no warnings. This shows that the code will not throw a PatternSyntaxException at compile time.

6. Run the Example

Run the program as before (but adding `checker-qual.jar` to the classpath) to verify that the program prints a user-friendly warning.

```
$ java -cp ".:$CHECKERFRAMEWORK/checker/dist/checker-qual.jar" RegexExample '[01]?
[\d-\([0123]?\d\)-\d{4}+' '01-24-2013'
Input is not a regular expression "[01]?[d-([0123]?d)-d{4}+": Illegal character
range near index 24
```

For a full discussion of the Regex Checker, please see the Regex Checker chapter of the Checker Framework manual.

Next, try Finding a Security Error, a complex example using the Tainting Checker.

Assignment Project Exam Help

https://powcoder.com

Add WeChat powcoder