CORE JAVA

With

SCJP / OCJP

Study Material

Chapter 13: Regular Expressions

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Regular Expression

Agenda

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    - Write a program to extract all Mail IDS from the File
    - Write a program to display all .txt file names present in specific(E:\scjp) folder

Introduction

A Regular Expression is a expression which represents a group of Strings according to a particular pattern.

Example:

- We can write a Regular Expression to represent all valid mail ids.
- We can write a Regular Expression to represent all valid mobile numbers.

The main important application areas of Regular Expression are:

- To implement validation logic.
- To develop Pattern matching applications.
- To develop translators like compilers, interpreters etc.
- To develop digital circuits.
- To develop communication protocols like TCP/IP, UDP etc.

```
Example:
importjava.util.regex.*;
classRegularExpressionDemo
{
        public static void main(String[] args)
        {
                int count=0;
                Pattern p=Pattern.compile("ab");
                Matcher m=p.matcher("abbbabbaba");
                while(m.find())
                {
                count++;
                System.out.println(m.start()+"------"+m.end()+"--
-----"+m.group());
                }
                System.out.println("The no of occurences
:"+count);
        }
}
Output:
0------2------ab
4------6------ab
7------9------ab
The no of occurrences: 3
```

Pattern class:

- **A Pattern object represents "compiled version of Regular Expression".**
- **We can create a Pattern object by using compile() method of Pattern class.**

public static Pattern compile(String regex);
Example:
```
Pattern p=Pattern.compile("ab");
```
Note: if we refer API we will get more information about pattern class.

Matcher:

A Matcher object can be used to match character sequences against a Regular Expression.
We can create a Matcher object by using matcher() method of Pattern class.

```
public Matcher matcher(String target);
        Matcher m=p.matcher("abbbabbaba");
```

Important methods of Matcher class:

1. **boolean find();**
   It attempts to find next match and returns true if it is available otherwise returns false.

2. int start();
    Returns the start index of the match.
3. int end();
    Returns the offset(equalize) after the last character matched.(or)
    Returns the "end+1" index of the matched.
4. String group();
    Returns the matched Pattern.

Note: Pattern and Matcher classes are available in java.util.regex package, and introduced in 1.4 version

Character classes:

1. [abc]-------------------Either 'a' or 'b' or 'c'
2. [^abc] ----------------Except 'a' and 'b' and 'c'
3. [a-z] --------------------Any lower case alphabet symbol
4. [A-Z] --------------------Any upper case alphabet symbol
5. [a-zA-Z] ----------------Any alphabet symbol
6. [0-9] --------------------Any digit from 0 to 9
7. [a-zA-Z0-9] ------------Any alphanumeric character
8. [^a-zA-Z0-9] -----------Any special character

```
Example:
importjava.util.regex.*;
classRegularExpressionDemo
{
      public static void main(String[] args)
      {
            Pattern p=Pattern.compile("x");
            Matcher m=p.matcher("a1b7@z#");
            while(m.find())
            {
                  System.out.println(m.start()+"-------
"+m.group());
            }
      }
}
```

Output:

x=[abc]	x=[^abc]	x=[0-9]	x=[a-z]
0-------a	1-------1	1-------1	0-------a
2-------b	3-------7	3-------7	2-------b
	4-------@		5-------z
	5-------z		
	6-------#		

Predefined character classes:

\s--------------------space character
\d--------------------Any digit from o to 9[o-9]
\w--------------------Any word character[a-zA-Z0-9]
. --------------------Any character including special characters.

\S--------------------any character except space character
\D--------------------any character except digit
\W--------------------any character except word character(special character)

```
Example:
importjava.util.regex.*;
classRegularExpressionDemo
{
      public static void main(String[] args)
      {
            Pattern p=Pattern.compile("x");
            Matcher m=p.matcher("a1b7 @z#");
            while(m.find())
            {
                  System.out.println(m.start()+"-------
"+m.group());
            }
      }
}
```

Output:

x=\\s	x=\\d	x=\\w	x=.
4-------	1------1	0------a	0------a
	3------7	1------1	1------1
		2------b	2------b
		3------7	3------7
		6------z	4-------
			5------@
			6------z
			7------#

Quantifiers:

Quantifiers can be used to specify no of characters to match.

a-----------------------Exactly one 'a'

a+----------------------At least one 'a'

a*----------------------Any no of a's including zero number

a? ---------------------At most one 'a'

```
Example:
importjava.util.regex.*;
classRegularExpressionDemo
{
      public static void main(String[] args)
      {
            Pattern p=Pattern.compile("x");
            Matcher m=p.matcher("abaabaaab");
            while(m.find())
            {
                  System.out.println(m.start()+"-------
"+m.group());
            }
      }
}
```

Output:

x=a	x=a+	x=a*	x=a?
0-------a	0-------a	0-------a	0-------a
2-------a	2-------aa	1-------	1-------
3-------a	5-------aaa	2-------aa	2-------a
5-------a		4-------	3-------a
6-------a		5-------aaa	4-------
7-------a		8-------	5-------a
		9-------	6-------a
			7-------a
			8-------
			9-------

Pattern class split() method:

Pattern class contains split() method to split the given string against a regular expression.

```
Example 1:
importjava.util.regex.*;
classRegularExpressionDemo
{
      public static void main(String[] args)
      {
            Pattern p=Pattern.compile("\\s");
            String[] s=p.split("ashok software solutions");
            for(String s1:s)
            {
                  System.out.println(s1);//ashok
                                          //software
                                           //solutions
            }
      }
}
Example 2:
importjava.util.regex.*;
classRegularExpressionDemo
{
```

```
        public static void main(String[] args)
        {
                Pattern p=Pattern.compile("\\.");  //(or)[.]
                String[] s=p.split("www.dugrajobs.com");
                for(String s1:s)
                {
                        System.out.println(s1);//www
                                               //dugrajobs
                                                //com
                }
        }
}
```

String class split() method:

String class also contains split() method to split the given string against a regular expression.

```
Example:
importjava.util.regex.*;
classRegularExpressionDemo
{
        public static void main(String[] args)
        {
                String s="www.saijobs.com";
                String[] s1=s.split("\\.");
                for(String s2:s1)
                {
                        System.out.println(s2);//www
                                               //saijobs
                                               //com
                }
        }
}
```

Note : String class split() method can take regular expression as argument where as pattern class split() method can take target string as the argument.

StringTokenizer:

- **This class present in java.util package.**
- **It is a specially designed class to perform string tokenization.**

```
Example 1:
importjava.util.*;
classRegularExpressionDemo
{
        public static void main(String[] args)
        {
                StringTokenizerst=new StringTokenizer("sai
software solutions");
```

```
                while(st.hasMoreTokens())
                {
                        System.out.println(st.nextToken());//sai
                                                //software
                                                //solutions
                }
        }
}
```
The default regular expression for the StringTokenizer is space.

```
Example 2:
importjava.util.*;
classRegularExpressionDemo
{
        public static void main(String[] args)
        {




        StringTokenizerst=new StringTokenizer("1,99,988",",");
        while(st.hasMoreTokens())
                {
                        System.out.println(st.nextToken());//1
                                                //99
                                                //988
                }
        }
}
```

Requirement:

Write a regular expression to represent all valid identifiers in java language.
Rules:
The allowed characters are:

1. a to z, A to Z, 0 to 9, -,#
2. The 1st character should be alphabet symbol only.
3. The length of the identifier should be at least 2.

```
Program:
importjava.util.regex.*;
classRegularExpressionDemo
{
        public static void main(String[] args)
        {
                Pattern p=Pattern.compile("[a-zA-Z][a-zA-Z0-9-
#]⁺"); (or)
```

```
            Pattern p=Pattern.compile("[a-zA-Z][a-zA-Z0-9-
#][a-zA-Z0-9-#]*");
            Matcher m=p.matcher(args[0]);
            if(m.find()&&m.group().equals(args[0]))
            {
                    System.out.println("valid identifier");
            }
            else
            {
                    System.out.println("invalid identifier");
            }

        }
}
Output:
E:\scjp>javac RegularExpressionDemo.java
E:\scjp>java RegularExpressionDemoashok
Valid identifier

E:\scjp>java RegularExpressionDemo ?ashok
Invalid identifier
```

Requirement:

Write a regular expression to represent all mobile numbers.

1. Should contain exactly 10 digits.
2. The 1st digit should be 7 to 9.

```
Program:
importjava.util.regex.*;
classRegularExpressionDemo
{
      public static void main(String[] args)
      {
            Pattern p=Pattern.compile("
                        [7-9][0-9][0-9][0-9][0-9][0-
9][0-9][0-9][0-9][0-9]");
            //Pattern p=Pattern.compile("[7-9][0-9]{9}");
            Matcher m=p.matcher(args[0]);
            if(m.find()&&m.group().equals(args[0]))
            {
                    System.out.println("valid number");
            }
            else
            {
                    System.out.println("invalid number");
            }
}
}
```

```
Analysis:
10 digits mobile:
[7-9][0-9][0-9][0-9][0-9][0-9][0-9][0-9][0-9][0-9]   (or)
[7-9][0-9]{9}

Output:
E:\scjp>javac RegularExpressionDemo.java
E:\scjp>java RegularExpressionDemo 9989123456
Valid number

E:\scjp>java RegularExpressionDemo 6989654321
Invalid number
10 digits (or) 11 digits:
(0?[7-9][0-9]{9})

Output:
E:\scjp>javac RegularExpressionDemo.java

E:\scjp>java RegularExpressionDemo 9989123456
Valid number

E:\scjp>java RegularExpressionDemo 09989123456
Valid number

E:\scjp>java RegularExpressionDemo 919989123456
Invalid number
10 digits (0r) 11 digit (or) 12 digits:
(0|91)?[7-9][0-9]{9}   (or)
(91)?(0?[7-9][0-9]{9})

E:\scjp>javac RegularExpressionDemo.java
E:\scjp>java RegularExpressionDemo 9989123456
Valid number
E:\scjp>java RegularExpressionDemo 09989123456
Valid number
E:\scjp>java RegularExpressionDemo 919989123456
Valid number
E:\scjp>java RegularExpressionDemo 69989123456
Invalid number
```

Requirement:
Write a regular expression to represent all Mail Ids.

```
Program:
importjava.util.regex.*;
classRegularExpressionDemo
{
       public static void main(String[] args)
       {
               Pattern p=Pattern.compile("
```

```
                                        [a-zA-Z][a-zA-Z0-9-.]*@[a-zA-Z0-
9]+([.][a-zA-Z]+)+");
            Matcher m=p.matcher(args[0]);
            if(m.find()&&m.group().equals(args[0]))
            {
                    System.out.println("valid mail id");
            }
            else
            {
                    System.out.println("invalid mail id");
            }
        }
}
Output:
E:\scjp>javac RegularExpressionDemo.java
E:\scjp>java RegularExpressionDemo sunmicrosystem@gmail.com
Valid mail id
E:\scjp>java RegularExpressionDemo 999sunmicrosystem@gmail.com
Invalid mail id
E:\scjp>java RegularExpressionDemo 999sunmicrosystem@gmail.co9
Invalid mail id
```
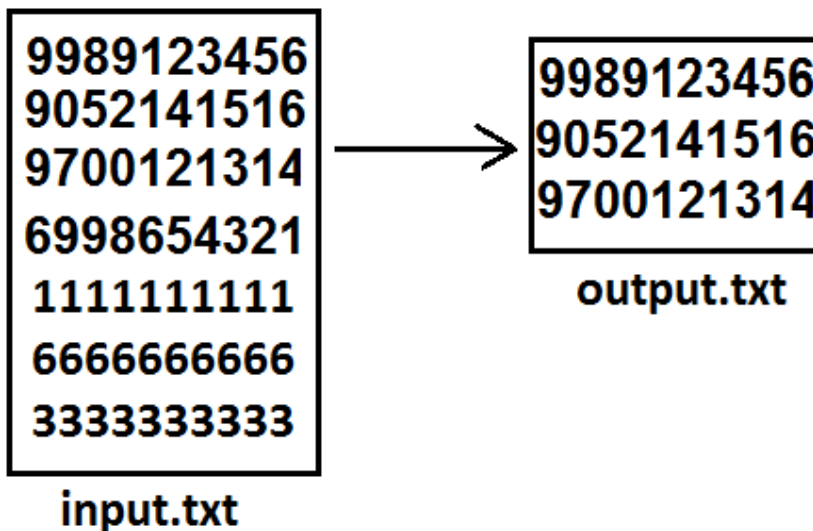
Requirement:

Write a program to extract all valid mobile numbers from a file.

Diagram:

input.txt → output.txt

```
Program:
importjava.util.regex.*;
import java.io.*;
classRegularExpressionDemo
{
        public static void main(String[] args)throws IOException
```

```
            {
                    PrintWriter out=new PrintWriter("output.txt");
                    BufferedReaderbr=new BufferedReader(new
FileReader("input.txt"));
                    Pattern p=Pattern.compile("(0|91)?[7-9][0-
9]{9}");
                    String line=br.readLine();
                    while(line!=null)
                    {
                            Matcher m=p.matcher(line);
                            while(m.find())
                            {
                                    out.println(m.group());
                            }
                            line=br.readLine();
                    }
                    out.flush();
            }
}
```

Requirement:
Write a program to extract all Mail IDS from the File.

Note: In the above program replace mobile number regular expression with MAIL ID
regular expression.

Requirement:
Write a program to display all .txt file names present in E:\scjp folder.

```
Program:
importjava.util.regex.*;
import java.io.*;
classRegularExpressionDemo
{
      public static void main(String[] args)throws IOException
      {
              int count=0;
              Pattern p=Pattern.compile("[a-zA-Z0-9-
$.]+[.]txt");
              File f=new File("E:\\scjp");
              String[] s=f.list();
              for(String s1:s)
              {
                      Matcher m=p.matcher(s1);
                      if(m.find()&&m.group().equals(s1))
                      {
                              count++;
                              System.out.println(s1);
                      }
              }
```

```
                System.out.println(count);
        }
}
Output:
input.txt
output.txt
outut.txt
3
```

Write a program to check whether the given mailid is valid or not.
In the above program we have to replace mobile number regular expression with mailid regular expression

Write a regular expressions to represent valid Gmail mail id's :
[a-zA-Z0-9][a-zA-Z0-9-.]*@gmail[.]com

Write a regular expressions to represent all Java language identifiers :
Rules :

- **The length of the identifier should be atleast two.**
- **The allowed characters are**
- **a-z**
- **A-Z**
- **0-9**
- **#**
- **$**
-
-
- **The first character should be lower case alphabet symbol k-z , and second character should be a digit divisible by 3**

[k-z][0369][a-zA-Z0-9#$]*

Write a regular expressions to represent all names starts with 'a'
[aA][a-zA-Z]*

To represent all names starts with 'A' ends with 'K'
[aA][a-zA-Z]*[kK]