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I, ME AND MYSELF !!!

SATURDAY, MAY 15, 2010

Expression Evaluation

Infix to Postfix transformation and evaluation

Here, I would like to share a java source for converting an Infix expression to a Postfix equivalent and evaluate the Postfix expression. Postfix is also known as "Reverse Polish Notation". If you want to know more about this algorithm, this will be helpful.

Here is a simple java implementation. (Oh, we could do it a lot easily in C++, but, actually it has a academic purpose as well). A few things to note:

- Fixed format of input, as this is just a demonstration. Do not use spaces.
- It doesn't check whether the given expression is consistent or not.
- No math error is checked here, you have to add it to your own.
- Check sample execution for more details.
- Only for binary operators +,-,*,/,%,^ and parenthesis ()

Java Source

```
//
// @author Zobayer
// @date May 10, 2010
//

import java.io.BufferedReader;
import java.io.InputStreamReader;
import java.io.IOException;
import java.util.List;
import java.util.ArrayList;
import java.util.Stack;

//
// Demonstrates Expression evaluation process.
// Doesn't take care of wrong input,
// You need to handle that on your own.
//

public class Expression {

    // A sample main() method to demonstrate this process
    public static void main(String[] args) throws IOException {
        BufferedReader stdin = new BufferedReader(new InputStreamReader(System.in));
        String expr;
        List<String> inFix, postFix;
        int result;

        while((expr = stdin.readLine())!=null) {
            expr = "(" + expr + ")";
            inFix = getInFix(expr);
            postFix = getPostFix(inFix);
            result = evaluate(postFix);
            System.out.println("Postfix form: " + postFix);
            System.out.println("Result: " + result);
        }
    }

    // Parse the input string and form an infix notation
```

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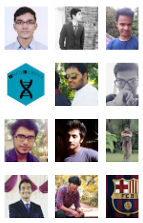

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```
    static List<String> getInFix(String expr) {
        List<String> list = new ArrayList<String>();
        int n, i;
        char ch;
        boolean hasInt;

        for(i = n = 0, hasInt = false; i < expr.length(); i++) {
            ch = expr.charAt(i);
            if(!isDigit(ch)) {
                if(hasInt) {
                    list.add("" + n);
                    n = 0;
                    hasInt = false;
                }
                list.add("" + ch);
            }
            else {
                n = n * 10 + (ch - 48);
                hasInt = true;
            }
        }

        return list;
    }

    // Enlist the tokens in a postfix notation
    static List<String> getPostFix(List<String> inFix) {
        List<String> list = new ArrayList<String>();
        Stack<String> oper = new Stack<String>();
        int i;
        char ch;
        String token, peek;

        for(i = 0; i < inFix.size(); i++) {
            token = inFix.get(i);
            ch = token.charAt(0);
            if(isDigit(ch)) list.add(token);
            else if(ch=='(') oper.push("" + ch);
            else if(ch==')') {
                while(!oper.empty()) {
                    peek = oper.pop();
                    if(peek.charAt(0)!='(') list.add(peek);
                    else break;
                }
            }
            else {
                while(!oper.empty()) {
                    peek = oper.peek();
                    if(peek.charAt(0)!='(' && preced(ch) <= preced(peek.charAt(0))) {
                        list.add(peek);
                        oper.pop();
                    }
                    else {
                        oper.push(token);
                        break;
                    }
                }
            }
        }

        return list;
    }

    // Evaluate the postfix notation passed as a list
    static int evaluate(List<String> postFix) {
        Stack<Integer> stack = new Stack<Integer>();
        int i, a, b;
        String token;
        char ch;

        for(i = 0; i < postFix.size(); i++) {
            token = postFix.get(i);
            ch = token.charAt(0);
            if(isDigit(ch)) stack.push(Integer.parseInt(token));
            else {
                b = stack.pop();
                a = stack.pop();
                switch(ch) {
                    case '+': a = a + b; break;
                    case '-': a = a - b; break;
                    case '*': a = a * b; break;
                    case '/': a = a / b; break;
                    case '%': a = a % b; break;
                    case '^': a = (int)Math.pow(a, b); break;
                }
                stack.push(a);
            }
        }

        return stack.pop();
    }

    // Provides operator precedence
    static int preced(char op) {
        if(op=='^') return 3;
        if(op=='*' || op=='/' || op=='%') return 2;
        if(op=='+' || op=='-') return 1;
        return 0;
    }

    // Checks if ch is a digit or not
    static boolean isDigit(char ch) {
        return (ch >= '0' && ch <= '9');
    }
}
```

Sample run

```
(3+8-90*36)*((((89-5%6+2^3-10-10-10)))-8)+100
Postfix form: [3, 8, +, 90, 36, *, -, 89, 5, 6, %, -, 2, 3, ^, +, 10, -, 10, -, 10, -, 8, -, *, 100, +]
Result: -174266
90+0
Postfix form: [90, 0, +]
Result: 90
6+763-67*2367-(54/234)
Postfix form: [6, 763, +, 67, 2367, *, -, 54, 234, /, -]
Result: -157820
```

The algorithm implemented here is pretty simple, so I guess I haven't made a mistake yet, but who knows? So please check it...

Posted by Zobayer Hasan at 11:06 PM

9 comments:

Zobayer Hasan May 16, 2010 at 12:02 AM

and yes, java sux

Reply

Replies

munna1505 April 2, 2015 at 6:05 PM

I am rolling on the floor now seeing you are a professional on java platform for two years in a row now.

Zobayer Hasan April 2, 2015 at 6:06 PM

Yeah, true... ROFLMAO

Reply