Interpreter 패턴

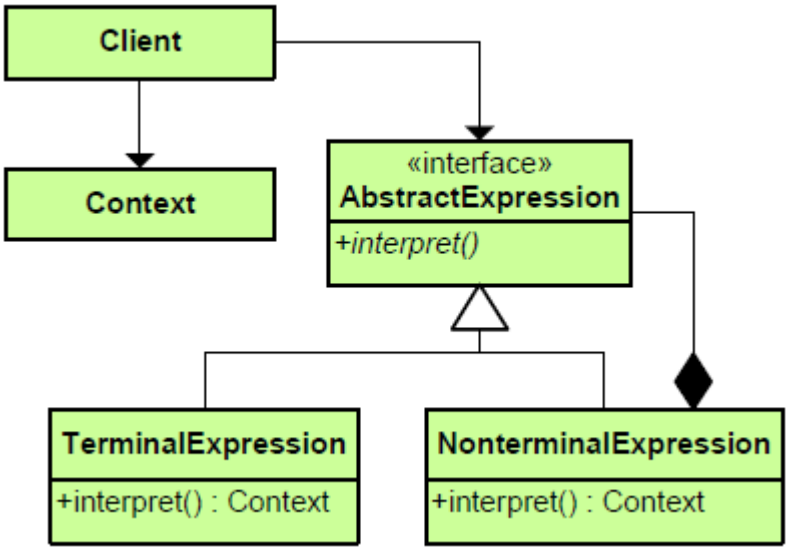
타입

Behavioral Pattern

문제

해결

클래스 다이어그램



예제

interpreter1.cpp

```
#include <iostream>
#include <string.h>

using namespace std;

class Thousand;
class Hundred;
class Ten;
class One;

class RNInterpreter
```

```
{
public:
    RNInterpreter(); // ctor for client
    RNInterpreter(int){}
    // ctor for subclasses, avoids infinite loop
    int interpret(char*); // interpret() for client
    virtual void interpret(char *input, int &total)
    {
        // for internal use
        int index;
        index = 0;
        if (!strncmp(input, nine(), 2))
        {
            total += 9 * multiplier();
            index += 2;
        }
        else if (!strncmp(input, four(), 2))
        {
            total += 4 * multiplier();
            index += 2;
        }
        else
        {
            if (input[0] == five())
            {
                total += 5 * multiplier();
                index = 1;
            }
            else
                index = 0;
            for (int end = index + 3; index < end; index++)
                if (input[index] == one())
                    total += 1 * multiplier();
                else
                    break;
        }
        strcpy(input, &(input[index]));
    } // remove leading chars processed
protected:
    // cannot be pure virtual because client asks for instance
    virtual char one(){ return '\0'; }
    virtual char *four(){ return ""; }
    virtual char five(){ return '\0'; }
    virtual char *nine(){ return ""; }
    virtual int multiplier(){ return 0; }
private:
    RNInterpreter *thousands;
    RNInterpreter *hundreds;
    RNInterpreter *tens;
    RNInterpreter *ones;
```

```
};

class Thousand: public RNInterpreter
{
public:
    // provide 1-arg ctor to avoid infinite loop in base class ctor
    Thousand(int): RNInterpreter(1){}
protected:
    char one()
    {
        return 'M';
    }
    char *four()
    {
        return "";
    }
    char five()
    {
        return '\0';
    }
    char *nine()
    {
        return "";
    }
    int multiplier()
    {
        return 1000;
    }
};

class Hundred: public RNInterpreter
{
public:
    Hundred(int): RNInterpreter(1){}
protected:
    char one()
    {
        return 'C';
    }
    char *four()
    {
        return "CD";
    }
    char five()
    {
        return 'D';
    }
    char *nine()
    {
        return "CM";
    }
```

```
    int multiplier()
    {
        return 100;
    }
};

class Ten: public RNInterpreter
{
public:
    Ten(int): RNInterpreter(1){}
protected:
    char one()
    {
        return 'X';
    }
    char *four()
    {
        return "XL";
    }
    char five()
    {
        return 'L';
    }
    char *nine()
    {
        return "XC";
    }
    int multiplier()
    {
        return 10;
    }
};

class One: public RNInterpreter
{
public:
    One(int): RNInterpreter(1){}
protected:
    char one()
    {
        return 'I';
    }
    char *four()
    {
        return "IV";
    }
    char five()
    {
        return 'V';
    }
```

```
    char *nine()
    {
        return "IX";
    }
    int multiplier()
    {
        return 1;
    }
};

RNInterpreter::RNInterpreter()
{
    // use 1-arg ctor to avoid infinite loop
    thousands = new Thousand(1);
    hundreds = new Hundred(1);
    tens = new Ten(1);
    ones = new One(1);
}

int RNInterpreter::interpret(char *input)
{
    int total;
    total = 0;
    thousands->interpret(input, total);
    hundreds->interpret(input, total);
    tens->interpret(input, total);
    ones->interpret(input, total);
    if (strcmp(input, ""))
        // if input was invalid, return 0
        return 0;
    return total;
}

int main()
{
    RNInterpreter interpreter;
    char input[20];
    cout << "Enter Roman Numeral: ";
    while (cin >> input)
    {
        cout << "   interpretation is " << interpreter.interpret(input)
<< endl;
        cout << "Enter Roman Numeral: ";
    }
}
```

interpreter2.cpp

```
#include <iostream>
#include <string>
```

```
#include <map>
#include <list>

namespace wikibooks_design_patterns
{

    //  based on the Java sample around here

    typedef std::string String;
    struct Expression;
    typedef std::map<String,Expression*> Map;
    typedef std::list<Expression*> Stack;

    struct Expression {
        virtual int interpret(Map variables) = 0;
        virtual ~Expression() {}
    };

    class Number : public Expression {
    private:
        int number;
    public:
        Number(int number)       { this->number = number; }
        int interpret(Map variables)  { return number; }
    };

    class Plus : public Expression {
        Expression* leftOperand;
        Expression* rightOperand;
    public:

        Plus(Expression* left, Expression* right) {
            leftOperand = left;
            rightOperand = right;
        }
        ~Plus(){
            delete leftOperand;
            delete rightOperand;
        }

        int interpret(Map variables)  {
            return leftOperand->interpret(variables) +
rightOperand->interpret(variables);
        }
    };

    class Minus : public Expression {
        Expression* leftOperand;
        Expression* rightOperand;
    public:
```

```
        Minus(Expression* left, Expression* right) {
            leftOperand = left;
            rightOperand = right;
        }
        ~Minus(){
            delete leftOperand;
            delete rightOperand;
        }

        int interpret(Map variables)  {
            return leftOperand->interpret(variables) -
rightOperand->interpret(variables);
        }
    };

    class Variable : public Expression {
        String name;
    public:
        Variable(String name)       { this->name = name; }
        int interpret(Map variables)  {
            if(variables.end() == variables.find(name)) return 0;
            return variables[name]->interpret(variables);
        }
    };

    //  While the interpreter pattern does not address parsing, a
parser is provided for completeness.

    class Evaluator : public Expression {
        Expression* syntaxTree;

    public:
        Evaluator(String expression){
            Stack expressionStack;

            size_t last = 0;
            for (size_t next = 0; String::npos != last; last =
(String::npos == next) ? next : (1+next)) {
                next = expression.find(' ', last);
                String token( expression.substr(last, (String::npos ==
next) ? (expression.length()-last) : (next-last)));

                if  (token == "+") {
                    Expression* right = expressionStack.back();
expressionStack.pop_back();
                    Expression* left = expressionStack.back();
expressionStack.pop_back();
                    Expression* subExpression = new Plus(right, left);
                    expressionStack.push_back( subExpression );
                }
                else if (token == "-") {
```

```
                    // it's necessary remove first the right operand
from the stack
                    Expression* right = expressionStack.back();
expressionStack.pop_back();
                    // ..and after the left one
                    Expression* left = expressionStack.back();
expressionStack.pop_back();
                    Expression* subExpression = new Minus(left, right);
                    expressionStack.push_back( subExpression );
                }
                else
                    expressionStack.push_back( new Variable(token) );
            }

            syntaxTree = expressionStack.back();
expressionStack.pop_back();
        }

        ~Evaluator() {
            delete syntaxTree;
        }

        int interpret(Map context) {
            return syntaxTree->interpret(context);
        }
    };

}

void main()
{
    using namespace wikibooks_design_patterns;

    Evaluator sentence("w x z - +");

    static
        const int sequences[][3] = {
            {5, 10, 42}, {1, 3, 2}, {7, 9, -5},
    };
    for (size_t i = 0; sizeof(sequences)/sizeof(sequences[0]) > i; ++i)
{
        Map variables;
        variables["w"] = new Number(sequences[i][0]);
        variables["x"] = new Number(sequences[i][1]);
        variables["z"] = new Number(sequences[i][2]);
        int result = sentence.interpret(variables);
        for (Map::iterator it = variables.begin(); variables.end() !=
it; ++it) delete it->second;

        std::cout<<"Interpreter result: "<<result<<std::endl;
```

```
        }
}
```

참고

http://en.wikibooks.org/wiki/C%2B%2B_Programming/Code/Design_Patterns#Interpreter