INRIA

Visitor

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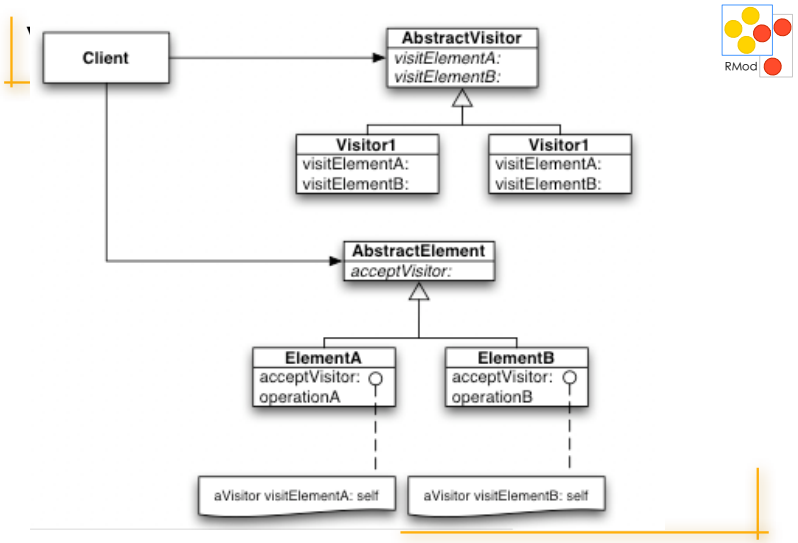
Visitor

Represent an operation to be performed on the elements of an object structure in a class separate from the elements themselves. Visitor lets you define a new operation *without* changing the classes of the elements on which it operates.

Visitor Intent

Intent: Represent an operation to be performed on the elements of an object structure in a class separate from the elements themselves. Visitor lets you define a new operation *without* changing the classes of the elements on which it operates.



When to use a Visitor

Whenever you have a number of items on which you have to perform a number of actions, and When you 'decouple' the actions from the items.
Examples:
- the parse tree (ProgramNode) uses a visitor for the compilation (emitting code on CodeStream)
- GraphicsContext is a visitor for VisualComponents, Geometrics, and some other ones (CharacterArray, ...)
- Rendering documents

Applying the Visitor

So all our problems are solved, no?
Well...
- when to use a visitor
- control over item traversal
- choosing the granularity of visitor methods
- implementation tricks

When to Use a Visitor

Use a Visitor:
- when the operations on items change a lot.

Do not use a visitor:
- when the items you want to visit change a lot.

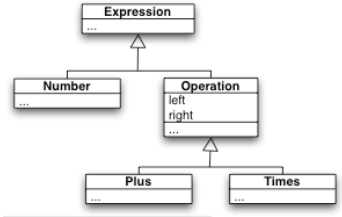
Question: But how do we know what to choose up-front?

Visitor Toy Example

Language to deal with arithmetic expressions.
It supports one kind of number, and has +, *, (,)
We want to evaluate expressions, and print them.
Example:

```
1 + 1
        result: 1 + 1 = 2
((4 * 2) * (3 + 5)) * 3
        result: (4 * 2 * (3 + 5)) * 3 = 192
...
```

Visitor Toy Example: ParseTree



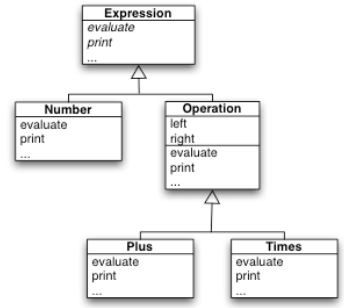
Implementing the Actions

Two solutions:

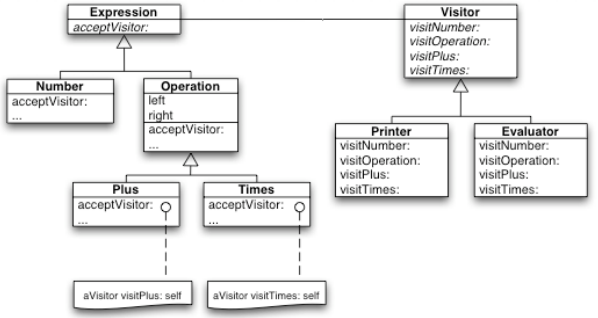
add methods for evaluating, printing, ... on Expression and its subclasses

create a Visitor, add the visit methods on Expression and its subclasses, and implement visitors for evaluation, printing, ...

Visitor Toy Example Solution 1



Visitor Toy Example 2



Toy Example: Discussion

So which solution to take?

In this case you might say:

- printing is not easy
- adding it directly on Expression clutters Expression (need to add instance variables etc.)
- therefore we can factor out the printing on a separate class.
- if we do this with a visitor we can then implement evaluation there as well.

Smalltalk's class extensions

Smalltalk has class extensions:

- method addition
- method replacement

So 'Decoupling' actions from items can be done:

- e.g., put all the printing methods together.
- take care: works only for methods
- makes it also really easy to package a visitor!

Note: this is a static solution!

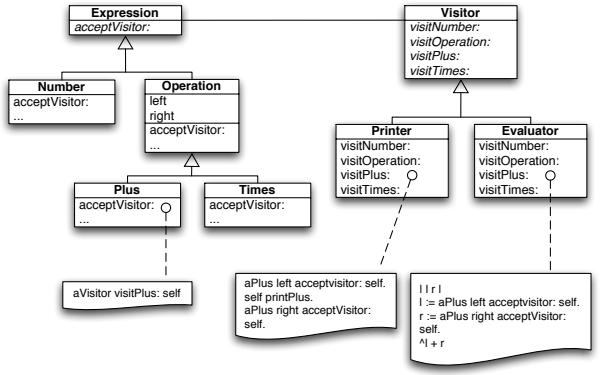
Controlling the traversal

Somewhere in the visitor, items are traversed.

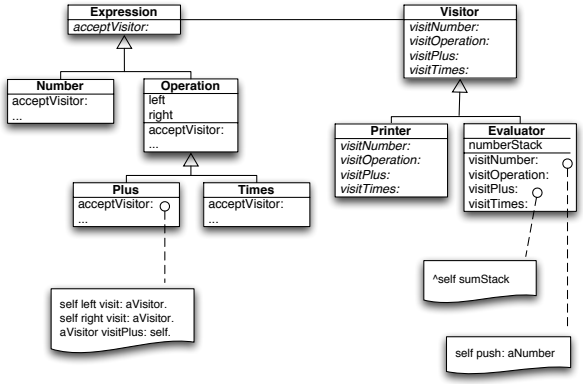
Different places where the traversal can be implemented:

- in the visitor
- on the items hierarchy

Traversal on the Visitor



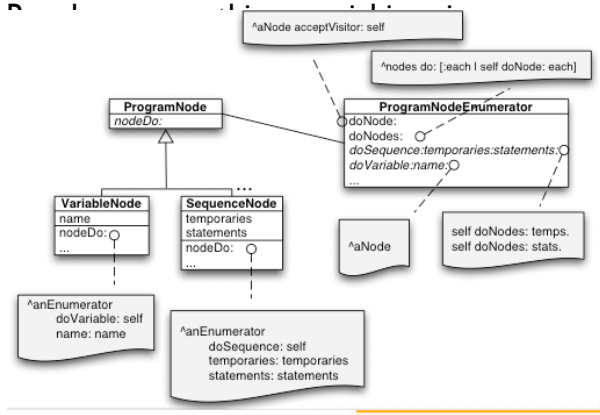
Traversal on the Items



Granularity of Visit Methods

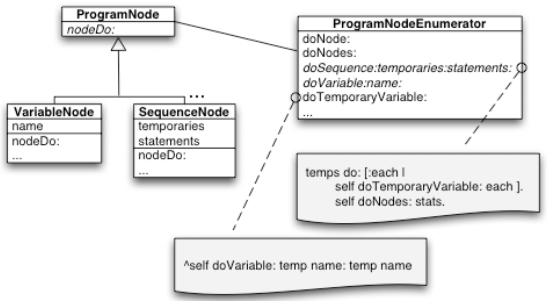
Sometimes you can pass context information with the visit methods
So visitors have more information for implementing their operations

Granularity of Visit Methods



Refined Granularity

Here methods allow finer control of variables (#doTemporaryVariable)



Implementation Tricks

You can implement it as we have shown before.
But notice the general structure of the methods!
This can be taken as advantage:
- code can be generated for a visitor.
- the method can be performed/invoked

But take care:
- only works when there is a full correspondence.
- can make the code hard to understand.

Using #perform: