

The Choice Calculus: A Representation for Software Variation by MARTIN ERWIG and ERIC WALKINGSHAW, TOSEM, 2011

Quick presentation by Ralf Lämmel
at SPL meeting (host: Vander Alves) on 17 March 2011 at UnB

		<i>Implementation</i>	
<i>Name</i>		<i>plus</i>	<i>times</i>
	<i>x</i>	<pre>int twice(int x) { return x+x; }</pre>	<pre>int twice(int x) { return 2*x; }</pre>
	<i>y</i>	<pre>int twice(int y) { return y+y; }</pre>	<pre>int twice(int y) { return 2*y; }</pre>

These functions vary in two independent *dimensions* with two *options* each.

Choice for name dimension

```
int twice(int  $\langle x: x, y: y \rangle$ ) {  
    return 2* $\langle x: x, y: y \rangle$ ;  
}
```

... implementation dimension


```
int twice(int  $\langle x: x, y: y \rangle$ ) {  
    return  $\langle plus: \langle x: x+x, y: y+y \rangle, times: \langle x: 2*x, y: 2*y \rangle \rangle$ ;  
}
```

Factoring with LET

```
let  $v = \langle x: x, y: y \rangle$  in  
int twice(int  $v$ ) {  
    return  $\langle plus: v+v, times: 2*v \rangle$ ;  
}
```

Problems with direct tagging

non-
modular



```
let  $v = \langle x: x, y: y \rangle$  in  
int twice(int  $v$ ) {  
    return  $\langle plus: v+v, times: 2*v \rangle$ ;  
}
```

unstructured



```
let  $v = \langle x: x, y: y \rangle$  in  
int thrice(int  $v$ ) {  
    return  $\langle times: 3*v \rangle$ ;  
}
```

Explicit, local dimension declarations

```
dim Par $\langle x, y \rangle$  in  
dim Impl $\langle plus, times \rangle$  in  
let  $v = Par\langle x, y \rangle$  in  
  int twice(int  $v$ ) {  
    return Impl $\langle v+v, 2*v \rangle$ ;  
  }  
let  $v = Par\langle x, y \rangle$  in  
  int thrice(int  $v$ ) {  
    return Impl $\langle v+v+v, 3*v \rangle$ ;  
  }
```

Vary **independently**

```
dim Impl⟨plus,times⟩ in  
let v=(dim Par⟨x,y⟩ in Par⟨x,y⟩) in  
int twice(int v) {  
    return Impl⟨v+v,2*v⟩;  
}  
let v=(dim Par⟨x,y⟩ in Par⟨x,y⟩) in  
int thrice(int v) {  
    return Impl⟨v+v+v,3*v⟩;  
}
```


Syntax summary

$e ::= a\langle e, \dots, e \rangle$	<i>Structure</i>
let $v = e$ in e	<i>Binding</i>
v	<i>Reference</i>
dim $D\langle t, \dots, t \rangle$ in e	<i>Dimension</i>
$D\langle e, \dots, e \rangle$	<i>Choice</i>

Formal framework

- Property “well dimensional”
- Plain expressions
- Choice elimination
- Choice semantics
- Factorization and distribution
- Normal forms
- Simplifications