

BASTA!

Oliver Sturm

Expression Trees

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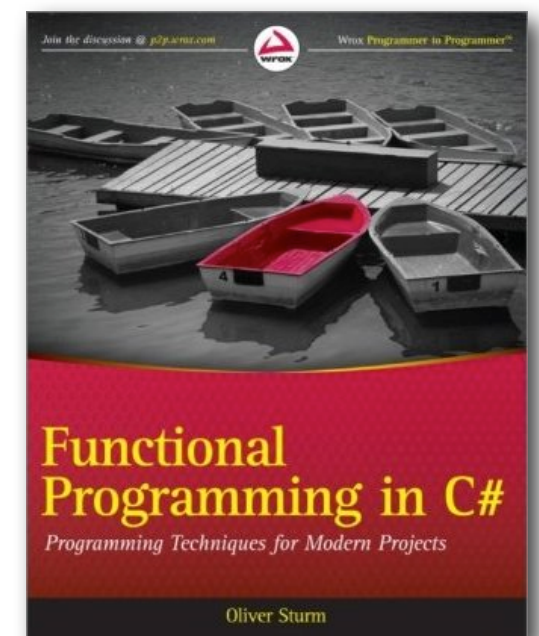
thinkecture
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Agenda

- What are expression trees?
 - How do they work
 - Creating them
 - Analyzing them
- Sample: Query by Example
- What's new in .NET 4.0?
 - Blocks and things
- Sample: the great Lambda Tracer
- Beware: lots of code coming up!

What are expression trees?

- Code as Data, “eval” etc...
- “Compiler as a Service”
- Needed for LINQ - Translation
- IL Emission, anybody?

Demo

Compiler generated expression trees
A first self-constructed tree

Query by Example

```

MethodCallExpression String.StartsWith (
  Arguments:
    ConstantExpression (B)
  Object:
    MemberExpression CountryInfo.Name (
      Expression:
        ParameterExpression (countryInfo)
    )
)

```

Name starting with: Area KM² greater than: Population greater than:

| | | |
|------------|--------|-----------|
| Bahamas | 13940 | 301800 |
| Bahrain | 665 | 688300 |
| Bangladesh | 144000 | 144319600 |
| Barbados | 431 | 279300 |
| Belarus | 207600 | 10300500 |
| Belgium | 30510 | 10364400 |
| Belize | 22966 | 279500 |

Demo

Query by Example

What's new in .NET 4.0?

From the POV of the Expression class:

| | | |
|-------------------|-----------------------|-----------------------|
| AddAssign | IsFalse | ReduceExtensions |
| AddAssignChecked | IsTrue | ReferenceEqual |
| AndAssign | Label | ReferenceNotEqual |
| ArrayAccess | LeftShiftAssign | Rethrow |
| Assign | Loop | Return |
| Bind | MakeCatchBlock | RightShiftAssign |
| Block | MakeDynamic | RuntimeVariables |
| Break | MakeGoto | SubtractAssign |
| Catch | MakeIndex | SubtractAssignChecked |
| ClearDebugInfo | MakeTry | Switch |
| Continue | MakeUnary | SwitchCase |
| DebugInfo | ModuloAssign | SymbolDocument |
| Decrement | MultiplyAssign | Throw |
| Default | MultiplyAssignChecked | TryCatch |
| DivideAssign | OnesComplement | TryCatchFinally |
| Dynamic | OrAssign | TryFault |
| Empty | PostDecrementAssign | TryFinally |
| ExclusiveOrAssign | PostIncrementAssign | TryGetActionType |
| GetDelegateType | PowerAssign | TryGetFuncType |
| Goto | PreDecrementAssign | TypeEqual |
| IfThen | PreIncrementAssign | Unbox |
| IfThenElse | Reduce | Variable |
| Increment | ReduceAndCheck | |

... as well as lots of new overloads

What's new in .NET 4.0?

- Statement bodies can now be implemented
- Type generation can't be implemented yet - perhaps in the future...
- Compiler can't generate trees for statement bodies yet

Demo

Runtime-generated Fact

Demo

The great lambda tracer

Summary

- Cool new expression tree features in .NET 4!
- ... and if you haven't played with expression trees at all, go do it!

Thank you!

Please feel free to contact me about
the content anytime!

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