Lost in Translation
Reguläre Ausdrücke als Englische Sätze

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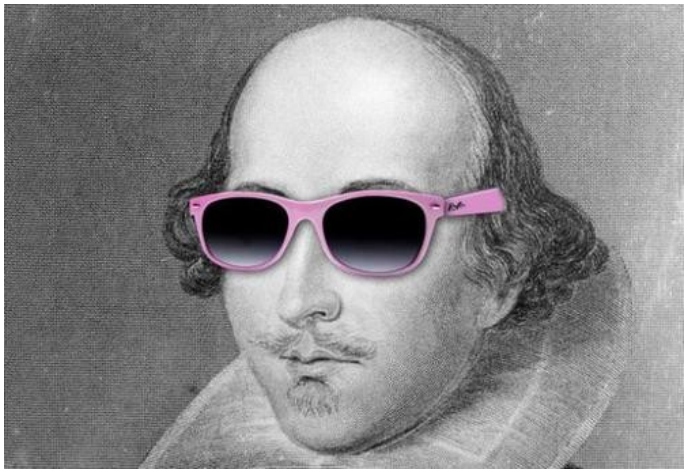
The menu

- Foreword
- * Expression
  - VerbalExpression (Prior-Art)
  - SimpleExpression (Nice try)
  - MagicExpression (Masterpiece)
- Wrap up

Image: internationalpointofsale.com

TL; DR;



- Why express yourself like this?

```
[A-Z0-9._%+-]+@[A-Z0-9.-]+\.[A-Z]{2,4}
```

- When you can say it like Shakespeare?

```
Thou shall match a string of letters
follow'd by @
then some characters
a dram dot
and some moo stuff
```

- A more coder friendly version maybe?

```
Thou.shallmatch(a-string-of-letters)
    .followdby("@")
    .then.somecharacters()
    .adram(".")
    .and.some(moostuff);
```

A regular expression DSL?

- “SimpleExpression”
  - Syntax close to the English language
  - Built as a fluent API
  - Outputs regular expressions
  - Tailored for newbies
    - Could it satisfy veterans too?

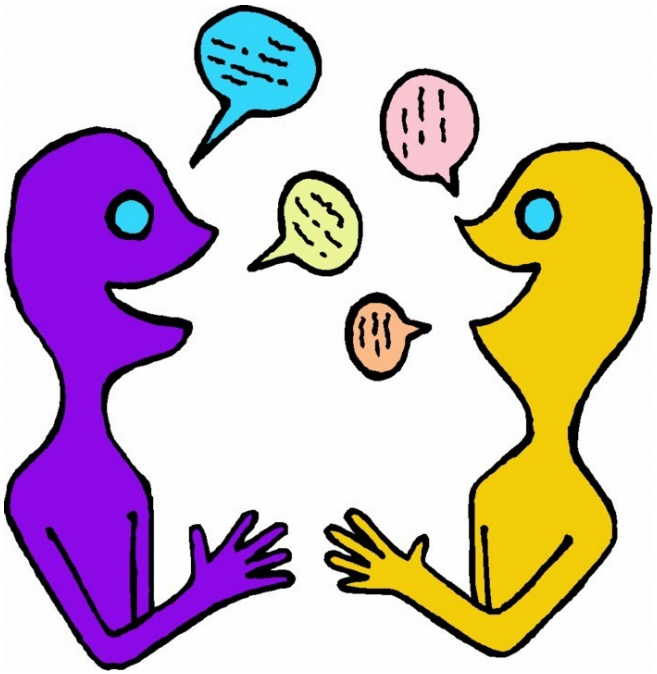


Image: scilogs.com

Why… Why… WHY?

- Example for a “C# dynamics” talk
- Write a real DSL (at least) once
- See if it works…
- Regular Expression knowledge refresh

- ~~Get rich and famous (bitches!)~~

- **Because I can!**

What is there to lose?

(© Franck Mée, a "friend" who ~~likes~~ loves regular expressions)

- The more complex the expression, the more surprised and god-like you'll feel when it works
- When you write one that works and you know no-one will ever understand, feel like Houdini mystifying everyone
- You can strip down someone's regex to pieces and yet never figure it out. Which makes you feel like looking at Houdini and God's work combined
- Old regexes (of yours) are like teenage kids, you know they came out of you, but you don't quite get them anymore

What we will NOT talk about

- How to write regular expressions
- Do’s and don’ts working with Regexes
- Optimization & performance
- Discuss the use of the RFC822 Email Regex

?
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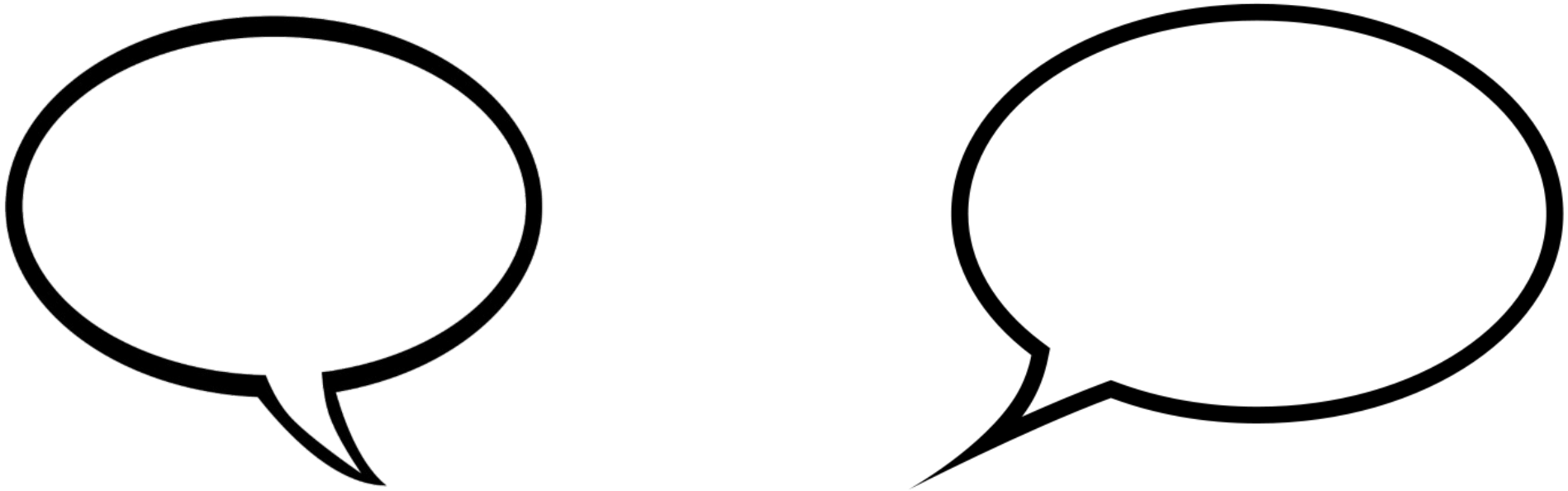


VerbalExpression

Prior-Art? Yes, “VerbalExpressions”

- “JavaScript Regular expressions made easy”
  - On github (github.com/VerbalExpressions)
  - Forks for: Ruby, C#, Python, Java, Groovy, PHP, Haskell, C++ and Objective-C

```
var tester = VerEx()
      .startOfLine()
      .then( "http" )
      .maybe( "s" )
      .then( "://" )
      .maybe( "www." )
      .anythingBut( " " )
      .endOfLine();
```

NotSoClearExpressions…

- Inconsistencies

```
var expression = VerEx()
      .find( "http" )
      .maybe( "s" )
      .then( "://" )
      .or()
      .then( "ftp://" )
```

  - find()
  - or().then(X)
  - Or() logic

NotSoClearExpressions…

- Branching

Could you please get me a burger and fries or a pizza?

```
var expression = VerEx()
        .find( "http" ).maybe( "s" ).then( "://" )
        .or()
        .then( "ftp://" )
```

?

```
var expression = VerEx()
        .(find( "http" ).maybe( "s" )
        .then( "://" ))
        .or()
        .(then( "ftp://" ))
```

```
var expression = VerEx()
        .find( "http" ).maybe( "s" )
        .(then( "://" ))
        .or()
        .(then( "ftp://" ))
```

NotSoClearExpressions…

Can you tell what this VerbalExpression does?

```
VerEx().then( "." ).replace( my_paragraph, ". Stop." );
```

- Is this intuitive?
- Why not something like the following?

```
VerEx().find( "." ).in( my_paragraph).and.replaceWith(". Stop." );
```

SimpleExpression(s)

Emoticons: brusheezy.com/members/tijo

How to manipulate SimpleExpressions?

- Here's how you use a SimpleExpression

```
dynamic simpex = new SimpleExpression();
simpex.here.I.can.chain.my.commands.Generate();
Console.Write(simpex.Expression);
```

- „dynamic"?

```
dynamic someInt = 4;
someInt.ICanWriteHereWhateverIWantAndItCompiles("doh");
// … but will crash & burn in flames at runtime
```

- DynamicObject

```
dynamic someDynamic = new DynamicObject();
someDynamic.Something();
=> TryInvokeMember(„Something")
```

Examples 1 & 2

- Floating point number matching

```
simpex
      .Maybe('-')
      .Numbers                    //Default is „zero or more“
      .One('.')
      .Numbers.AtLeast(1)
      .Generate();
```

- Hexadecimal Color

```
simpex
      .One('#')
      .Numbers.And(“abcdef“).Exactly(3)
            .Or
      .Numbers.And(“abcdef“).Exactly(6)
      .Generate();
```

Example 3: Email validation

```
string allowedChars = @"!#$%&'*+/=?^_`{|}~-";
simpex
    .Group
        .Alphanumerics.And(allowedChars).AtLeast(1)
    .Together.As("beforeAt")
    .One('@')
    .Group
        .Letters.And(allowedChars).AtLeast(1)
        .Group
            .One(".")
            .Alphanumerics.And(allowedChars).AtLeast(1)
        .Together.As("dotAndAfter")
    .Together.As("afterAt")
    .Generate();
```

- Letters, Alphanumerics

Example 4: IP

- Regular Expression Range for 0-255?
  - [0-9]|[1-9][0-9]|1[0-9][0-9]|2[0-4][0-9]|25[0-5]
  - e.g. a number in 0-9 or 10-99 or 100-199 or 200-249 or 250-255

- IP Match

```
Simpex
      .NumberInRange("1-255").One('.')
      .NumberInRange("0-255").One('.')
      .NumberInRange("0-255").One('.')
      .NumberInRange("0-255")
      .Generate();
```

Temperature check?

- How do you like SimpleExpression sofar?
- Any comments / suggestions / violent rant?

- Let's criticize!

Image: halleballedog.com

Critics: Syntax Hunting Season

- Isn’t the following gorgeous to read? (hint: the answer is **YES** ;)

```
simpex.Letters.AtLeast(3).AtMost(4)
simpex.Letters.And("-_ ").Except("a")
simpex.Group.Text("http").Maybe('s').Together.As("protocol")
```

- What about the following?

```
simpex.Group.One('0').Letters.Exactly(1).Together.Exactly(2)
```

  - Isn't there an 'And' missing?
  - 'Two' or 'Twice'?
  - .Letters.Exactly(1) or .Exactly(1).Letters ?
  - Group Cardinality
    - .Group.Exactly(2).X.Together ?
    - .Exactly(2).Group.X.Together ?

Critics: Repetition Mess

- What does the following mean?

```
Simpex
    .Group.AtLeast(5).Numbers.Exactly(2).Together.One(' ').AtLeast(1)
```

  - *“Group at least 5 numbers twice, followed by at least one space”?*
  - *“At least 5 groups of 2 numbers followed by at least one space“?*
- The problem here:

```
Group.AtLeast.X.Exactly.Together.Y.AtLeast
```

  - And no, pushing it after the ‘together’ wouldn’t solve the issue

```
Group.X.Exactly.Together.AtLeast.Y.AtLeast
```

Critics: Stuttering

- “Stuttering”, one of the limits of that prose

```
Simpex
    .Group
        .Group
            .Text(abcd)
            .Group
                .Letters.And("-")
            .Together
        .Together
        .Text("cde")
    .Together
```

SubExpressions, a sub solution

- Create now, join later

```
var abcd = new SimpleExpression().Text("abcd").Generate();
var efgh = new SimpleExpression().Text("efgh").Generate();

simpex.Sub(abcd).Or.Sub(efgh).Generate();
```

- That encapsulated grouping example

```
var innerMostGp = new SimpleExpression()
      .Goup.Letters.And("-").Together.Generate();

var innerGp = new SimpleExpression()
      .Group.Text(abcd).Sub(innerMostGp).Together.Generate();

var outerGp = new SimpleExpression()
      .Group.Sub(innerGp).Text("cde").Together.Generate();
```

Critic: Implicit Cardinality

- What is meant here?

```
simpex.EitherOf("a|b|c").AtLeast(2)
```

  - *“a, b or c, at least two of them”?*
  - *“twice a or twice b or twice c“?*
    - How do I do I express the other one?

Critic: Experts, get lost!

- Regular expression “experts” fall back onto what they know
- Does this create a class? A Group? Capturing or not?

```
simpex.Letters.Except("aeiou").And("§$%&").AtLeast(2).AtMost(4)
```

- How can I do Backward & Forward Lookup?
  - Well you can't

- The more you know, the more disturbing SimpleExpression is

Critic: dynamics Architecture

- All functions are known at compile time
  - Fully “implement-able” via a Fluent API
- Unnecessary lack of Intellisense support

Abstract Syntax Tree

- SimpleExpression's commands cannot be linearly parsed
- Simple repeat count

```
Simpex.One(“x“).AtLeast(3).AtMost(“5”)

// x => x{3,} => x{3,5}
```

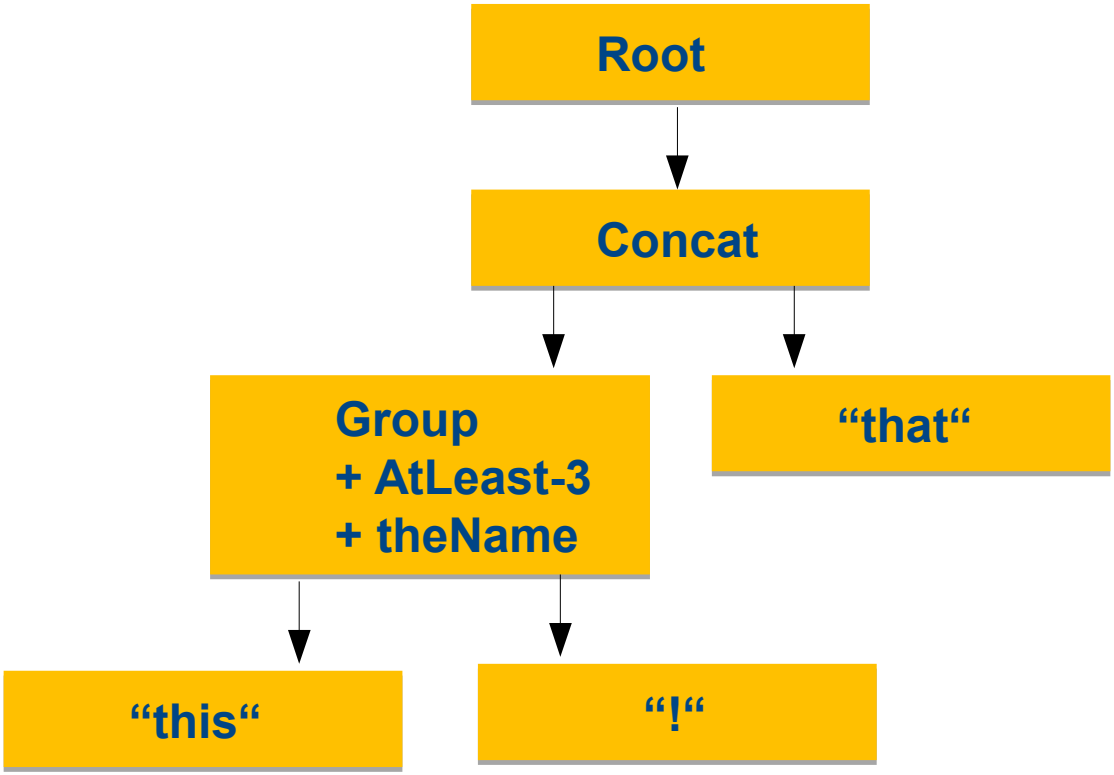
- Inversion of named groups and repeat count

```
simpex
    .Group.AtLeast(3).Text("something").Together.As("theName")

// (<theName>something){3,}
```

Abstract Syntax Tree

```
simpex
      .Group.AtLeast(3)
            .Text("this").One(“!“)
      .Together.As("theName")
      .Text(“that“)
      .Generate();
```




```
//Recursively generated expression:
  (<theName>this!){3,})that
```

What then?

- SimpleExpression’s semantic is quite nice and in some cases can actually be helpful

- Many edge cases where the grammatic doesn't fit that well and tend to pull down the concept as a whole ; it is like *“death by 1000 paper cuts”*

- Using parenthesis & reordering elements logically instead of grammatically

  → Losing some readability for the sake of precision?

MagicExpression

TL; DR;

- Compared to SimpleExpression
  - Loses the dynamics for a fluent API
  - Less-funky but less ambiguous functions
  - No more cumbersome Abstract Syntax Tree
  - Way more functions!

„MagicExpression for Muggles“ (©Ghusse)

- Install via Nuget

```
Install-Package MagicExpression
```

- Instanciation

```
var magicWand = Magex.New();

magicWand.The.Functions.Here;       //no lame .Generate() here

Console.WriteLine(magicWand.Expression);
```

Example 1: floating point match

```
var magicWand = Magex.New();

MagicWand
      .Character('-').Repeat.AtMostOnce()
      .CharacterIn(Characters.Numeral).Repeat.Any()
      .Character('.')
      .CharacterIn(Characters.Numeral).Repeat.AtLeastOnce();

// Creates the following regex:     -?[0-9]*\.[0-9]+
// Matches "1.234", "-1.234", "0.0", ".01"
// Doesn't Match "0", "1,234", "0x234", "#1a4f66"
```

```
Simpex
      .Maybe('-')
      .Numbers
      .One('.')
      .Numbers.AtLeast(1)
      .Generate();
```

- Character() & CharacterIn()
- .Repeat trigger
- Optional block handled via .AtMostOnce()
  - .Any() or .Between(0, uint) would also do the trick

Example 2: XML Tag Matching

```
var magicWand = Magex.New()
      .Character('<')
      .CaptureAs("tag",
            x => x.CharacterNotIn('>').Repeat.AtLeastOnce())
      .Character('>')
      .Character().Repeat.Any().Lazy()
      .String("</")
      .BackReference("tag")
      .Character('>');

// Matches "<strong>hello world</strong>" & "<h1>A title</h1>"
// Doesn't match "<h1>A tag mismatch</strong>"
```

- Group() → Non-capturing group
- Capture() → Capturing group
- CaptureAs() → Named capturing group
- BackReference(string) → Back reference on a named group

Example 3: URL Matching

```
var magicWand = Magex.New();
magicWand.Options = RegexOptions.IgnoreCase;
const string allowedChars = @"!#$%&'*+/=?^_`{|}~-";

MagicWand
    .Alternative(
        Magex.New().String("http"),
        Magex.New().String("ftp"))
    .Character('s').Repeat.AtMostOnce()
    .String("://")
    .Group(Magex.New().String("www."))
        .Repeat.AtMostOnce()
    .CharacterIn(Characters.Alphanumeric, allowedChars);
```

- Alternative(params Magex[])
- CharacterIn(params char[])

Example 4: Hexadecimal numbers

- „0x12e5ad“

```
Magex.New()
    .Character('0')
    .CharacterIn("xX")
    .CharacterIn(Characters.Numeral, "abcdefABCDEF").Repeat.Times(6)
    .EndOfLine();
```

- Hex Color

```
Magex.New()
    .Character('#')
    .Alternative(
        Magex.New().CharacterIn(Characters.Numeral, "abcdefABCDEF")
            .Repeat.Times(6).EndOfLine(),
        Magex.New().CharacterIn(Characters.Numeral, "abcdefABCDEF")
            .Repeat.Times(3).EndOfLine());
```

Example 5: IP

```
Magex.New()
    .Builder.NumericRange(1, 255).Character('.')
    .Builder.NumericRange(0, 255).Character('.')
    .Builder.NumericRange(0, 255).Character('.')
    .Builder.NumericRange(0, 255);
```

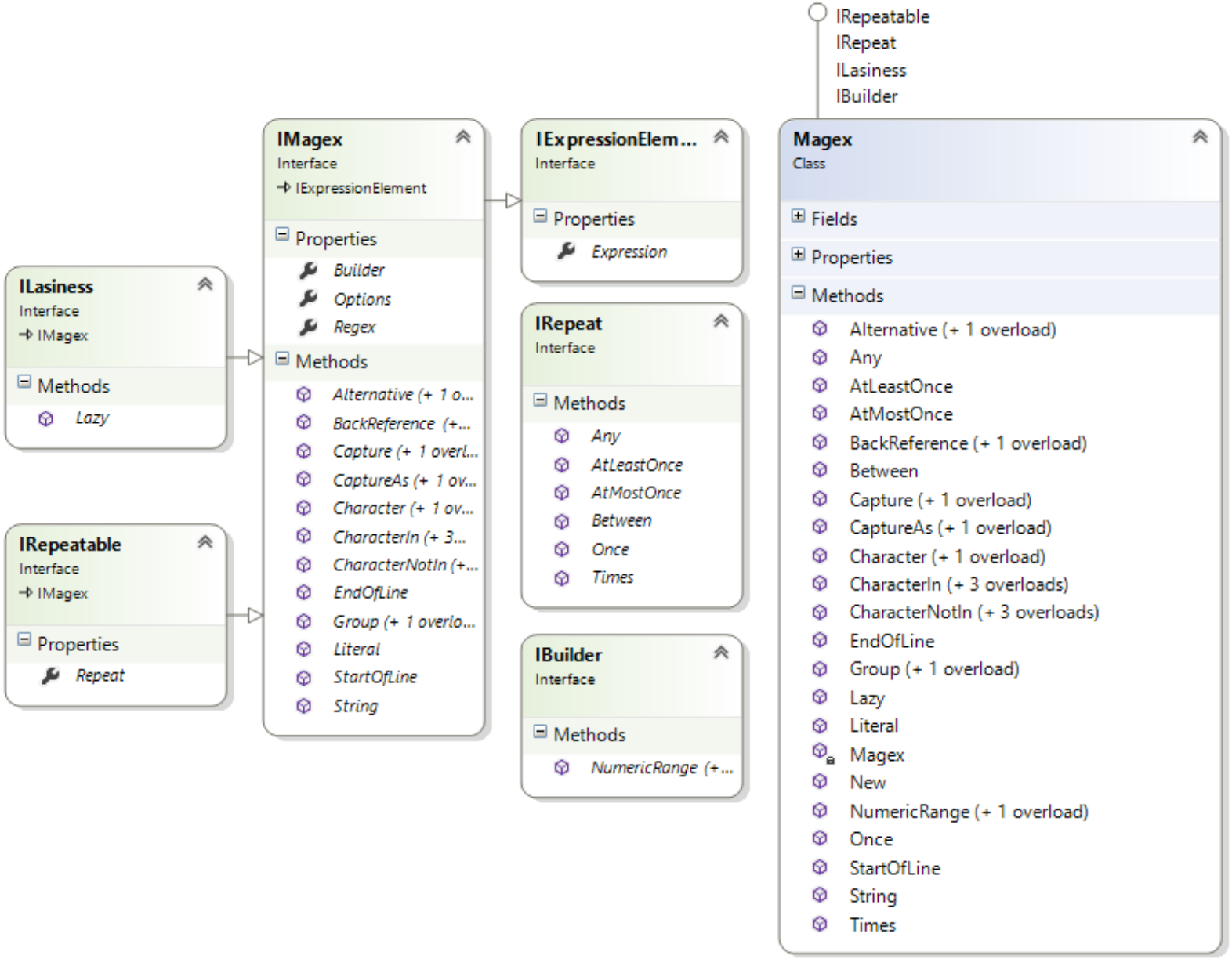
- Builder property to help you with predefined functions
  - Currently only NumericRange()
- Literal(string) function to add a predefined regular expression

- Other functions?
  - Email? Date with pseudo variable format → „yyyy-MM-dd“ ?
  - Hex, Floating point number... ? Any ideas? Wishes?

Doc?

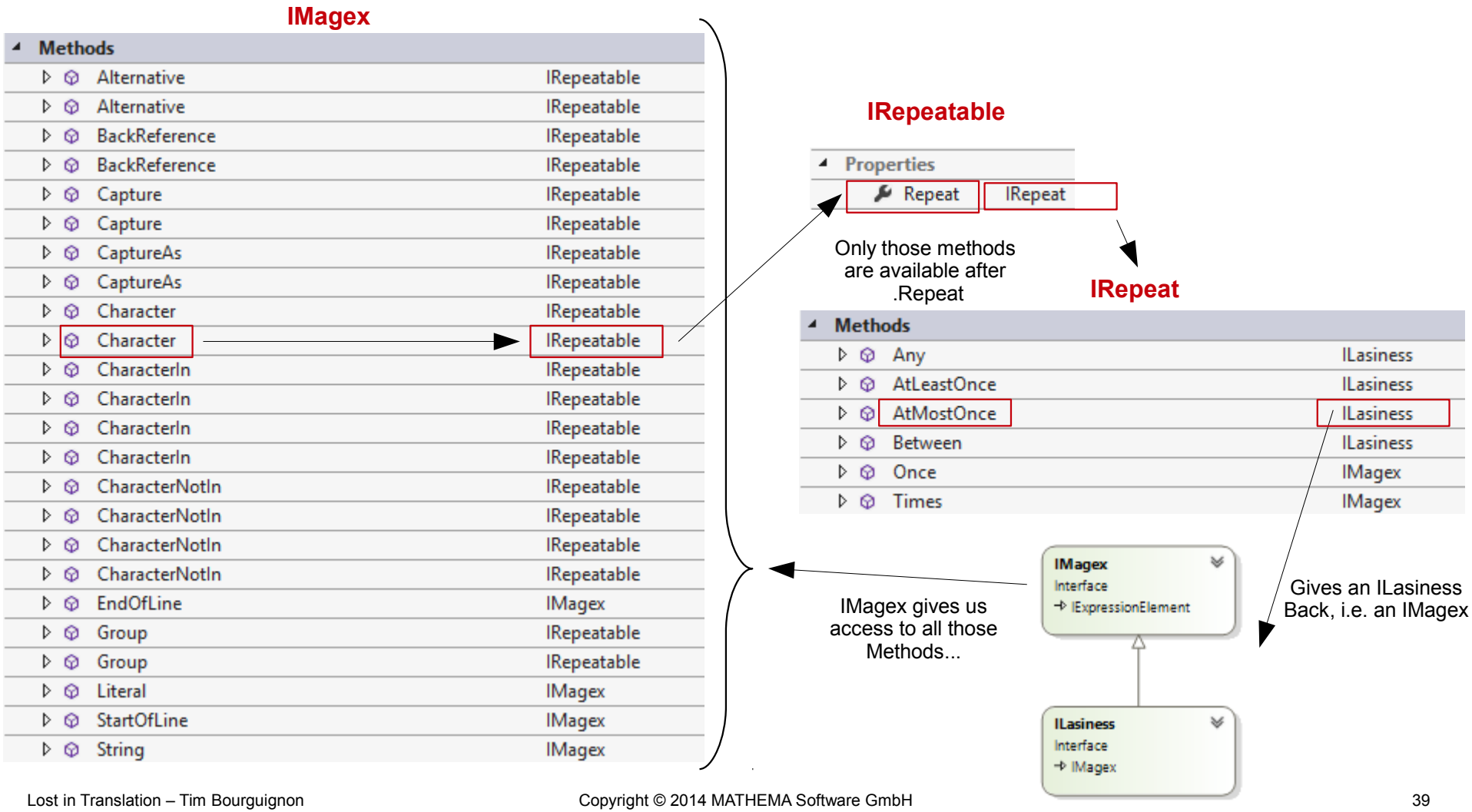
- Readme
  - https://github.com/ghusse/magicexpression

Architecture: Magex Interfaces



Architecture: Ghusse's Interfaces Game

magex.Character('s').Repeat.AtMostOnce().Character...



Let's wrap up

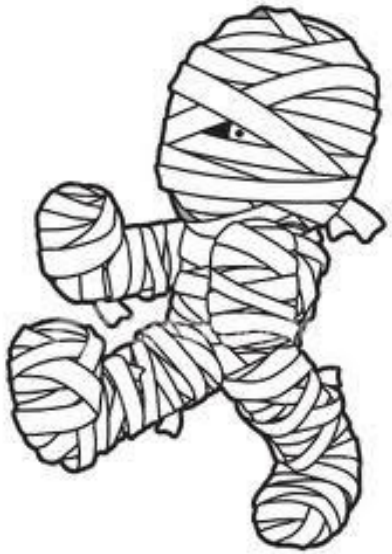


Image: teenlibrariantoolbox.com

Wrap Up

- It is possible to write such a DSL!
  - ~~I'm going to be rich and famous~~
  - Our languages are not always a good thing to immitate
  - But (in this case) a pinch of DSL doesn't hurt
- SimpleExpression
  - Semantically attractive, but not viable as is
- MagicExpression
  - Less sexy but useful
  - Next big feature → Reverse engineer regular expressions?

Fragen?

QUESTIONS?
SUGGESTIONS?
IDEAS?

THANKS!

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