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?

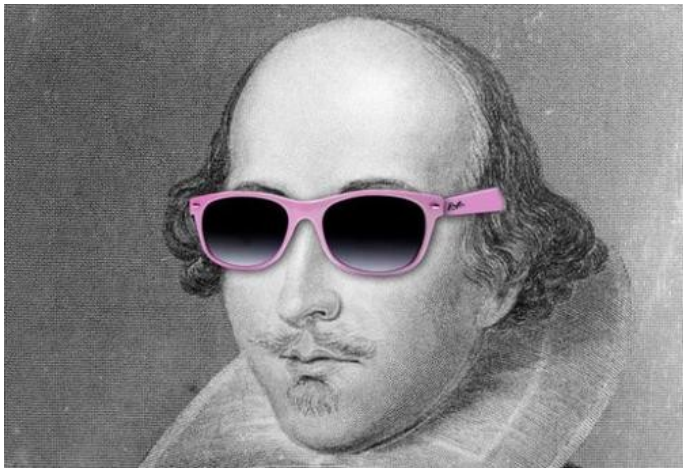
```
[A-Z0-9._%+-]+@[A-Z0-9.-]+\.[A-Z]{2,4}
```

- 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

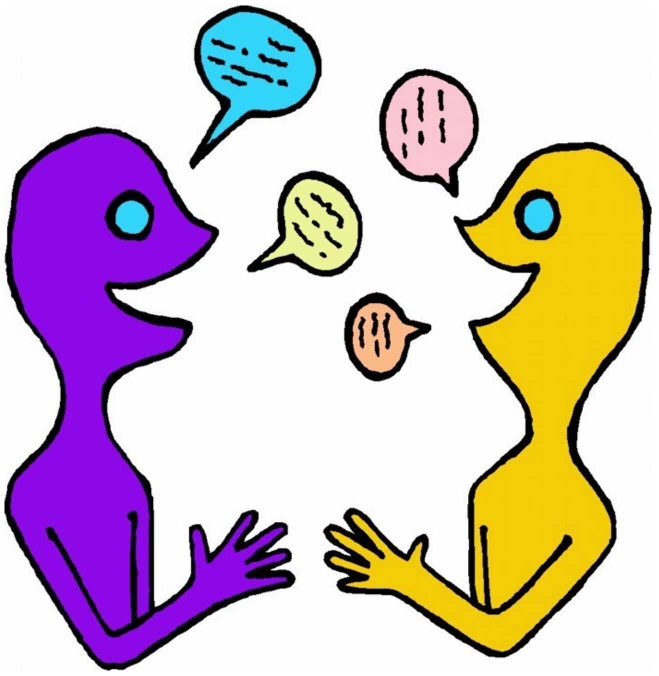
- A more coder friendly version maybe?

```
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?



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)

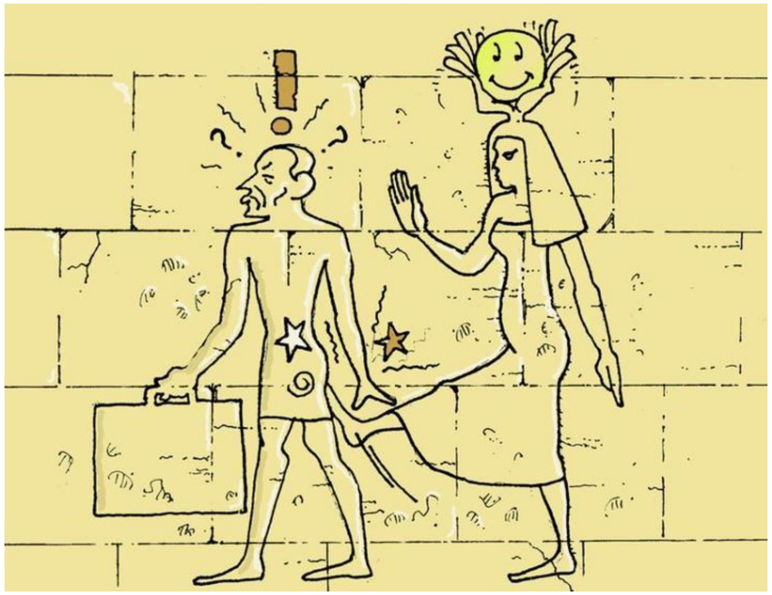
- The more complex the expression, the more surprised and god-like you’ll feel when it works
- When you write one that works and you know no-one will ever understand, feel like Houdini mystifying everyone
- You can strip down someone’s regex to pieces and yet never figure it out. Which makes you feel 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

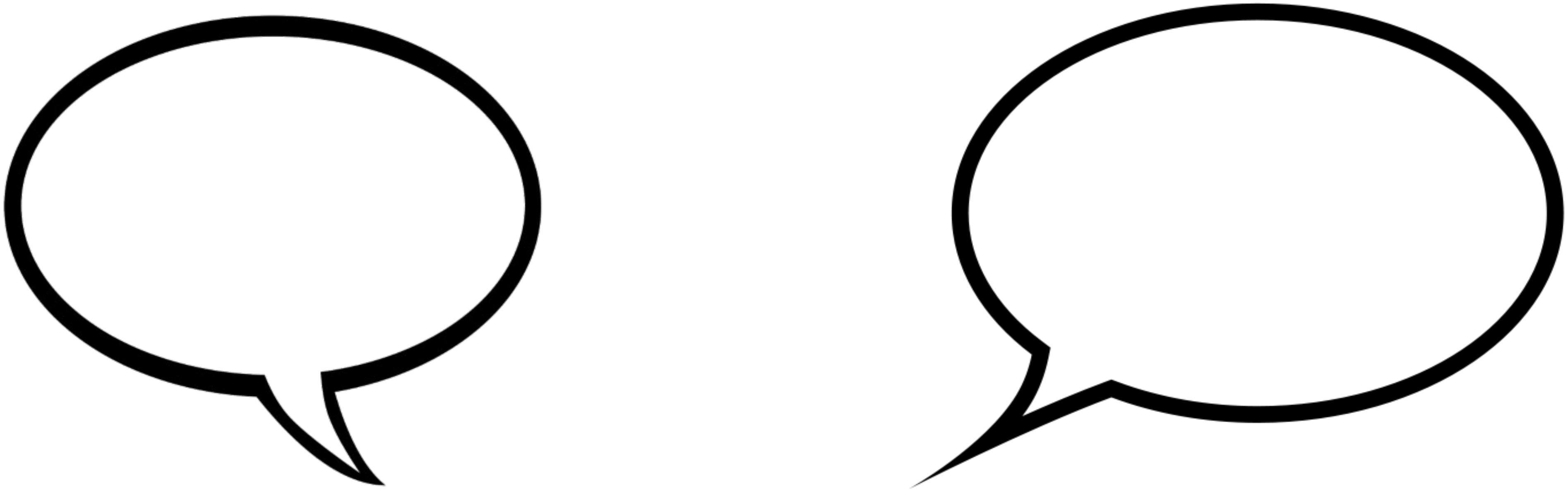
What we will NOT talk about

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

[illegible]

? ==





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)

😢 ☹ 😐 🙂 😃

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}
```

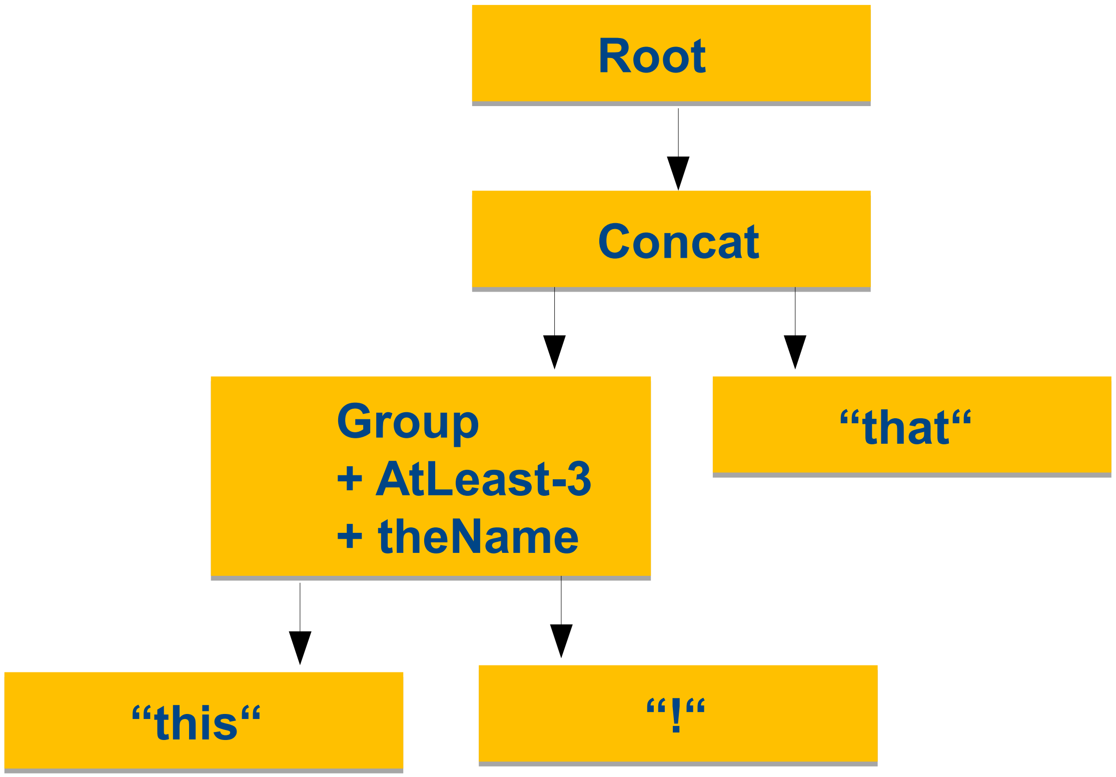
- Inversion of named groups and repeat count

```
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);
```

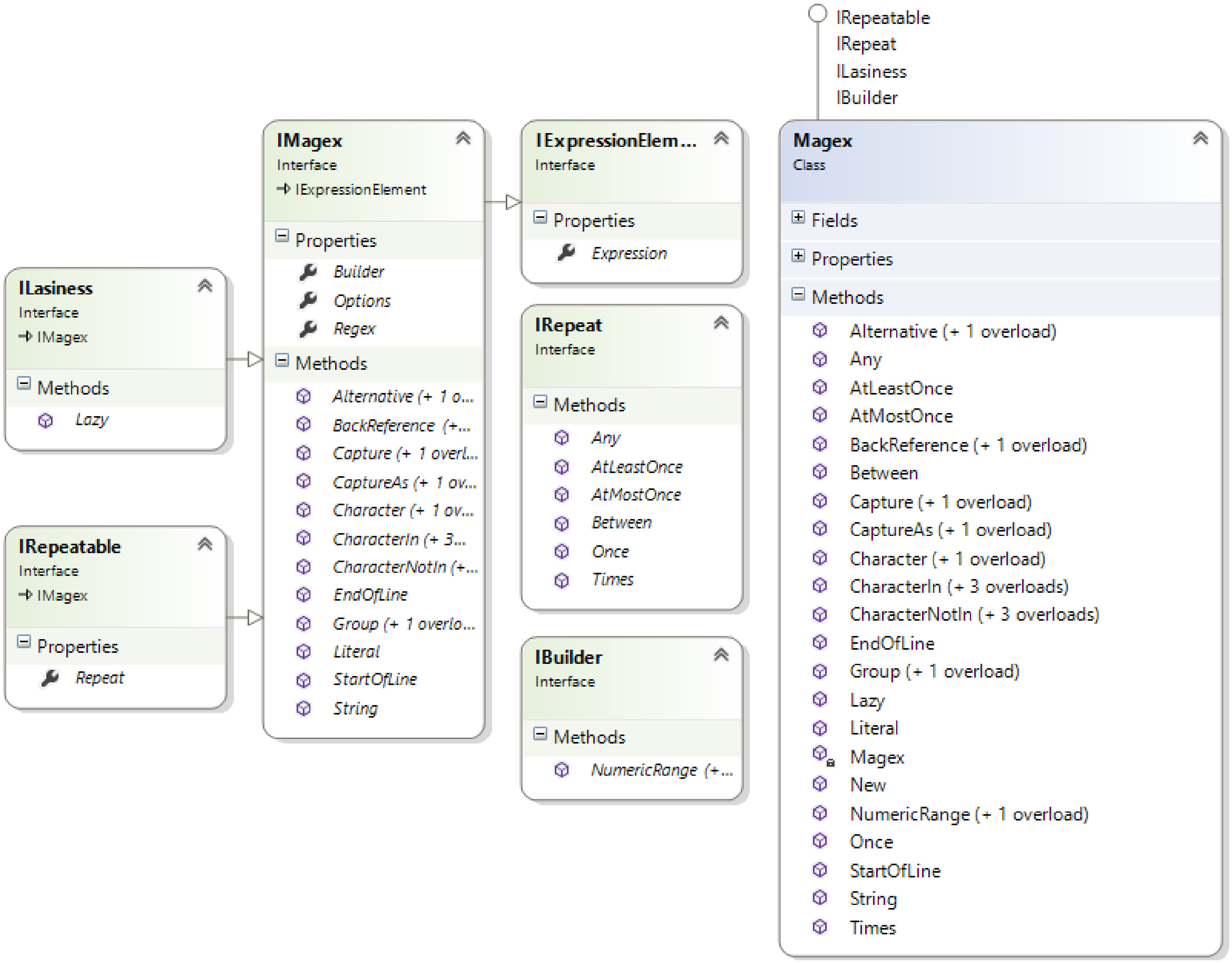
- Builder property to help you with predefined functions
  - Currently only NumericRange()
- Literal(string) function to add a predefined regular expression

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

Doc?

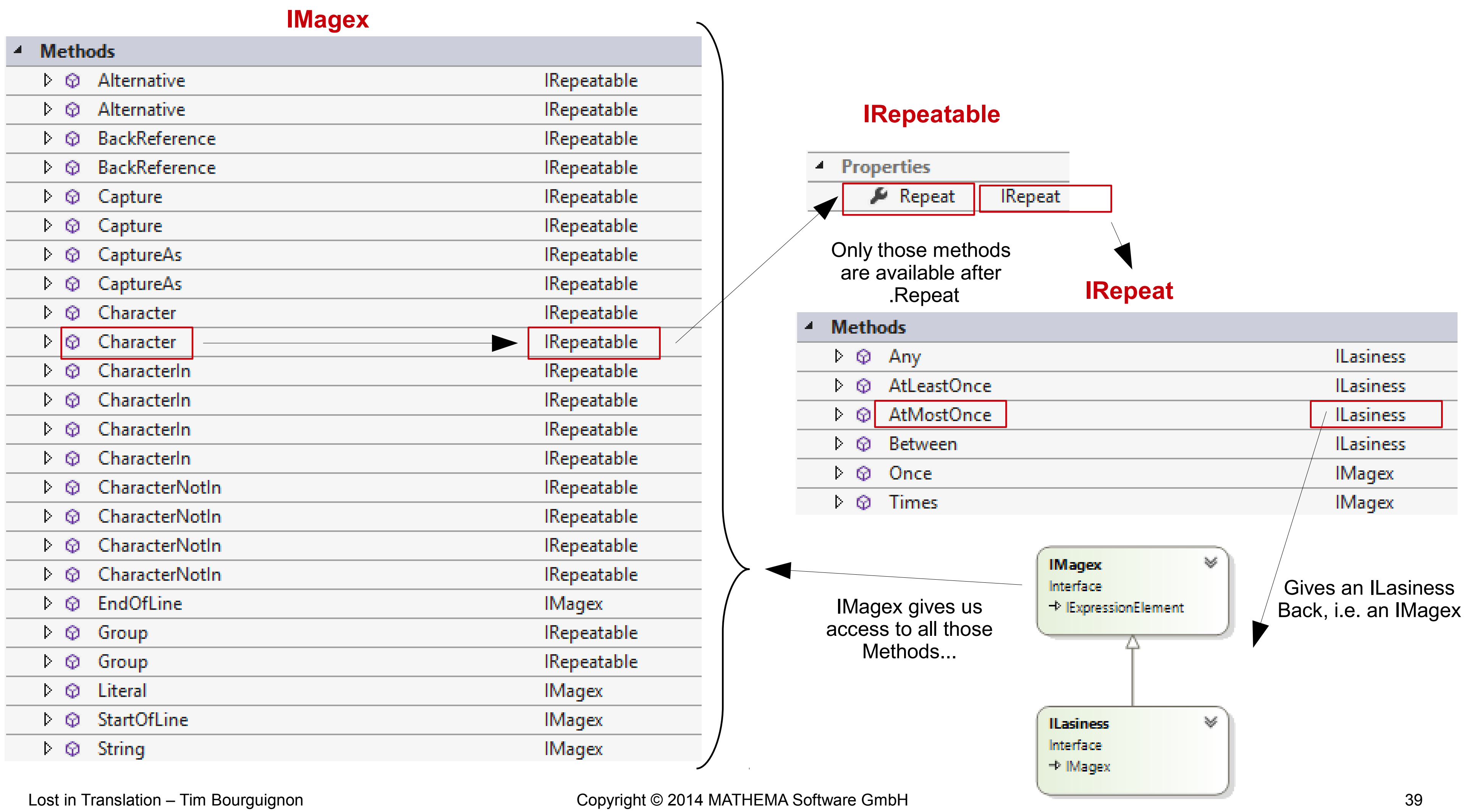
- Readme
  - https://github.com/ghusse/magicexpression

Architecture: Magex Interfaces



Architecture: Ghusse's Interfaces Game

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



IMagex

Methods	
Alternative	IRepeatable
Alternative	IRepeatable
BackReference	IRepeatable
BackReference	IRepeatable
Capture	IRepeatable
Capture	IRepeatable
CaptureAs	IRepeatable
CaptureAs	IRepeatable
Character	IRepeatable
Character	IRepeatable
CharacterIn	IRepeatable
CharacterIn	IRepeatable
CharacterIn	IRepeatable
CharacterIn	IRepeatable
CharacterNotIn	IRepeatable
CharacterNotIn	IRepeatable
CharacterNotIn	IRepeatable
CharacterNotIn	IRepeatable
EndOfLine	IMagex
Group	IRepeatable
Group	IRepeatable
Literal	IMagex
StartOfLine	IMagex
String	IMagex

IRepeatable

Properties	
Repeat	IRepeat

Only those methods are available after .Repeat

IRepeat

Methods	
Any	ILasiness
AtLeastOnce	ILasiness
AtMostOnce	ILasiness
Between	ILasiness
Once	IMagex
Times	IMagex

IMagex gives us access to all those Methods...

Gives an ILasiness Back, i.e. an IMagex

Let's wrap up

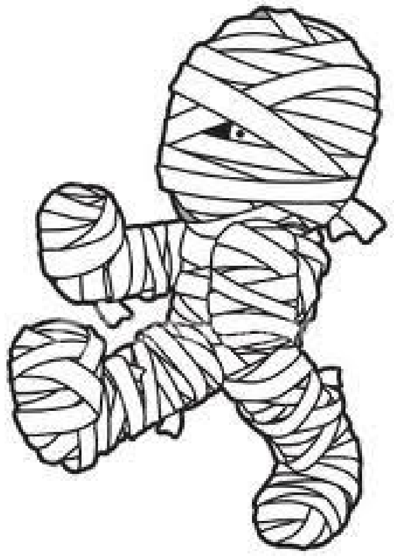


Image: teenlibrariantoolbox.com

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?

Fork me on GitHub

Fragen?

THANKS!

QUESTIONS?
SUGGESTIONS?
IDEAS?

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