Web Programming

Week 3

"I recommend that you write programs as though JavaScript had been designed correctly."

Douglas Crockford, How JavaScript Works, p. 6.2

Retrospective

JS Goodie

Ball Challenge

Open Questions

Storybook (initial)

Drehbuch, Intro, Functions
Scientific foundations
Algebraic Data Types, Snake
Applied Science
Scripting, PWA, Plotter, Excel
Objects
Classes
JS Types, JsDoc
Async Programming
Modules
Data Flow, Excel improved
Iterator Protocol, Sequences
Moves, User Interfaces
Crazy JS

Agenda

Lambda Boolean Logic

Lambda Algebraic Datatypes

Quiz

Goal

Becoming creative with

- Higher Order Functions
- Using the Lambda scope

Atomic Lambda Terms

```
// atoms
const id    = x =>       x;
const konst = x => y => x;


// derived true, false, and, or, equals, …
const F = …;
const T = …;
```

Pair, Product Type

```
const Pair = x => y => f => f(x)(y);
const fst  = p => p(T);
const snd  = p => p(F);
```

the basic product type

Triple

Can you encode triples by following the same pattern as for pairs?

N-Tuples?

Pair encoding

```
const person =
              firstname =>
              lastname  =>
              age       =>
              pair (pair(firstname)(lastname)) (age);

const firstn = p => fst(fst(p));
const lastn  = p => snd(fst(p));
const age    = p => snd(p);
```

Pair, Triple, etc.

Note that our pattern leads to **immutable** values ("objects")!

Accessor functions are **lazy** until they are applied (beta reduced).

Either, Co-Product, Sum

```
// dual of the product
const Pair = x => y => f => f(x)(y);    // one ctor
const fst  = p => p(T);                 // accessor 1
const snd  = p => p(F);                 // accessor 2
```

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const Left   = x => …;                     // ctor 1
const Right  = x => …;                     // ctor 2
const either = e => f => g => …;           // accessor
```

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```

the basic sum type

Special Case: Maybe

```
const Nothing  = Left ();
const Just     = Right  ;
const maybe    = either ;

maybe (expressionThatMightGoWrong)
      (handleBad)
      (handleGood);
```

go around null / undefined

To Do at Home

Use Pair and T/F in snake.

JavaScript Scope Chains and Closures: https://www.youtube.com/watch?v=zRZNb4GDOPI (InfoQ, 56 min)