Eq Programming Language
How to write a program with LaTeX?

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Agenda

1 General overview
- Fibonacci numbers

2 EqCode
- Basic functionality

3 Problem overview

Fibonacci numbers

Mathematical terms

$$F_0 = 0$$
$$F_1 = 1$$
$$F_i = F_{i-1} + F_{i-2}$$

C / SaC

```
int f(int n)
{
  if ((n == 0) || (n == 1))
    return n;
  return f(n - 1) + f(n - 2);
}
```

Mathematical notation

$$F_0 = 0$$
$$F_1 = 1$$
$$F_i = F_{i-1} + F_{i-2}$$

- Familiar
- Short
- Easy to understand
- Customizable backend

For-loop

EqCode

$$f(n) : \mathbb{Z} \rightarrow \mathbb{Z}$$
$$F^{[0]} = 0$$
$$F^{[1]} = 1$$
$$F^{[i]} = F^{[i-1]} + F^{[i-2]}$$
$$\textbf{return}(\textbf{filter}(F^{[i]} \mid i = n))$$

LaTeX

```
\begin{eqcode}{n}{\type{Z}}{\type{Z}}
  F^{[0]} = 0 \lend
  F^{[1]} = 1 \lend
  f^{[i]} = F^{[i-1]} + F^{[i-2]} \lend
  \return{\filter{F^{[i]}\  |\  i = n}}
\end{eqcode}
```

With-loop

EqCode

$$a_{i,j} \mid 0 \leq i < 5 \wedge 2 \leq j < 6 = \begin{cases} 42 & 0 \leq i < 2 \wedge 0 \leq j < 3 \\ 0 & \text{otherwise} \end{cases}$$

LaTeX

```
a_{i,j}\  |\  0 \leq i < 5 \land 2 \leq j < 6 =
  \begin{cases}
    42 & 0 \leq i < 2 \land 0 \leq j < 3 \lend
    0 \otherwise
  \end{cases}
```

SaC

```
a = with {
      ([0,2] <= [i,j] < [5,6] ) : 42;
  } : genarray([5,6], 0);
```

Vector

EqCode

$$w \in \mathbb{Z}^1$$

$$w = \begin{pmatrix} 1 \\ 2 \\ 3 \end{pmatrix}$$

LaTeX

```
w \in \type{Z}^1 \lend
w = \begin{vector}
  1 \lend
  2 \lend
  3 \lend
\end{vector}
```

Matrix

EqCode

$$w \in \mathbb{Z}^2$$

$$w = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$$

LaTeX

```
w \in \type{Z}^2 \lend
w = \begin{matrix}{cc}
  1 & 2\lend
  3 & 4 \lend
\end{matrix}
```

Problems and restrictions

- Loss of abstraction
- Types and type conversion
- Syntax restrictions

Project repository

http://github.com/zayac/EqCode/

Contacts

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Questions?