FlexJava: Language Support for Safe and Modular Approximate Programming

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Safe Programming in FlexJava

Selectively approximating data and operations

```
float a, b, c;

float approx(float x) {
    return x * 0.5f + x * 0.6f + x * 0.1f;
}
```

Control flow safety

```
int fibonachi(int n) {
    if (n < 2) return 0;
    else return fibonachi(n - 1) + fibonachi(n - 2);
}
```

Predication to improve approximability

```
private static double x(double y) {
    return Math.sin(y) / Math.cos(y);
}
```

Modular Approximate Programming

Scoped Approximation

```
int p = 1;
for (int i = 0; i < a.length; i++) {
    for (int j = 0; j < a.length; j++) {
        if (j < 2) throw new UnsupportedOperationException();
    }
}
```

Evaluation

[1] Number of annotations: Comparison with a leading approximate programming language – EnerJ


Source code

Approximation Safety Analysis

Approximable Data/Operations

Source Code Highlighting Tool

Highlighted Source Code

Approximate Program

Figure: Approximation Efficiency Comparison

Table: Approximation Efficiency Comparison

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