
Software Engineering

<http://swt.informatik.uni-freiburg.de/node/94>
<http://proglang.informatik.uni-freiburg.de/teaching/swt/2008/>

Exercise Sheet 2

2008-05-09

Exercise 1 (Type checking for Featherweight Java; 6 Points)

Given the following Featherweight Java program:

```
class Author extends Object {
  String firstName;
  String lastName;

  Author(String firstName, String lastName) {
    super();
    this.firstName = firstName;
    this.lastName = lastName;
  }
}

class Book extends Object {
  Author author;

  Book(Author author) {
    super();
    this.author = author;
  }

  String getAuthorLastName() {
    return this.author.lastName;
  }
}

class BestsellerBook extends Book {
  int howManySelled;
  BestsellerBook(Author author, int howManySelled) {
    super(author);
    this.howManySelled = howManySelled;
  }
}
```

To extend Featherweight Java with support for strings and ints, we need two new typing rules.

$$\frac{\text{STRING} \\ s \text{ is a string literal}}{A \vdash s : \text{String}}$$
$$\frac{\text{INT} \\ i \text{ is an integer literal}}{A \vdash i : \text{int}}$$

Now give a typing derivation for the following expression:

```
new BestsellerBook(new Author("Benjamin", "Pierce"), 1024).
    getAuthorLastName()
```

Exercise 2 (Properties of linksets; (3+3) Points)

(a) Which of the following linksets are well-formed, which are intra-checked, and which are inter-checked? Justify your conclusion.

- $L_1 \equiv \emptyset \mid (x \approx \emptyset \vdash 1 : \text{int}), (b \approx y : \text{int} \vdash y > 0 : \text{bool})$
- $L_2 \equiv \emptyset \mid (x \approx \emptyset \vdash 1 : \text{int}), (b \approx \emptyset \vdash y > 0 : \text{bool})$
- $L_3 \equiv y : \text{bool} \mid (x \approx \emptyset \vdash 1 : \text{int}), (b \approx x : \text{int} \vdash y > 0 : \text{bool})$

(b) Define a linkset L_4 that is well-formed, intra-checked, but not inter-checked.