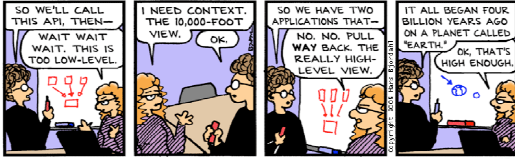


SML: Recursion, Pattern Matching, Datatypes

Prof. Evan Chang
Meeting 9, CSCI 3155, Fall 2009



Announcements

- Assignment 4 due Thu at 11:55pm
 - Individual
- No new assignment this Thu ☺
 - Study for the midterm next Thu ☺

2

Review

Typing and Evaluation with Bindings

- **Declarations** yield an environment
- An **environment** is a set of bindings (e.g., variable to values) used in subsequent declarations or expressions $val\ x=3$

$x + 3 : int ?$

$x + 3 \Downarrow 6?$

$x : int \vdash x + 3 : int$

$x \Downarrow 3 \vdash x + 3 \Downarrow 6$

environment "mutable"
mapping variables to types

Var \rightarrow Values

4

Tuples and Records

Recursion, Pattern Matching, and Datatypes

5

Evaluation

```
fun factorial 0 = 1
  | factorial n = n * factorial (n - 1);
factorial 3;
```

factorial 3 → 3 * factorial (3-1)
→ 3 * factorial (2)
→ 3 * (2 * factorial (1))
→ 3 * (2 * (1 * factorial (0)))
→ 3 * (2 * (1 * (1)))
→ 6

7

Evaluation

```
fun factorial_iter (n: int) : int =
  let fun helper (0: int, acc: int) : int = acc
      | helper (n: int, acc: int) : int = helper (n - 1, n * acc)
  in helper (n, 1) end;
factorial_iter 3;
```

factorial_iter 3 → helper (3, 1)
→ helper (2, 3*1) → helper (2, 3)
→ helper (1, 2*3) → helper (1, 6)
→ helper (0, 6)
→ 6

8

For Next Time

- Reading
- Online discussion forum
 - ≥1 substantive question, comment, or answer each week
- Homework assignment 4

9