Parametric Polymorphism

Prof. Evan Chang
Meeting 24, CSCI 3155, Fall 2009

Announcements

- HW8 due tonight at 11:55pm
- PROJ1 redo interview before last class 12/11

Eager evaluation vs. Lazy evaluation

arguments are evaluated before a call is made
val x=3, y=4, z=5
add (x-y, z)
argments are passed in

fun add (a, b) = a+b
fun subtract (a, b) = a-b
fun divide (a, b) = a/b

Lazy evaluation: Pass-by-name

Ian: “Don’t evaluate arguments & values;
pass the code to caller”

fun f x = f (loopfunction())
  fun loopfunction () = loopfunction
  (lazy evaluation)
  (lazy evaluation)
Functional Languages: Parameter Passing

\[
(f \times e) \quad (f + e) \\
(f \times e) \quad (f + e) \\
\]

About your classmates

- Taking classes on freerunning
- Favorite food is hot wings
- Was Gandalf for Halloween
- Was a pirate for Halloween
- Likes to go streaking!
- Encourages people to sing the CU fight song correctly
- Was in marching band for 2 years (and thus knows all the fight songs)

Review

- Inclusion polymorphism
  \[
  \text{Object id(Object o) \{ return o; \}}
  \]

- Parametric polymorphism
  \[
  (f \times (x,y) = x) = f + x
  \]

Issues with inclusion polymorphism

- Parametric polymorphism
  \[
  (f \times (x,y) = x) = f + x
  \]

- Parametric polymorphism
  \[
  (f \times (x,y) = x) = f + x
  \]
Example

- Type of a search method over an Object array

```
<T> T id(T x) { return x; }
```

```
template <class T>
T id(T x) { ... }
```

```
Object id(Object x)
```

```
(T) T search(Object a[3], Object k)
```

```
Rectangle r = ... Rectangle a[3] = Rectangle(l[3]), m[3];
```

```
<T> T search(T a[3], T k)
```
Exercise

• Write a method that takes an array of objects and a value and return number of elements greater than that value.

Subtyping

List<T> <: List<U> if T <: U ?

For Next Time

• Reading
• Forum comment
• HW8