

CS 603: Programming Language Organization

Lecture 9

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Outline

- Questions
 - Yours
 - What most differentiates Scheme from C or C++?
- μ -Scheme
- Reading for next time

μ -Scheme

- What distinguishes scheme from C++?

Pair Up:

What does distinguish?

- Recursion,
- anonymous functions
- functions as values \Rightarrow higher order functions

Values in μ -Scheme

- Compare values of Impcore to Scheme's

Pair Up:

What values does μ -Scheme have?

- Compare aggregations of C to Schemes—
i.e. (struct, union, arrays) vs. lists

Pair Up:

How can you “fake” structs, unions, and arrays using lists?

Impcore vs. μ -Scheme

Pair Up:

What does $(+ 2 3)$ mean in impcore? In μ -Scheme?

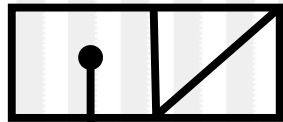
What does $'(+ 2 3)$ mean in μ -Scheme?

Box/cons cell model

- Cons cell—primitive data structure used to construct lists, basically a 2-tuple, drawn as:

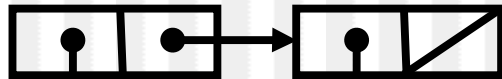


- A single element list, '(a) is drawn as:



a

- A double element list, '(a b) is drawn as:



a

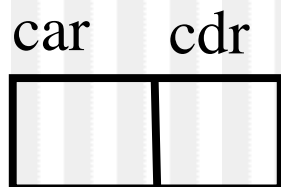
b

Lists (cont.)

- To answer previous question, `'(+ 2 3)` is a list

Pair Up:

What is the box diagram for `'(+ 2 3)`? Draw it on the board.



- car—what first element points to
- $(\text{car } '(a\ b)) = a$
- cdr—what second element points to
- $(\text{cdr } '(a\ b)) = '(b)$

Lists (cont.)

- Cons–constructs/makes a new cons cell
 - ‘(+ 2 3) is shorthand for:
 - (cons ‘+ (cons 2 (cons 3 ‘())))
- Pronunciation:
 - car = kawr, cdr = cudder, cons = kawns
- More complicated formed by concatenation:
 - (cadr L) = (car (cdr L)), katter
 - (cddr L) = (cdr (cdr L)), kadidder
 - (cdar L) = (cdr (car L)), kadar

Lists—Examples

Pair Up:

Write the expression of cons to get ‘((a) b).

Write the expression to get the “a” from ‘((a) b).

- S-expression predicates, append, +1 +2 => map

Reading & Questions for Next Class

- Chapter 3.8–3.10
- You might also want to look at the online version of the book “Structure and Interpretation of Computer Programs” at:<http://mitpress.mit.edu/sicp/>