

Class 22: Stateful Evaluation Rules

Upcoming Schedule

- **New Friday office hours:** right after class (Peter, Rice 1st)
- **Reading:** if you haven't already, should soon finish reading the course book through the end of Chapter 9, and *The Information* through the end of Chapter 7.
- **Friday, 21 October (beginning of class): Problem Set 5**
- **Wednesday, 26 October: Quiz 3** (covers the course book through Chapter 10, *The Information* through the end of Chapter 8, and some other readings, details to be provided later)

Names, Places, Frames, and Environments

Places: a place stores a value

Frame: a collection of zero or more places (like a picture frame)

Environment: a **frame**, and a pointer to a parent environment

Global Environment: the only environment with no parent

define creates a new named place in the global environment's frame, and stores a value in that place

set! ("set bang") changes the value associated with a place

Applying a procedure creates a new environment, and creates places in that environment's frame named after the parameters, with the argument values

Stateful Evaluation Rule 2: Names. To evaluate a name expression, search the evaluation environment's frame for a place with a name that matches the name in the expression. If such a place exists, the value of the name expression is the value in that place. Otherwise, the value of the name expression is the result of evaluating the name expression in the parent environment. If the evaluation environment has no parent, the name is not defined and the name expression evaluates to an error.

Stateful Definition Rule. A definition creates a new place with the definition's name in the frame associated with the evaluation environment. The value in the place is value of the definition's expression. If there is already a place with the name in the current frame, the definition replaces the old place with a new place and value

Stateful Application Rule 2: Constructed Procedures. To apply a constructed procedure:

1. Construct a new environment, whose parent is the environment of the applied procedure.
2. For each procedure parameter, create a place in the frame of the new environment with the name of the parameter. Evaluate each operand expression in the environment or the application and initialize the value in each place to the value of the corresponding operand expression.
3. Evaluate the body of the procedure in the newly created environment. The resulting value is the value of the application.

Draw the environment for evaluating:

```
(define double (lambda (x) (+ x x)))  
(double 4)
```

11. Define a procedure, **count-tandem-repeats**, that takes as input a list, p , and a number, n . The output should be the total number of times the first n elements of p are consecutively repeated at the beginning of p . Repetitions may not overlap.