Discussion 11

Programs as Data

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Announcements

- Lecture 32 Youtube videos do not contain all examples: watch live lecture or the recording.
- Homework 8 due next Thursday 11/17 (extended).
- Scheme project checkpoint 2 due Sunday 11/13.
- Project parties: 5-7:30 Wednesday, 5-7:30 Thursday in Warren.
 Thursday 12-5 office hours are online only: oh.cs61a.org
- Try to finish Checkpoint 2 by TODAY (no weekend office hours)!
- Scheme is due Tuesday 11/22.
 - \circ 1 bonus point for submitting by Monday 11/21.
 - 2 bonus points are automatically granted if you submit the project by Tuesday 11/22.
 - o 1 bonus point for the extra c140 it question.

Programs as Data

• So far we've seen expressions like these...

```
>>> print(print(5))
5
None
>>> (lambda f, a: f(a))(lambda x: x * x, 3)
9
```

But what if we wanted to do this?

```
[<expr> for i in range(5)]
```

• execute <expr> five times

Some Problems

```
def list_5(expr):
    return [expr for i in range(5)]
>>> lst = list_5(print(10))
10
>>> lst
[None, None, None, None]
```

- What's happening?
 - Python is evaluating the operands before executing the function,
 so expr is bound to None when executing the list comp

A Solution

delay evaluation by passing in expr as a String

```
def list_5(expr):
        return f"[{expr} for i in range(5)]"
>>> list_5("print(10)")
"[print(10) for i in range(5))]"
>>> lst = eval(list_5("print(10)"))
10
10
10
10
10
>>> lst
[None, None, None, None, None]
```

Scheme Programs as Data

Scheme stores all non-primitive expressions to store data
 can use lists to represent programs as data rather than Strings

```
scm> (define expr (list '+ 2 2))
expr
scm> expr
(+ 2 2)
scm> (eval expr)
4
```

Quasiquotation

 functions very similarly to quote, but we can also unquote or , to evaluate SOME expressions in a quoted list

```
scm> (define a 5)
a
scm> (define b 3)
b
scm> `(* a b)
(* a b)
scm> `(* a ,b)
(* a 3)
scm> '(* a ,b)
(* a (unquote b))
```

Thank you!!!

Anon Feedback -> https://tinyurl.com/adit-anon