Structs, Vectors, and Classes in DSSL2

EECS 214, Fall 2018

Welcome to DSSL2

- A Racket-based language, like BSL and ISL from EECS 111
- But made especially for you

DSSL2 expressions

```
3 + 5
```

DSSL2 expressions

```
3 + 5

6 * (3 + 5)

1 + 'hello'.len()
```

DSSL2 statements

```
let x = 5

8 * x
```

DSSL2 statements

```
let x = 5

8 * x

if condition:
    do_some_stuff()
else:
    do_other_stuff(x, y, z)
```

DSSL2 functions

```
# hypotenuse: Number Number -> Number
# Finds the length of the hypotenuse.
def hypotenuse(a, b):
    (a * a + b * b).sqrt()
```

DSSL2 functions

```
# hypotenuse: Number Number -> Number
# Finds the length of the hypotenuse.
def hypotenuse(a, b):
    (a * a + b * b).sqrt()

# fact: Natural -> Natural
# Computes the factorial of `n`.
def fact(n):
    if n == 0: 1
    else: n * fact(n - 1)

assert_eq fact(5), 120
```

Vectors


```
[ 0, 1, 1, 2, 4, 7, 13, 24, 44, 82 ]
```

Vector operations

```
let v = [ 0, 1, 1, 2, 4, 7, 13, 24, 44, 82 ]
```

Vector operations

```
let v = [ 0, 1, 1, 2, 4, 7, 13, 24, 44, 82 ]

test 'vector basics':
    assert_eq v[3], 2
    assert_eq v[6], 13
```

Vector operations

```
let v = [ 0, 1, 1, 2, 4, 7, 13, 24, 44, 82 ]

test 'vector basics':
    assert_eq v[3], 2
    assert_eq v[6], 13

test 'vector set':
    v[6] = 23
    assert_eq v[6], 23
```

What if I want a really big vector?

```
[ 0; 1000000 ]
```

Example: average

```
# average: Vector<Number> -> Number
# Averages the elements of a non-empty vector.
def average(vec):
    sum(vec) / vec.len()
```

Example: average

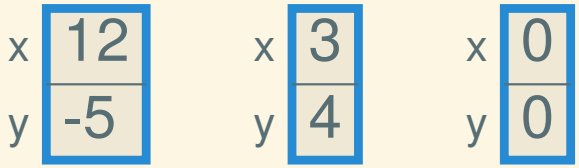
```
# average: Vector<Number> -> Number
# Averages the elements of a non-empty vector.
def average(vec):
    sum(vec) / vec.len()

# sum: Vector<Number> -> Number
# Sums the elements of a non-empty vector.
def sum(vec):
    let result = 0
    for v in vec:
        result = result + v
    return result
```

Structs


```
struct posn:
    let x
    let y
```

Structs




```
struct posn:
    let x
    let y

posn { x: 12, y: -5 }
posn { x: 0, y: 0 }
posn(3, 4)
```

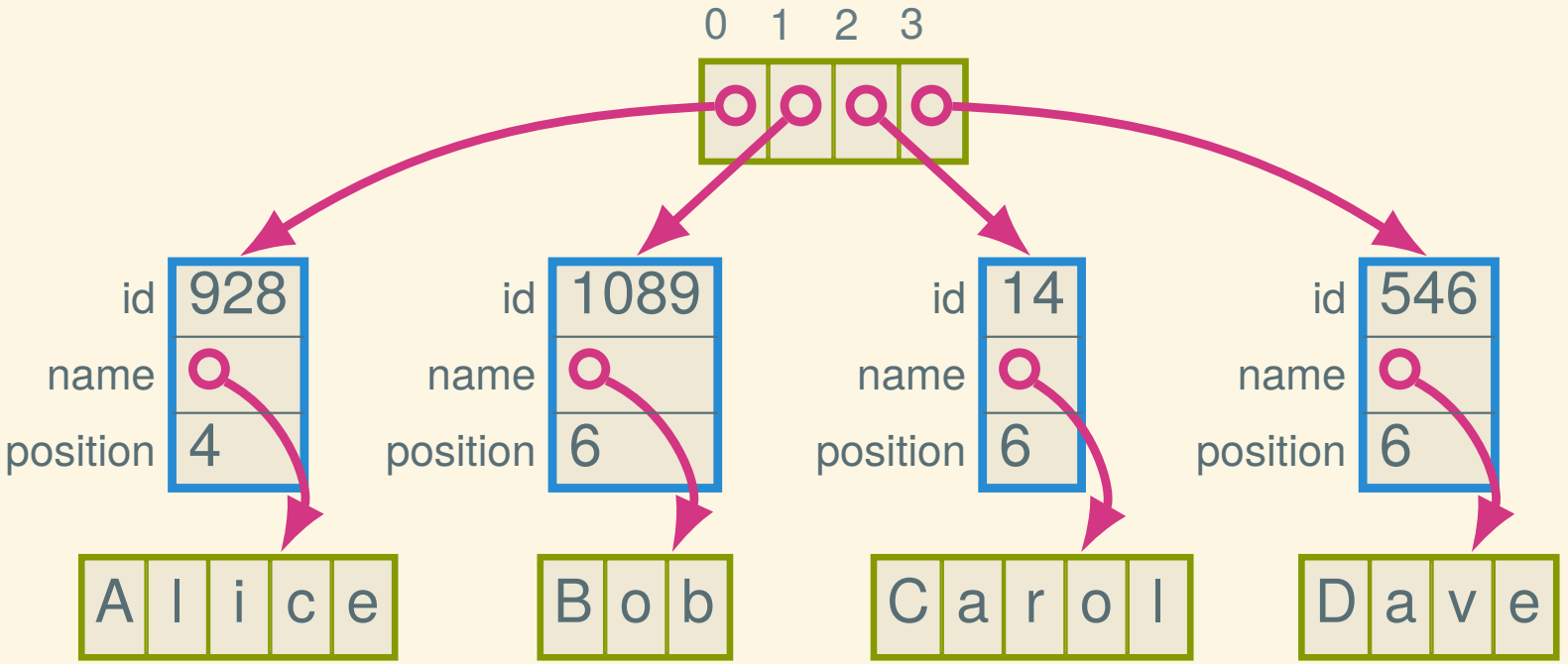
Working with structs

```
struct posn:
    let x
    let y

let p = posn(3, 4)
assert posn?(p)
assert_eq p.x, 3
assert_eq p.y, 4

p.x = 6
assert_eq p.x, 6
assert_eq p.y, 4
```

Structs and vectors




```
struct employee:
    let id; let name; let position

let employees = [ employee( 928, "Alice", 4),
                  employee(1089, "Bob",   6),
                  employee(  14, "Carol", 6),
                  employee( 546, "Dave",  6) ]
```

Working with structs and vectors

```
struct employee:
    let id; let name; let position

let employees = [
    employee( 928, "Alice", 4),
    employee(1089, "Bob",   6),
    employee(  14, "Carol", 6),
    employee( 546, "Dave",  6),
]
```

Suppose we want to find out Carol's position:

Working with structs and vectors

```
struct employee:
    let id; let name; let position

let employees = [
    employee( 928, "Alice", 4),
    employee(1089, "Bob",   6),
    employee(  14, "Carol", 6),
    employee( 546, "Dave",  6),
]
```

Suppose we want to find out Carol's position:

```
employees[2].position
```

How can we give her a promotion (from 6 to 5)?

Working with structs and vectors

```
struct employee:
    let id; let name; let position

let employees = [
    employee( 928, "Alice", 4),
    employee(1089, "Bob",   6),
    employee(  14, "Carol", 6),
    employee( 546, "Dave",  6),
]
```

Suppose we want to find out Carol's position:

```
employees[2].position
```

How can we give her a promotion (from 6 to 5)?

```
employees[2].position = 5
```

Generalizing

```
# promote-employee : Vector<Employee> Natural ->
# Decrements the position of the `index`th employee.
def promote_employee(employees, index):
    let emp = employees[index]
    emp.position = emp.position - 1
```

Classes

A class is like a struct with methods

It's way to package data with the operations that know how to operate on it

A first class example

```
class Posn:
    let x
    let y

    def __init__(self, x, y):
        self.x = x
        self.y = y

    def get_x(self): self.x

    def get_y(self): self.y

    def distance(self, other):
        let dx = self.x - other.get_x()
        let dy = self.y - other.get_y()
        (dx * dx + dy * dy).sqrt()
```

Using the Posn class

```
let p = Posn(3, 4)
assert_eq p.get_x(), 3
assert_eq p.get_y(), 4
assert_error p.x            # fields are private

let q = Posn(0, 0);
assert_eq p.distance(q), 5
```

For more DSSL2 information

See the DSSL2 reference (or help desk)

Next time: The lowly linked list