Property lists

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Overview

- Properties for symbols
- Library example
- Components of a symbol
- Using setf with symbol components

[ref.: chap 7- Wilensky]

Properties

- Objects have properties, e.g. color, weight, etc.
- Symbols can have properties as well.
  - To get the value of the property ‘color’ for symbol ‘chair’:
    > (**get** ‘chair ‘color)
    NIL
  - To set the value of the property ‘color’ for symbol ‘chair’:
    > (**setf** (get ‘chair ‘color) ‘blue)
    BLUE
    > (get ‘chair ‘color)
    BLUE

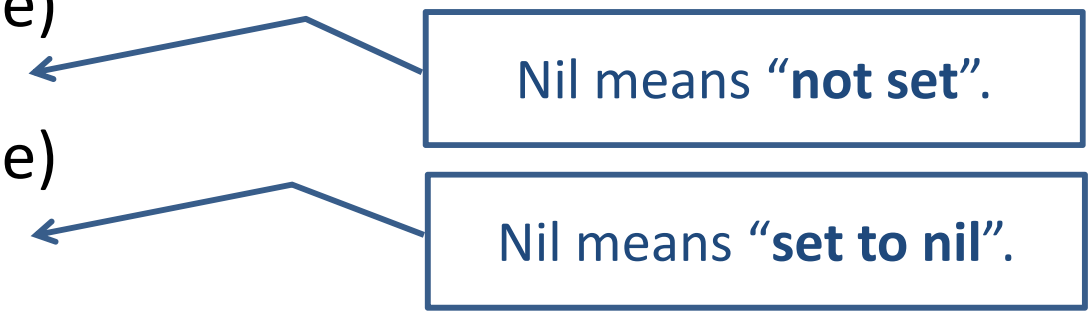
Not set, or set to nil?

- Assume we set the following properties:

```
> (setf (get 'food1 'taste) 'sour)
SOUR
> (setf (get 'food2 'taste) 'sweet)
SWEET
> (setf (get 'food2 'peanutfree) nil)
NIL
```

- If we access the value of properties:

```
> (get 'food1 'peanutfree)
NIL
> (get 'food2 'peanutfree)
NIL
```



Not set, or set to nil? (cont.)

- To distinguish, we can use get with 3 arguments

```
> (get  'food1  'peanutfree  'unknown)
UNKNOWN

> (get  'food2  'peanutfree  'unknown)
NIL
```

If third parameter is returned, it means "**not set**".

Nil means actually "**set to nil**".

- The third argument is an **optional** argument, while the first two arguments are **required** arguments.

Library example

- We can use a global variable **library** to store the list of books.
- A function to add a book:

```
> (defun addbook (bookref  newtitle  newauthor)
                 (setf  (get  bookref  'title)  newtitle)
                 (setf  (get  bookref  'author)  newauthor)
                 (setq  library  (cons  bookref  library))
                 bookref)
ADDBOOK
```

Library example (cont.)

```
> (setq  library  nil)
NIL
> (addbook   'book1  '(common  lispcraft) '(robert  wilensky))
BOOK1
> (addbook   'book2  '(programming in prolog)  '(william clocksin))
BOOK2

> library
(book2  book1)

> (get 'book1 'author)
(ROBERT WILENSKY)
```

Three argument, last two are lists

Adding to the front of list **library**

Properties are set globally!
(we will see why shortly)

Library example (cont.)

- A function to retrieve information, for example:

```
> (retrieveby  'author  '(robert  wilensky))
(BOOK1)

> (defun  retrieveby (property  value)
      (do  ( (lst   library   (cdr  lst))
             (result  nil   (if   (equal  (get (car lst) property)
    value)
                                  (cons  (car  lst)  result)
                                  result)))
          ((null  lst)  result)))
```

  - Two index variables: lst and result
  - Variable lst is initially set to library. In each loop, the head is checked, and then it is set to the tail
  - Variable result is initially set to nil (empty list). In each loop, if a relevant book is found it will be added to the front of result.

Library example (cont.)

- Exercises:

1. Write a function that deletes from the library.
2. Write a retrieving function that works if we have the value of the property partially, for example:

   > (retrieveby2 ‘author ‘robert)
   (BOOK1)

3. Write a function that retrieves books by searching in values of all properties, e.g.

   >(retrieveall ‘robert)
   (BOOK1)

Uniqueness of symbols

- **Symbols** can refer to different **variables**.
- Properties are attributes of the symbol, **not** the variables it can refer to!
- Unlike the variables they refer to, symbols are **unique**.
- Therefore changes to properties of a symbol are not local, but are **global**.

Example

```
> (setq  x  5)
5
> (setf  (get  'x  'color)  'red)
RED

> (defun  f1  (x)  (setq  x  (+ x 2)) (setf  (get 'x  'color)  'blue)  'done)
F1

> (f1  2)
DONE
> x
5
> (get 'x 'color)
BLUE
```

x: a global variable here

x: a formal parameter, therefore bound and local here

Changes to x inside f1 were local, value of global variable x not changed.

Changes to properties of x are **global**!

Four components of a symbol

[http://xahlee.org/elisp/Symbol-Components.html]

- Each symbol in LISP has
  - Print name:
    a string, for reading and printing the symbol's name
  - Value:
    The current value of the symbol as a **variable**
  - Function:
    The function definition for the symbol
  - Property list:
    The property list of the symbol

Four components of a symbol (cont.)

```
> (setq x 5)
5
> (defun  x (y) (*  100  y))
X
> (setf  (get  'x  'comment) '(this is a comment))
(THIS IS A COMMENT)

> (symbol-name 'x)
"X"
> (symbol-value 'x)
5
> (symbol-function 'x)
#<FUNCTION X (Y) (DECLARE (SYSTEM::IN-DEFUN X)) (BLOCK X (* 100 Y))>
> (symbol-plist 'x)
(COMMENT (THIS IS A COMMENT) SYSTEM::DEFINITION ((DEFUN X (Y) (* 100 Y)) .
```

Using setf with symbol components

- Setf to set value (instead of setq)

```
(setq x 20)
```

```
= (setf (symbol-value 'x) 20)
```

- Setf to set property list

```
(setf (get 'chair 'color) red)
(setf (get 'chair 'height) 50)
```

```
= (setf (symbol-plist 'chair)
        '(height 50 color red))
```

- Setf to set function definition (instead of defun)

```
(defun f1 (x) (* x 100))
```

```
= (setf (symbol-function 'f1)
        (lambda (x) (* x 100))
```