Data Structures

Iterators

DataLab

November 12, 2016

Outline

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Iterator Method

Scenario

We often want to access every item in a data structure or collection in turn...

Example with the array representation

1. listSize = len(List)
2. for i in range(n)
3. print List[i]

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For example the get in Chain List Representation

We will see that it has complexity $O(n)$!!!

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In Java at java.util we have the interface Iterator

Interface

```
package java.util;
public interface Iterator<Item> {

public boolean hasNext();

public Item next();

// Optional method
public void remove();

} // end Iterator
```

Explanation

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public void remove()

- It removes from the collection of data the last entry that next() returned.

Precondition: next() has been called, and remove() has not been called since then.

- It throws IllegalStateException if next() has not been called, or if remove() was called already after the last call to next().

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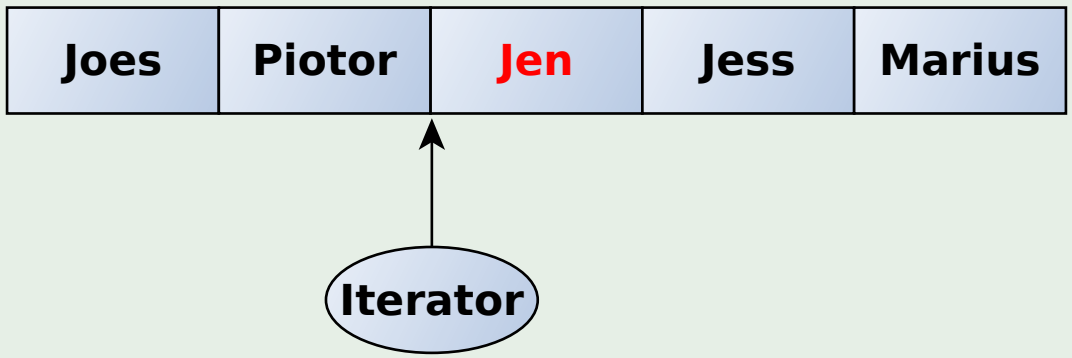
Effect in a list

The List Before Any Operation with the Iterator



After the next() operation

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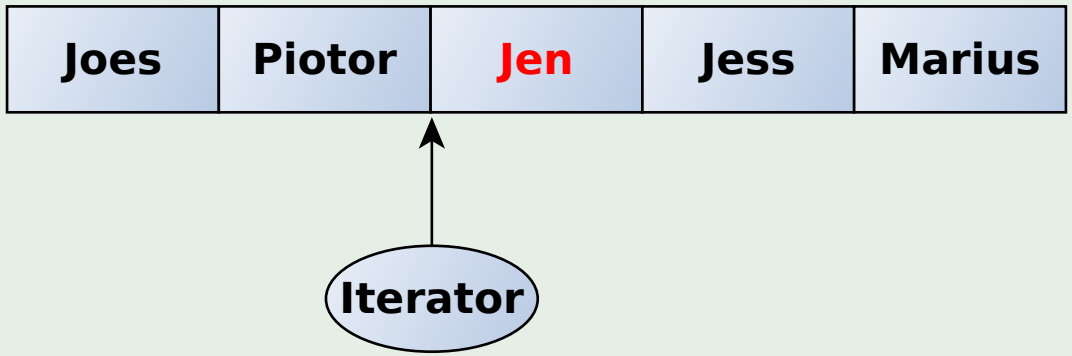

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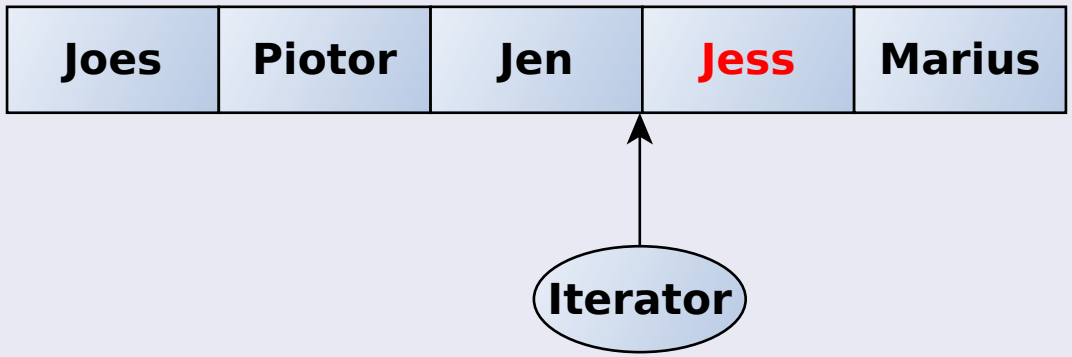
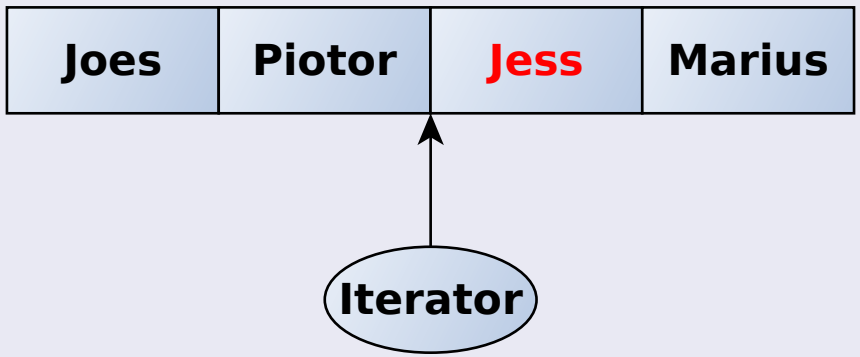


Effect in a list

Now, we issue a remove()



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We have the Iter Protocol

We have the following

- Operation “iter”

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```
class yrange:
    def __init__(self, n):
        self.i = 0
        self.n = n

    def __iter__(self):
        return self

    def next(self):
        if self.i < self.n:
            i = self.i
            self.i += 1
            return i
        else:
            raise StopIteration()
```

Explanation

We have

- The ___iter___ method is what makes an object iterable.
- Behind the scenes, the iter function calls ___iter___ method on the given object.

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Problems

Problem 1

Write an iterator class reverse_iter, that takes a list and iterates it from the reverse direction.

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Write an iterator class, that takes a list and iterates over the even indexes

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