Estructuras de Datos

es

Gonzalo Gabriel Méndez, Ph.D.

www.ggmendez.com

Facultad de Ingeniería en Electricidad y Computación

ESCUELA SUPERIOR POLITECNICA DEL LITORAL
ESPOL

La Interface `Iterable`

Utilidad

Permite el uso de una versión mejorada de lazo **for**

A este tipo de lazo se lo conoce como **for-each**

```
for (Item item: customDataStructure)
{
    // do stuff
}
```

Recorriendo ArrayList y LinkedList

```
ArrayList al = new ArrayList();
al.add(3);
al.add(2);
al.add(1);
al.add(4);
al.add(5);
al.add(6);
al.add(6);

Iterator iter1 = al.iterator();
while(iter1.hasNext()){
System.out.println(iter1.next());
}
```

```
LinkedList ll = new LinkedList();
ll.add(3);
ll.add(2);
ll.add(1);
ll.add(4);
ll.add(5);
ll.add(6);
ll.add(6);

Iterator iter2 = ll.iterator();
while(iter2.hasNext()){
System.out.println(iter2.next());
}
```

Recorriendo ArrayList y LinkedList

```
ArrayList al = new ArrayList();
al.add(3);
al.add(2);
al.add(1);
al.add(4);
al.add(5);
al.add(6);
al.add(6);
```

```
Iterator iter1 = al.iterator();
while(iter1.hasNext()){
System.out.println(iter1.next());
}
```

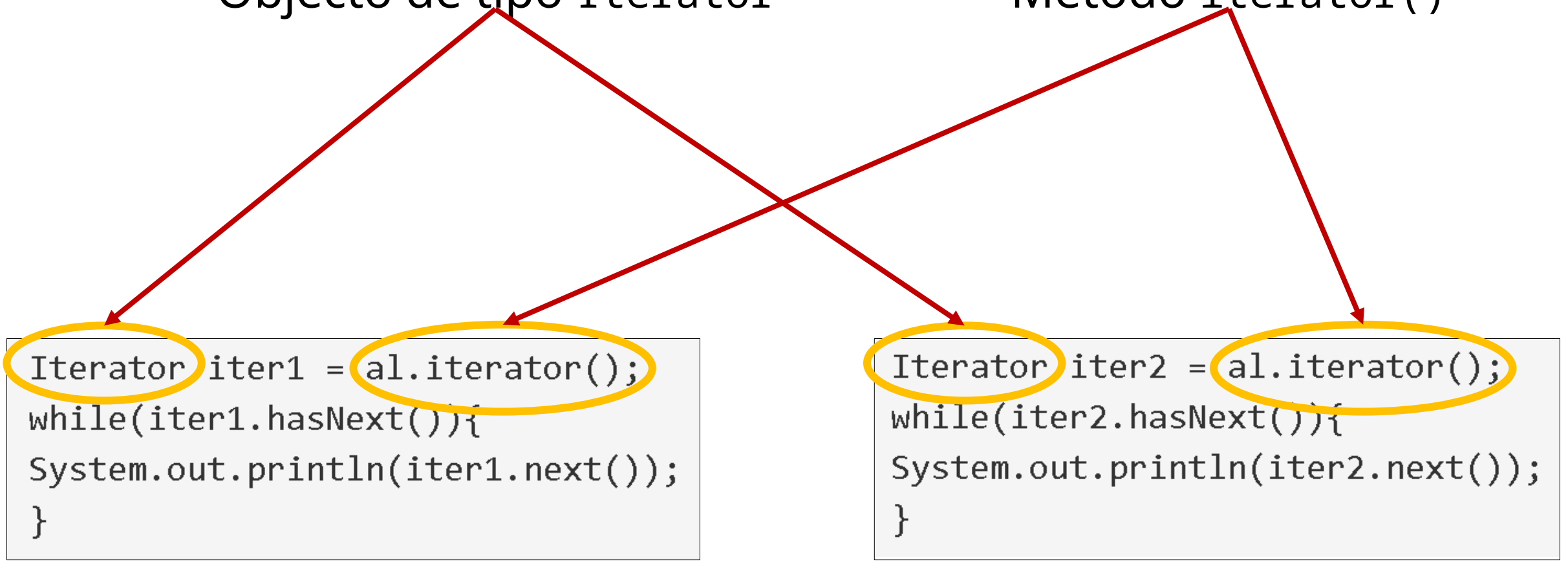
```
LinkedList ll = new LinkedList();
ll.add(3);
ll.add(2);
ll.add(1);
ll.add(4);
ll.add(5);
ll.add(6);
ll.add(6);
```

```
Iterator iter2 = al.iterator();
while(iter2.hasNext()){
System.out.println(iter2.next());
}
```

Recorriendo `ArrayList` y `LinkedList`

Objecto de tipo `Iterator`

Método `iterator()`



```
Iterator iter1 = al.iterator();
while(iter1.hasNext()){
System.out.println(iter1.next());
}
```

```
Iterator iter2 = al.iterator();
while(iter2.hasNext()){
System.out.println(iter2.next());
}
```

¿Cómo Implementarla?

Implementar la interface **Iterable**

Crear una clase que implemente la interface **Iterable**

```
class CustomDataStructure implements Iterable<E> {

    // code for data structure
    public Iterator<E> iterator() {
        return new CustomIterator<>(this);
    }

}
```

Clase CustomIterator

```
class CustomIterator<E> implements Iterator<E> {

	// constructor
	CustomIterator<E>(CustomDataStructure obj) {
		// initialize cursor
	}

	// Checks if the next element exists
	public boolean hasNext() {
	}

	// moves the cursor/iterator to next element
	public E next() {
	}

	// Used to remove an element. Implement only if
needed
	public void remove() {
		// Default throws
UnsupportedOperationException.
	}
```

El método `iterator`

Retorna una instancia de la interface `Iterator`

Dicha instancia guarda el estado de la iteración (en qué punto del recorrido vamos)

Debe producir un nuevo iterador cada vez que es invocado

No debe retornar el mismo iterador dos veces. De otro modo, hay conflictos

Cómo podemos guardar el estado de la iteración de una lista?

Interface `Iterator`

El método `iterator()` retorna un objecto de tipo `Iterator`

Un iterador es una es una abstracción que provee acceso a los elementos de la lista

Quien usa el TDA no tiene que instanciar un nodo viajero ni llamar a `getContent`

En Java, `It` …o.


java.util

Interface Iterator<E>

Type Parameters:

E - the type of elements returned by this iterator

Interface `Iterator`

All Methods	Instance Methods	Abstract Methods	Default Methods

Modifier and Type	Method and Description
`boolean`	**`hasNext`**`()` Returns `true` if the iteration has more elements.
`E`	**`next`**`()` Returns the next element in the iteration.

Toda clase que implementa esta interfaz debe definir dos métodos:

```
boolean hasNext ();
```

Qué hacen `next()` y `hasNext()`?

Un iterador debe hacer seguimiento del elemento en el que está actualmente

Debe permitir avanzar de un elemento a otro

Esto se hace en el método **`next()`** que:

1. devuelve el elemento actual y,
2. avanza el cursor al siguiente elemento

Antes de avanzar, verificamos si hay siguiente elemento:

```
while(iterator.hasNext()) { //if next element
exists
    E e = iterator.next(); // advance the
pointer
```

Resumen

`boolean hasNext();`

`E next();`

`Iterator iterator();`

```
Iterator iter1 = al.iterator();
while(iter1.hasNext()){
System.out.println(iter1.next());
}
```

Implementando Iterators

Forma 1: Clase que implemente la interface `Iterator`

```
public class MyIterator<E> implements Iterator
{

    // interface implementation

}
```

```
    public Iterator<E> iterator() {
      return new MyIterator<E>();
    }
```

Forma 2: Creando una clase anónima

```
public Iterator<E> iterator() {

  Iterator<E> it = new Iterator<E>(){
      // interface implementation
  }

  return it;
}
```

La Interface `ListIterator`

Interfaz ListIterator

Permite implementar iteradores para recorrer la lista en cualquier dirección:

Method Summary

Methods

Modifier and Type	Method and Description
void	**add(E e)** Inserts the specified element into the list (optional operation).
boolean	**hasNext()** Returns `true` if this list iterator has more elements when traversing the list in the forward direction.
boolean	**hasPrevious()** Returns `true` if this list iterator has more elements when traversing the list in the reverse direction.
E	**next()** Returns the next element in the list and advances the cursor position.
int	**nextIndex()** Returns the index of the element that would be returned by a subsequent call to **next()**.
E	**previous()** Returns the previous element in the list and moves the cursor position backwards.
int	**previousIndex()** Returns the index of the element that would be returned by a subsequent call to **previous()**.
void	**remove()** Removes from the list the last element that was returned by **next()** or **previous()** (optional operation).
void	**set(E e)** Replaces the last element returned by **next()** or **previous()** with the specified element (optional operation).

Interfaz ListIterator

Permite implementar iteradores para recorrer la lista en cualquier dirección:

Method Summary

Methods

Modifier and Type	Method and Description
void	**add(E e)** Inserts the specified element into the list (optional operation).
boolean	**hasNext()** Returns true if this list iterator has more elements when traversing the list in the forward direction.
boolean	**hasPrevious()** Returns true if this list iterator has more elements when traversing the list in the reverse direction.
E	**next()** Returns the next element in the list and advances the cursor position.
int	**nextIndex()** Returns the index of the element that would be returned by a subsequent call to **next()**.
E	**previous()** Returns the previous element in the list and moves the cursor position backwards.
int	**previousIndex()** Returns the index of the element that would be returned by a subsequent call to **previous()**.
void	**remove()** Removes from the list the last element that was returned by **next()** or **previous()** (optional operation).
void	**set(E e)** Replaces the last element returned by **next()** or **previous()** with the specified element (optional operation).