

## Program Analysis Assignment-4

Name: Shradha Agarwal

Roll No.: MT20123

Code files can be found in aspect\_prop->src folder.

### Property 1: Iterating over a collection.

```
Iterating over a collection: two consecutive next calls  
Exception in thread "main" java.util.ConcurrentModificationException  
    at aspectj.ajc$before$aspectj$6$1300c0df(aspectj.aj:53)  
    at Evil.func(Evil.java:27)  
    at Evil.main(Evil.java:10)
```

Flag is set as 1 when iterator.next() is encountered and flag as 0 when Iterator.hasNext() is encountered. Now, if two next() calls are found consecutively that is found flag as 1 when .next() is called, then an ConcurrentModification Exception is thrown.

### Property 2: Removing an element from a collection

```
Removing an item from collection  
Exception in thread "main" FailSafeIter: iterating over updated collection  
java.util.ConcurrentModificationException  
    at aspectj.ajc$before$aspectj$4$b770a418(aspectj.aj:39)  
    at Evil.func(Evil.java:16)  
    at Evil.main(Evil.java:10)
```

It is checked if collection.remove() instead of iterator.remove() is called while iterating over it. If it is, then ConcurrentModification Exception is thrown.

### Property 3: FailSafelter

```
FailSafeIter: iterating over updated collection  
Exception in thread "main" java.util.ConcurrentModificationException  
    at aspectj.ajc$before$aspectj$4$b770a418(aspectj.aj:39)  
    at Evil.func(Evil.java:34)  
    at Evil.main(Evil.java:10)
```

A hash map is created of iterator and collection pair. If any modification like add or remove is there on the collection, then it is removed from the map. Now, while iterating over it, it is checked if the pair exist in the map. If it doesn't, then it means the collection is updated and it is trying to iterate over it. Thus, ConcurrentModification Exception is thrown.