cse15lfa23-SangDo-Lab

Lab 3 Report

Part 1 - Bugs

Chosen bugs: ArrayTests - testReverseInPlace(Array)

1. A failure-inducing input for the buggy program, as a JUnit test and any associated code (write it as a code block in Markdown)

```
    @Test
    public void SDtestReverseInPlace() {
int[] input1 = {1,2,3,4};
ArrayExamples.reverseInPlace(input1);
assertArrayEquals(new int[]{4,3,2,1}, input1);
    }
```

2. An input that doesn't induce a failure, as a JUnit test and any associated code (write it as a code block in Markdown)

```
    @Test
    public void testReverseInPlace() {
int[] input1 = { 3 };
ArrayExamples.reverseInPlace(input1);
assertArrayEquals(new int[]{ 3 }, input1);
    }
```

3. The symptom, as the output of running the tests (provide it as a screenshot of running JUnit with at least the two inputs above)

```
1) SDtestReverseInPlace(ArrayTests)
arrays first differed at element [2]; expected:<2> but was:<3>
        at org.junit.internal.ComparisonCriteria.arrayEquals(ComparisonCriteria.java:
78)
        at org.junit.internal.ComparisonCriteria.arrayEquals(ComparisonCriteria.java:
28)
        at org.junit.Assert.internalArrayEquals(Assert.java:534)
        at org.junit.Assert.assertArrayEquals(Assert.java:418)
        at org.junit.Assert.assertArrayEquals(Assert.java:429)
        at ArrayTests.SDtestReverseInPlace(ArrayTests.java:23)
        ... 32 trimmed
Caused by: java.lang.AssertionError: expected:<2> but was:<3>
        at org.junit.Assert.fail(Assert.java:89)
        at org.junit.Assert.failNotEquals(Assert.java:835)
        at org.junit.Assert.assertEquals(Assert.java:120)
        at org.junit.Assert.assertEquals(Assert.java:146)
        at org.junit.internal.ExactComparisonCriteria.assertElementsEqual(ExactCompar
isonCriteria.java:8)
        at org.junit.internal.ComparisonCriteria.arrayEquals(ComparisonCriteria.java:
76)
        ... 38 more
```

4. The bug, as the before-and-after code change required to fix it (as two code blocks in Markdown)

Before:

```
// Changes the input array to be in reversed order
static void reverseInPlace(int[] arr) {
  for(int i = 0; i < arr.length; i += 1) {
    arr[i] = arr[arr.length - i - 1];
  }
}
```

After:

```
// Changes the input array to be in reversed order
static void reverseInPlace(int[] arr) {
  for(int i = 0; i < arr.length/2; i += 1) { //change
    int temp = arr[i];    //change
    arr[i] = arr[arr.length - i - 1];
    arr[arr.length - i - 1] = temp; //change
  }
}
```

Briefly describe why the fix addresses the issue:

The `before` function iterates through the whole array, it directly assigns `arr[i]` with `arr[arr.length - i - 1]`, so when `i` gets to `arr.length/2`, the first of of the array will be identical in-reversed to the last half.

To fix this, `after` function interate through `arr.length/2`, it creates variable `temp` to store value of `arr[i]`, then swap `arr[i]` with `arr[arr.length - i - 1]`.

Part 2 - Research Commands

Chosen command: `grep`

Source: Google Bard, because ChatGPT is already too popular. Prompt given to Bard: `provide 4 grep command-line options`

Here are 4 grep command-line options:

- **-i** (ignore case): This option tells `grep` ` to ignore case distinctions when matching patterns. For example, the following command will match both “rna” and “RNA”:

```
grep -i "RNA" technical/plos/*
```

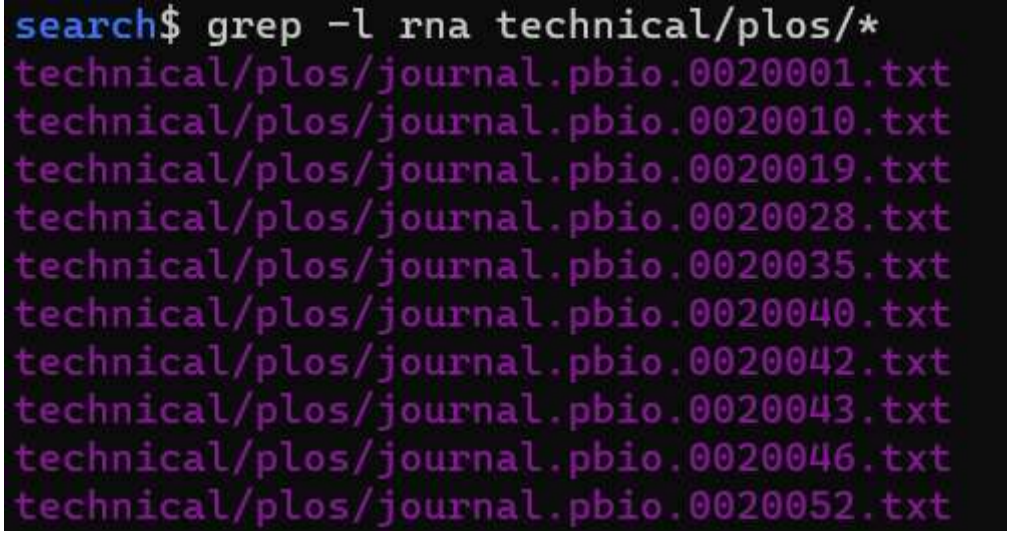
```
technical/plos/journal.pbio.0020010.txt:        publishers do not have to sell
their product to users of their journals, but local
technical/plos/journal.pbio.0020010.txt:        America and Western Europe to b
e published in peer-reviewed open-access journals more
technical/plos/journal.pbio.0020010.txt:        readily than in the traditional
 subscription-based journals.
technical/plos/journal.pbio.0020019.txt:        2+ concentration acts as an int
ernal sensor of neural activity (Marder
technical/plos/journal.pbio.0020028.txt:        RNA interference (RNAi) has bee
n called “one of the most has exciting discoveries in
technical/plos/journal.pbio.0020028.txt:        molecular biologist's toolkit.
Using short double-stranded RNA (dsRNA) molecules, RNAi can
```

```
grep -i Intern technical/plos/*
```

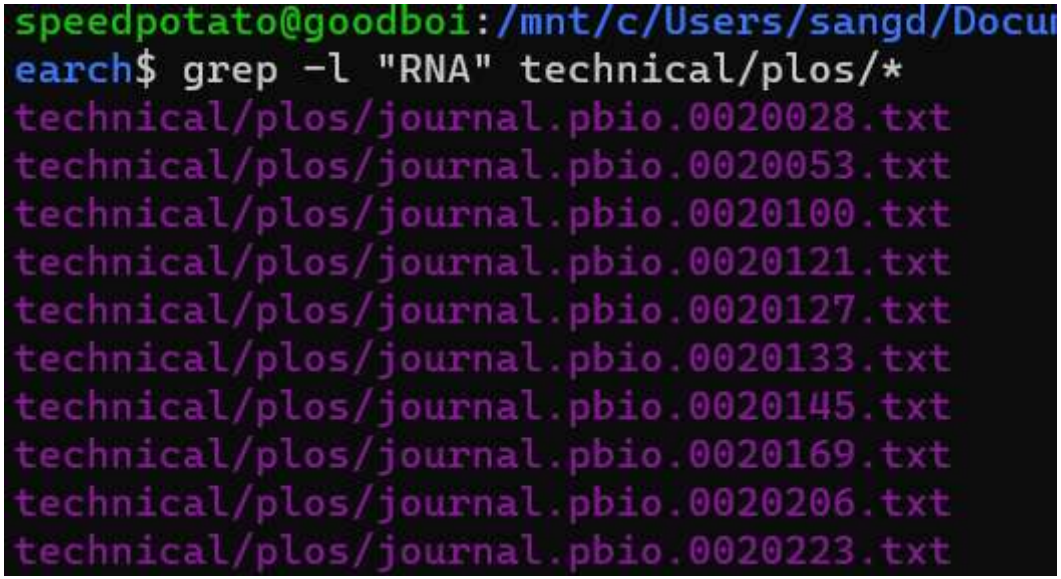
```
technical/plos/pmed.0020246.txt:        responsible for interpretation and moni
toring of the International Covenant on Economic,
technical/plos/pmed.0020246.txt:        other appropriate remedies at both nati
onal and international levels.”As a state party,
technical/plos/pmed.0020246.txt:        Nigeria is bound by the provisions of t
he International Covenant on Economic, Social, and
technical/plos/pmed.0020246.txt:        continue to address gaps in policy and
legislation and work together with the international
technical/plos/pmed.0020246.txt:        International principles of medical eth
ics and Nigerian codes of conduct clearly provide
```

- **-l** (list filenames only): This option tells grep to only print the filenames of files that contain matches, rather than printing the matching lines themselves. For example, the following command will print a list of all files in the current directory that contain the word “rna” (example 1) and “RNA” (example 2):

```
grep -l rna technical/plos/* .
```




```
grep -l "RNA" technical/plos/*
```



- **-n** (print line numbers): This option tells grep to print the line numbers of all matching lines. For example, the following command will print the line numbers of all lines in the files "pmed.00*.txt" that contain the word "RNA" (example 1) and "base" (example 2):

```
grep -n RNA technical/plos/pmed.00*.txt
```

```
speedpotato@goodboi:/mnt/c/Users/sangd/Documents/ucsd/fall2023/cse15l/week5/docsea
rch$ grep -n RNA technical/plos/pmed.00*.txt
technical/plos/pmed.0010008.txt:142:          Total cellular RNA was extracted fro
m CD14
technical/plos/pmed.0010008.txt:146:          expression of mRNA using the ABI Per
kin Elmer Prism 5700 Sequence Detection System
technical/plos/pmed.0010028.txt:219:          RNA was extracted from clones and te
tramer-positive cells using TRIzol (Invitrogen,
technical/plos/pmed.0010036.txt:28:        RNA copies/ml plasma for at least 6 mo
off therapy, the ability to contain viremia below
technical/plos/pmed.0010036.txt:50:          the presence of HIV-1 RNA in the plas
ma, a negative or weakly positive HIV-1 antibody by
```

```
grep -n base pair plos/pmed.00*.txt
```

```
speedpotato@goodboi:/mnt/c/Users/sangd/Documents/ucsd/fall2023/cse15l/week5/docsea
rch/technical$ grep -n base pair plos/pmed.00*.txt
grep: pair: No such file or directory
plos/pmed.0010008.txt:130:          Standard antibody-based enzyme-linked immunoso
rbent assay was used to measure supernatant
plos/pmed.0010008.txt:191:          distinguished based on these indices (Figure 1
D; data not shown).
plos/pmed.0010008.txt:192:          Although human lung macrophages are not known
to express CXCR3, we suspected based on
plos/pmed.0010008.txt:202:          expiratory volume in 1 s (FEV1), based on an
plos/pmed.0010010.txt:70:        What we saw was the success of a wonderful home-b
ased treatment and care program for
```

- **-c** (count matches): This option tells grep to count the number of lines that match the pattern, rather than printing the matching lines themselves. For example, the following command will print the number of lines in the files that contain the word “RNA” (example 1).

```
grep -c RNA plos/pmed.00*.txt
```

```
rch/technical$ grep -c RNA plos/pmed.00*
plos/pmed.0010008.txt:2
plos/pmed.0010010.txt:0
plos/pmed.0010013.txt:0
plos/pmed.0010021.txt:0
plos/pmed.0010022.txt:0
plos/pmed.0010023.txt:0
plos/pmed.0010024.txt:0
plos/pmed.0010025.txt:0
plos/pmed.0010026.txt:0
plos/pmed.0010028.txt:1
plos/pmed.0010029.txt:0
plos/pmed.0010030.txt:0
plos/pmed.0010034.txt:0
plos/pmed.0010036.txt:16
plos/pmed.0010039.txt:0
```

example 2, one file

```
grep -c RNA plos/pmed.0010010.txt
```

```
15l/week5/docsearch/technical$ grep -c RNA plos/pmed.0010010.txt
0
```

These are just a few of the many grep command-line options that are available. For more information, please see the grep man page.

Here is an example of how to use grep with multiple options. This command print out the line number of files (using `-n`) that contain "RNA", "rna"... (using `-i`)

```
grep -i -n RNA plos/pmed.00*
```

```
15l/week5/docsearch/technical$ grep -i -n RNA plos/pmed.00*
plos/pmed.0010008.txt:129:           triplicate for 4 d. Supernatan
ts were collected and stored at -80 °C for future analysis.
plos/pmed.0010008.txt:130:           Standard antibody-based enzyme
-linked immunosorbent assay was used to measure supernatant
plos/pmed.0010008.txt:139:           0, 50, 250, or 500 ng/ml of IF
N-γ, IL-4, MIG, I-TAC, and IP-10. Supernatants were
plos/pmed.0010008.txt:142:           Total cellular RNA was extract
ed from CD14
plos/pmed.0010008.txt:146:           expression of mRNA using the A
BI Perkin Elmer Prism 5700 Sequence Detection System
plos/pmed.0010010.txt:25:         The theme of this year's Internat
ional AIDS Conference in Bangkok was “Access for All.”
```