CS 218
Homework, Asst. #11 – Part B

Purpose: Become more familiar with file input/output buffering concepts.
Due: Monday (6/26)
Points: 50

Assignment:

Update the assignment #11 code to change the buffer size from **500,000** to **1**. Execute the original program from assignment #11 A (buffer of 500,000) and the modified assignment #11 B (buffer of 1). We will use the Unix time[1] command to obtain the execution times. For example, the following commands will execute the program and provide timing results (for both the 'large' and 'small' buffers):

```
ed-vm% time ./benfordLG -i random.txt -o tmp.txt -d F
ed-vm% time ./benfordSM -i random.txt -o tmp.txt -d F
```

To simplify this process, a script file is provided to execute the program three times with each executable file. The timing results are placed in a file 'a11times.txt'.

- Summarize your results for assignment #11 A and B. Edit the script file output (a11times.txt) and add the following information. (10 pts)
  - Briefly describe your machine (one sentence). Include the machine type (desktop/laptop/mini), processor speed, and memory.
  - Compute the average 'real' time for the three 'large' buffer size executions. Ensure to leave the original three results and add the final averaged result.
  - Compute the average 'real' time for the three 'small' buffer size executions. Ensure to leave the original three results and add the final averaged result.
  - State which was faster and by how much. Include the time difference and the percentage faster or slower. The percentage change[2] should be calcualted as follows:

$$percentChange = \left(\frac{(small\ buffer\ average) - (large\ buffer\ average)}{(large\ buffer\ average)} \right) * 100$$

- Explain the results. Specifically, explain the impact of the buffer size on the execution speed of the program. Explanation should not exceed 200 words. *Note, any explanations exceeding 200 words will not be graded and scored as a 0.* (40 pts)

Refer to the next page for using the script file and a brief explanation of the Unix time command (including the 'real' time as required by the assignment).

Submission:

When complete, submit:

- A copy of the **source file** via the class web page (assignment submission link) by class time. ***Assignments received after the due date/time will not be accepted.***

1 For more information, refer to: http://en.wikipedia.org/wiki/Time_%28Unix%29
2 For more information, refer to: http://en.wikipedia.org/wiki/Percent_change

Assignment #11B Script

The provided script file will execute the assignment #11 three times for the 'large' buffer size and three times for the 'small' buffer size and place the results in a file. You can download the script file, set the permission, and execute as follows:

```
ed-vm$ chmod +x a11timer
ed-vm$ ./a11timer benfordLG benfordSM
```

Where **benfordLG** is the assignment #11 A executable (with the large buffer) and **benfordSM** is the assignment #11 B executable (with the small buffer).

You will need to perform the averaging using a calculator. Be careful of the minutes and seconds times when adding the values! It may be easiest to convert all times to seconds.

Unix Time Command

The Unix Time command will provide some details on how long a program/command took to execute. For example, if you have a program **./someProg** then in the shell you can type:

```
ed-vm$ time ./someProg
```

The output (shown below) details how long the code took to run:

```
real    1m10.951s
user     0m2.390s
sys      0m1.705s
```

- Real time - Elapsed time from beginning to end of program (or wall clock time)
- CPU time - Divided into User time and System time
  - User time - time used by the program itself and any library subroutines it calls
  - System time - time used by the system calls invoked by the program (directly or indirectly)

At the terminal prompt, you can type **man time** to see the manual page for time.