Pimpri Chinchwad College of Engineering
Computer Laboratory - IV

Assignment No - B4

1 Aim

Write a program to check task distribution using Gprof.l.

2 Objective

- To check task distribution using Gprof.l

3 Software Requirements

- Linux
- GCC
- Gprof.l

4 Mathematical Model

Let
S = s, e, x, y, fme, DD, NDD, memshared
S = Initial State
E = End State
X = Input Value i.e. Executable files

Y = Output i.e. Calculated time in milliseconds.
Fm = Main function i.e. test() function for the calculation of time.
DD = Deterministic data
NDD = Non-deterministic data
Memshared = Core that is used for execution i.e. core1/core2

5 Theory

5.1 Gprof

- Gprof is a performance analysis tool for Unix applications. It uses a hybrid of instrumentation and sampling and was created as extended version of the older "prof" tool. Unlike prof, gprof is capable of limited call graph collecting and printing.

- GPROF was originally written by a group led by Susan L. Graham at the University of California, Berkeley for Berkeley Unix Another implementation was written as part of the GNU project for GNU Binutils in 1988 by Jay Fenlason.

5.2 Profiling Data File Format

- The old BSD-derived file format used for profile data does not contain a magic cookie that allows to check whether a data file really is a gprof file. Furthermore, it does not provide a version number, thus rendering changes to the file format almost impossible. gnu gprof uses a new file format that provides these features. For backward compatibility, gnu gprof continues to support the old BSD-derived format, but not all features are supported with it. For example, basic-block execution counts cannot be accommodated by the old file format.

5.3 Insert gprof Command Summary :

After you have a profile data file gmon.out, you can run gprof to interpret the information in it. The gprof program prints a flat profile

and a call graph on standard output. Typically you would redirect the output of gprof into a file with >.

5.4 You run gprof like this:

gprof options [executable-file [profile-data files...]] [>outfile]. If you omit the executable file name, the file a.out is used. If you give no profile data file name, the file gmon.out is used. If any file is not in the proper format, or if the profile data file does not appear to belong to the executable file, an error message is printed.

5.5 Debugging gprof:

If gprof was compiled with debugging enabled, the '-d' option triggers debugging output (to stdout) which can be helpful in understanding its operation. The debugging number specified is interpreted as a sum of the following options:

2 - Topological sort : Monitor depth-first numbering of symbols during call graph analysis 4 Cycles : Shows symbols as they are identified as cycle heads 16 Tallying : As the call graph arcs are read, show each arc and how the total calls to each function are tallied

32 - Call graph arc sorting : Details sorting individual parents/children within each call graph entry 64 - Reading histogram and call graph records : Shows address ranges of histograms as they are read, and each call graph arc 128 - Symbol table : Reading, classifying, and sorting the symbol table from the object file. For line-by-line profiling ('-l' option), also shows line numbers being assigned to memory addresses. 256 - Static call graph : Trace operation of '-c' option

6 Implementation:

Instrumentation code is automatically inserted into the program code during compilation (for example, by using the '-pg' option of the gcc compiler), to gather caller-function data. A call to the monitor function 'mcount' is inserted before each function call.

Sampling data is saved in 'gmon.out' or in 'progname.gmon' file just before the program exits, and can be analyzed with the 'gprof' command-line tool. Several gmon files can be combined with 'gprof -s' to accumulate data from several runs of a program.

GPROF output consists of two parts: the flat profile and the call graph. The flat profile gives the total execution time spent in each function and its percentage of the total running time. Function call counts are also reported. Output is sorted by percentage, with hot spots at the top of the list.

The second part of the output is the textual call graph, which shows for each function who called it (parent) and who it called (child subroutines). There is external tool called gprof2dot capable of converting the call graph from gprof into graphical form.

7 Testing

7.1 Positive Testing

Sr. No.	Test Condition	Steps to be executed	Expected Result	Actual Result
1.	Give a program with lot of functions & loop	Press Enter	Display time required to evaluate	Same as Expected

7.2 Negative Testing

Sr. No.	Test Condition	Steps to be executed	Expected Result	Actual Result
1.	Give a program with no functions & loop	Press Enter	No time will display	Display time required to evaluate

8 Limitations and Accuracy:

At run-time, timing values are obtained by statistical sampling. Sampling is done by probing the target program's program counter at regular intervals using operating system interrupts (programmed via profil(2) or setitimer(2) syscalls).
The resulting data is not exact, rather a statistical approximation. The amount of error is usually more than one sampling period. If a value is n times the sampling period, the expected error in the value is the square root of n sampling periods.
A typical sampling period is 0.01 second (10 milliseconds) or 0.001 second (1 ms) or in other words 100 or 1000 samples per second of CPU running time.

9 Conclusion

Hence we have successfully run the program using GPROF profiling tool.

Roll No.	Name of Student	Date of Performance	Date of Submission
302	Abhinav Bakshi	3/2/16	10/2/16

10 Output

pccoecomp@PC33: $cdDesktop/$
$pccoecomp@PC33: /Desktop$ cd gprof/
pccoecomp@PC33: /Desktop/gprof$gcc - Wall - pggprof.c$
$new_gprof.c - ogprofobj$
$pccoecomp@PC33: /Desktop/gprof$ ls
analysis.txt gmon.out gprof.c gprofobj new_gprof
$UntitledDocument$
$a.outgprofgprof.c\ gprof_objnew_gprof.c$
$pccoecomp@PC33: /Desktop/gprof$ ./gprofobj

Inside main()

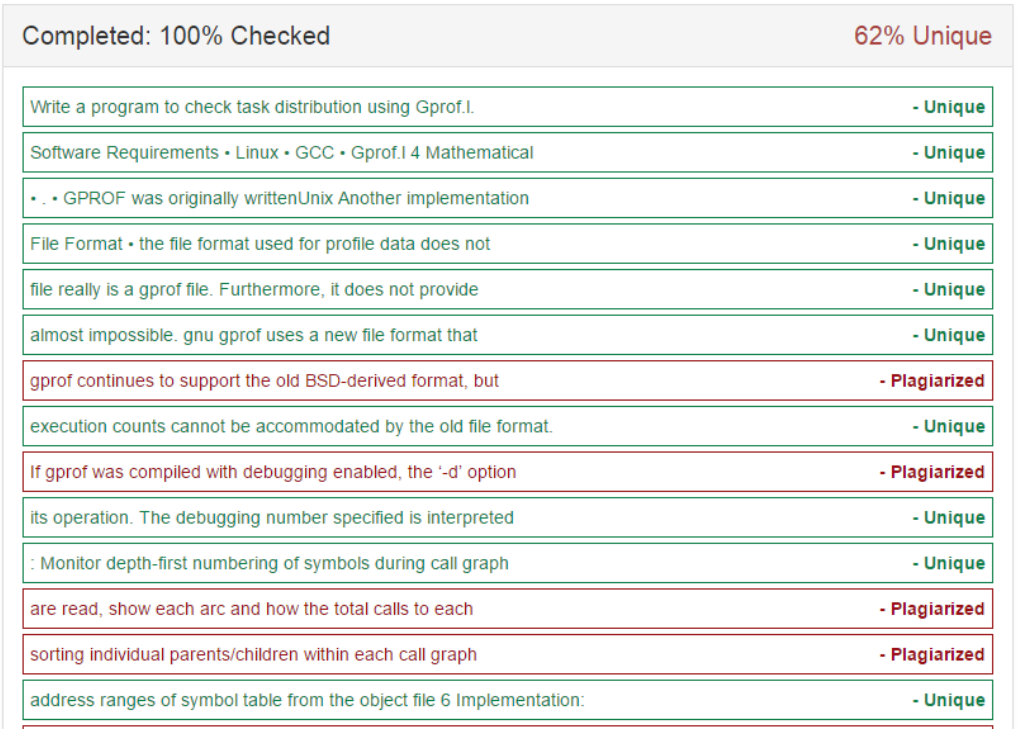
Inside func1

Inside new$_{f}unc1()$

$Insidefunc2$

$Insidefunc3$
$pccoecomp@PC33 :\ /Desktop/gprof$ ls
analysis.txt gmon.out gprof.c gprofobj new$_{g}prof$
$UntitledDocument$
$a.outgprofgprof.c\ gprof_{o}bjnew_{g}prof.c$
$pccoecomp@PC33 :\ /Desktop/gprof$ gprof gprofobj gmon.out ¿
analysis.txt
pccoecomp@PC33: /Desktop/gprofls
$analysis.txtgmon.outgprof.cgprofobjnew_{g}prof$
$UntitledDocument$
$a.outgprofgprof.c\ gprof_{o}bjnew_{g}prof.c$
$pccoecomp@PC33 :\ /Desktop/gprof$

11 Plagarism Report



Completed: 100% Checked — 62% Unique

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• . • GPROF was originally writtenUnix Another implementation	- Unique
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