Assignment: Two Studies

Box 2.1 Checklist for Avoiding Common Mistakes in Performance Evaluation

1. Is the system correctly defined and the goals clearly stated?
2. Are the goals stated in an unbiased manner?
3. Have all the steps of the analysis followed systematically?
4. Is the problem clearly understood before analyzing it?
5. Are the performance metrics relevant for this problem?
6. Is the workload correct for this problem?
7. Is the evaluation technique appropriate?
8. Is the list of parameters that affect performance complete?
9. Have all parameters that affect performance been chosen as factors to be varied?
10. Is the experimental design efficient in terms of time and results?
11. Is the level of detail proper?
12. Is the measured data presented with analysis and interpretation?
13. Is the analysis statistically correct?
14. Has the sensitivity analysis been done?
15. Would errors in the input cause an insignificant change in the results?
16. Have the outliers in the input or output been treated properly?
17. Have the future changes in the system and workload been modeled?
18. Has the variance of input been taken into account?
19. Has the variance of the results been analyzed?
20. Is the analysis easy to explain?
21. Is the presentation style suitable for its audience?
22. Have the results been presented graphically as much as possible?
23. Are the assumptions and limitations of the analysis clearly documented?

Box 2.2 Steps for a Performance Evaluation Study

1. State the goals of the study and define the system boundaries.
2. List system services and possible outcomes.
3. Select performance metrics.
4. List system and workload parameters.
5. Select factors and their values.
6. Select evaluation techniques.
7. Select the workload.
8. Design the experiments.
9. Analyze and interpret the data.
10. Present the results. Start over, if necessary.

Assignment 1 / Uebung 1

Chapter 2 of the textbooks includes two checklists:

- Common mistakes (box 2.1)
- A systematic approach (box 2.2)

Look at these two lists and then read the two articles (handouts). Compare the methodology and take a few notes.

(The handout are not very up to date, but anyway very exemplary)

Prepare to discuss the different approaches, the strong and weak points of both articles for the next “Uebungs” time slot.

Textbook:

Raj Jain, “The Art of Computer Systems Performance Analysis”, 1991 Wiley & Sons, New York, ISBN 0471503363

Sources:

- Local:
  www.books.ch, Orell Fuessli, CHF 200.- in 4 days
  www.freihofer.ch, Freihofer, ~CHF 209.- in 2-4 weeks
- Internet USA:
  www.amazon.com, USD 95.00 +Shipping
- Internet Germany:
  www.amazon.de, CHF 141.40
  1-2 weeks

SpecInt92-Instruction Mix-x86

Instruction	compress	eqntott	espresso	gcc (cc1)	li	Int. average
load	20.8%	18.5%	21.9%	24.9%	23.3%	22%
store	13.8%	3.2%	8.3%	16.6%	18.7%	12%
add	10.3%	8.8%	8.15%	7.6%	6.1%	8%
sub	7.0%	10.6%	3.5%	2.9%	3.6%	5%
mul				0.1%		0%
div						0%
compare	8.2%	27.7%	15.3%	13.5%	7.7%	16%
mov reg-reg	7.9%	0.6%	5.0%	4.2%	7.8%	4%
load imm	0.5%	0.2%	0.6%	0.4%		0%
cond. branch	15.5%	28.6%	18.9%	17.4%	15.4%	20%
uncond. branch	1.2%	0.2%	0.9%	2.2%	2.2%	1%
call	0.5%	0.4%	0.7%	1.5%	3.2%	1%
return, jmp indirect	0.5%	0.4%	0.7%	1.5%	3.2%	1%
shift	3.8%		2.5%	1.7%		1%
and	8.4%	1.0%	8.7%	4.5%	8.4%	6%
or	0.6%		2.7%	0.4%	0.4%	1%
other (xor, not,...)	0.9%		2.2%	0.1%		1%
load FP						0%
store FP						0%
add FP						0%
sub FP						0%
mul FP						0%
div FP						0%
compare FP						0%
mov reg-reg FP						0%
other (abs, sqrt,...)						0%

FIGURE D.15 80x86 instruction mix for five SPECint92 programs.

SpecFp92-Instruction Mix-x86

Instruction	doduc	ear	hydro2d	mdljdp2	su2cor	FP average
load	8.9%	6.5%	18.0%	27.6%	27.6%	20%
store	12.4%	3.1%	11.5%	7.8%	7.8%	8%
add	5.4%	6.6%	14.6%	8.8%	8.8%	10%
sub	1.0%	2.4%	3.3%	2.4%	2.4%	3%
mul						0%
div						0%
compare	1.8%	5.1%	0.8%	1.0%	1.0%	2%
mov reg-reg	3.2%	0.1%	1.8%	2.3%	2.3%	2%
load imm	0.4%	1.5%				0%
cond. branch	5.4%	8.2%	5.1%	2.7%	2.7%	5%
uncond branch	0.8%	0.4%	1.3%	0.3%	0.3%	1%
call	0.5%	1.6%		0.1%	0.1%	0%
return, jmp indirect	0.5%	1.6%		0.1%	0.1%	0%
shift	1.1%		4.5%	2.5%	2.5%	2%
and	0.8%	0.8%	0.7%	1.3%	1.3%	1%
or	0.1%			0.1%	0.1%	0%
other (xor, not,...)						0%
load FP	14.1%	22.5%	9.1%	12.6%	12.6%	14%
store FP	8.6%	11.4%	4.1%	6.6%	6.6%	7%
add FP	5.8%	6.1%	1.4%	6.6%	6.6%	5%
sub FP	2.2%	2.7%	3.1%	2.9%	2.9%	3%
mul FP	8.9%	8.0%	4.1%	12.0%	12.0%	9%
div FP	2.1%		0.8%	0.2%	0.2%	0%
compare FP	9.4%	6.9%	10.8%	0.5%	0.5%	5%
mov reg-reg FP	2.5%	0.8%	0.3%	0.8%	0.8%	1%
other (abs, sqrt,...)	3.9%	3.8%	4.1%	0.8%	0.8%	2%

FIGURE D.16 80x86 instruction mix for five SPECfp92 programs.

Instruction	compress	eqntott	espresso	gcc (cc1)	li	Integer average
load	19.8%	30.6%	20.9%	22.8%	31.3%	26%
store	5.6%	0.6%	5.1%	14.3%	16.7%	9%
add	14.4%	8.5%	23.8%	14.6%	11.1%	14%
sub	1.8%	0.3%		0.5%		0%
mul				0.1%		0%
div						0%
compare	15.4%	26.5%	8.3%	12.4%	5.4%	13%
load imm	8.1%	1.5%	1.3%	6.8%	2.4%	3%
cond. branch	17.4%	24.0%	15.0%	11.5%	14.6%	16%
uncond branch	1.5%	0.9%	0.5%	1.3%	1.8%	1%
call	0.1%	0.5%	0.4%	1.1%	3.1%	1%
return, jmp ind	0.1%	0.5%	0.5%	1.5%	3.5%	1%
shift	6.5%	0.3%	7.0%	6.2%	0.7%	4%
and	2.1%	0.1%	9.4%	1.6%	2.1%	3%
or	6.0%	5.5%	4.8%	4.2%	6.2%	5%
other (xor, not)	1.0%		2.0%	0.5%	0.1%	1%
load FP						0%
store FP						0%
add FP						0%
sub FP						0%
mul FP						0%
div FP						0%
compare FP						0%
mov reg-reg FP						0%
other FP						0%

FIGURE 2.26 DLX instruction mix for five SPECint92 programs. Note that integer register-register move instructions are included in the add instruction. Blank entries have the value 0.0%.

Instruction	doduc	ear	hydro2d	mdljdp2	su2cor	FP average
load	1.4%	0.2%	0.1%	1.1%	3.6%	1%
store	1.3%	0.1%		0.1%	1.3%	1%
add	13.6%	13.6%	10.9%	4.7%	9.7%	11%
sub	0.3%		0.2%		0.7%	0%
mul						0%
div						0%
compare	3.2%	3.1%	1.2%	0.3%	1.3%	2%
load imm	2.2%		0.2%	2.2%	0.9%	1%
cond. branch	8.0%	10.1%	11.7%	9.3%	2.6%	8%
uncond branch	0.9%	0.4%		0.4%	0.1%	0%
call	0.5%	1.9%			0.3%	1%
return, jmp ind	0.6%	1.9%			0.3%	1%
shift	2.0%	0.2%	2.4%	1.3%	2.3%	2%
and	0.4%	0.1%			0.3%	0%
or		0.2%	0.1%	0.1%	0.1%	0%
other (xor, not)						0%
load FP	23.3%	19.8%	24.1%	25.9%	21.6%	23%
store FP	5.7%	11.4%	9.9%	10.0%	9.8%	9%
add FP	8.8%	7.3%	3.6%	8.5%	12.4%	8%
sub FP	3.8%	3.2%	7.9%	10.4%	5.9%	6%
mul FP	12.0%	9.6%	9.4%	13.9%	21.6%	13%
div FP	2.3%		1.6%	0.9%	0.7%	1%
compare FP	4.2%	6.4%	10.4%	9.3%	0.8%	6%
mov reg-reg FP	2.1%	1.8%	5.2%	0.9%	1.9%	2%
other FP	2.4%	8.4%	0.2%	0.2%	1.2%	2%

FIGURE 2.27 DLX instruction mix for five programs from SPECfp92. Note that integer register-register move instructions are included in the add instruction. Blank entries have the value 0.0%.