Chapter 4 AIWC (11 Jan)

As for chapter 3, there is a lot of detail and not enough higher level abstraction and analysis. What are the overarching theme/issues. Also, again, need to pull out and make obvious exactly what you have done and are claiming to be new. (The referees – at least not all of them – will know this field and do not assume that they go away and read all your references. They probably have 0.5-1 day to complete the entire report.)

Intro

Pull 4th para "To this end, we present…" to be the opening para. In this chapter we present…. Then step back and justify why this is a useful thing to do.

Bottom page 49 "Exploitable coarse-grain…", all of this is detail that I would not expect in the intro section. It lives in one of the sections.

"We demo the use of …". This para should be an outline of the major sections that follow and at this point the intro should have contained enough info that it is no surprise to have the sections you list.

Section 4.2 – really I think much of this lives in the introduction. It is justification for taking the approach you have taken in building AIWC. It is fundamental. If the chapter was more general architecture independent workload characterization, articulating a number of options then it might be a section. But it is not. It is about AIWC. So justify in the intro.

Section 4.1 – metrics

You need to give the purpose of this section. At a high level in the intro, but then in the section what are you going to tell the reader. Currently this section goes straight into a bunch of detail that is tedious to read and gives the impression that it could well be put in an appendix! You really don't want this of the reader. It is about telling the reader "interesting stuff". Are there a few key issues that you can abstract from all the detail and focus on this?

Of the metrics in 4.1 – how many of these are direct from OCLGrind, how many are new? You need to pull out and emphasis whatever you have done that is new.

Section 4.3

This section is your opportunity to tell the reader exactly how much effort was required to go from OCLgrind to being able to collect all the data for the metrics you have just listed. Basically was this a few hundred lines or 10s of thousands of lines. What were the key issues you needed to consider in building this tool. You have some of this in the section, but it is not very reader friendly. The first para is good, but the second para "The Opcode diversity" and following is like the metrics section – the reader quickly says – why is this not an appendix. Pick out a few interesting things to tell the reader, and say that you will focus on these, with other stuff if necessary in an appendix.

Section 4.4

First para – refer back to chapter 3 rather than say "These benchmarks were extracted…"

2nd Para – The fact that you are collecting data only for each kernel invocation is important point. Probably should have been something you note in the intro to this chapter.

3rd para - the bit about tiny, small etc and cache size is all in chapter 3. Refer back do not repeat details. Oclgrind is deterministic – another critically important point. Explain, possibly also in the intro to chapter – you need to consider and discuss the implication of this.

4th para – do not say "cursory breakdown" in a thesis. This suggests lack of purpose and thought. Reword.

5th para "For almost all benchmarks..with problem size". The first thing you are asking the reader to look at in fig 4.1 requires them to jump from quadrant to quadrant. You are assuming they have fully digested what is in a quadrant. Think very carefully how you talk about figures and graphs and proceed in a somewhat pedestrian fashion. Consider first the top lefthand quadrant of the figure. This displays blah for the small benchmark. Etc

Fig 4.1 – This is information overload. I think you need to break this up and present just one quadrant first. For a figure you expect X and Y axis. The breakdown into T, S, M and L provides some segmenting. However it is not immediate apparent that the x axis for the bottom half is totally different to the top half (where axis is at top of page). Fundamental question – why are there lots of yellow histogram bars at the top for tiny, but less for M below. (Note you started your discussion by comparing T, S, M and L – argh!!).

I would start with T and talk to that. The comments (as appropriate begging question as to why) I would ask from this fig are

- bfs_kernel2 branch entropy is much larger than anything else
- Opcode all looks about the same
- Barriers per instruction is very significant in two cases
- One case with low global memory address entropy

Last para on p55 "For almost all.." goes on to say "Note…" highlighting issues with some problem sizes and lack of input data sets – however is this not all fixed now. At least from my understanding of what you did in chapter 3 it is all done.

Section 4.5

Para 1 you say "following Shao and Brooks" – in everything that follows you need to be very clear as to what they did and what you have done above and beyond what they did. Basically you are looking to emphasize what you have done above and beyond what they did. That is – you should NOT assume that the referee reads the paper by Shao and Brooks.

The discussion on normalization is a little confusing and not helped by deviation into discussion about parallelism metrics before we learn the denominator is from the largest value across all problem sizes (I don't quite understand why we don't see a 1 in the kiviat diagram for these metrics and largest problem or kernel?)

P60 "moving across the page" – I don't think it is across (ie not left to right).

One sentence para "The visual rep…compared". In what way. Having a single sentence para is a bit odd.

Final para in 4.5. The kernel is launched 4 times with different characteristics. Can you relate this back to the actual LU decomposition algorithm. Algorithmically what is this kernel doing, and why do you see the different characteristics. Basically closing the loop from abstract analysis to underlying numerical algorithm would substantially strengthen this para.

Section 4.6

Title is a bit misleading. This is not a new benchmark, it is about taking the opendawf benchmarks that have some bioinformatics relation and looking at them more closely. That is a fine thing to do. I would just title User Case: AIWC analysis of Opendwarf bioinformatics related benchmarks.

Why did you do this for the small test cases? Better if you have a reason.

Bottom of p61 “Fig 4.4a…NVIDIA ..compared to CPUs…” and paragraphs to follow. It is not until two paras later that I see you are relating things to data from chapter 3. You need to make this evident earlier. HOWEVER – given this is not a “cursory” comparison but for a number of cases I don't think you can expect the reader to be flicking back and forth to chapter 3. I think you need to collect the key comparison data in a NEW table that is within chapter 4.

Section 4.7

The statement “It is the first workload…” are good. Just review this section after doing a careful re-think of all the new contributions you have reported here.

Last para “Recently”. This is a strange paragraph. Are you talking about work that is going to be reported in the next chapter? In which case we don't want a detailed summary (1.1%, 8us to 1s) here!!