PMMS 2021: Assignment XX

1st February 2021

Group YY

STUDENT NAME
STUDENT NUMBER
EMAIL ADDRESS

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1　Introduction

Briefly summarize the assignment as an introduction. *Note:* Although defining a research question is a major part of a research report, this is less relevant for PMMS assignments. Thus, we recommend not to waste too much time to rephrase the assignment in all details, as the research goal/objective is clearly stated in the assignment itself [1]. Note that it is likely that you will need to have one research question per assignment.

1.1　Research questions

We recommend that you use `subsection` and `subsubsection` environments to format your work in a considered manner.

1.1.1　Citation

This is what a citation looks like [1].

2　Design and methodology

Then, describe your solution *design* at a high level of abstraction. Please describe *how* you have parallelized the algorithm, and, when needed, *why* you selected certain solutions when you had more options. Make sure that anything you find remarkable or super smart about your solution is elaborated on here (that is, feel free to brag about interesting ideas and/or solutions).

3　Implementation

Next, talk about your solution's *implementation*: *how* you have implemented your parallel algorithm using specific constructs, and, when needed, *why* you selected certain constructs when you had more options. Here it is recommended to support the explanations with code snippets. In other words, it is really not a good idea to copy the whole program code into the report, but it is often relevant and interesting to use pseudocode to highlight the core of the solution to the given problem, or specific implementation details that you find interesting

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[1] In other words, we consider the general research questions for each of the three assignments to be on the lines of "How can we design and implement <insert application> using <programming model>, and what is the performance we observe?". Feel free to paraphrase these "template questions" in your report.

36 to talk about. Please make sure you clearly state where in the code archive (i.e., which file)
37 the snippet originates from.

3.1   Limitations and problems

39 If you think your solution is not quite the best thing since sliced bread, also discuss that.
40 Explain potential limitations and failures - in the design and/or implementation - and explain
41 why you could not solve them (e.g. submission deadline was 5 minutes ahead when you
42 figured it out); ideally, please sketch out what you think would be a way forward towards
43 solving those limitations. This can be the basis for a good report, even if the programming
44 exercise did not work out that well for you this time around.

4   Experiments and results

46 Finally, assignments ask you to run certain experiments. Reporting on the experiments results
47 *and analysing them* are critical parts of your report. For every experiment, we recommend
48 that you provide *a description of the goal of the experiment, a hypothesis (usually strongly*
49 *correlated with the goal), the results of the empirical tests, and how they match or not your*
50 *hypothesis.* Whenever possible, please present the results in a graphical way.
51   For example, think of documenting an experiment as follows: "We run tests with our
52 application on 1,2,...,32 threads to see the impact the number of threads has on performance.
53 We report performance as speed-up over the sequential case, and we expect the speed-up to
54 ... as we add more threads. The results are presented in figure ... We observe that ... which
55 confirms/infirms/... our hypothesis. However, we also notice that ... "
56   Please note that we strongly recommend you present your experiments and results together
57 - i.e., each experiment setup followed by its own results and analysis. This is the common
58 practice in parallel processing, and it makes it easier to follow your analysis. Also note that
59 explanations and analysis are highly appreciated. For example, explain why does code A
60 perform better than code B, or why does the speed-up for code A increase linearly and for
61 code B it does not increase at all, or why using more threads shows lower efficiency. All
62 these are interesting and relevant questions, and give you excellent opportunities for you to
63 demonstrate your knowledge.

4.1   Additional research

65 *Important:* If you have ideas of other relevant experiments, that can showcase specific parts
66 or features of your solution, please feel free to run those as well,and analyse their results -
67 these are all examples of extra research.

5   Conclusion

69 Finally, please conclude your report with a short conclusion section, where you reflect briefly
70 on what you have learned and what were the challenges you encountered, focused, as much
71 as possible, on those aspects relevant to parallel algorithm design, implementation, and
72 empirical analysis.

Appendices

We will not read reports longer than 10 pages (excluding appendices and bibliography). If you have additional results, information, proofs, etc please add them as appendices.

─── **References** ───

1 P. Chris Broekema, J. Jan David Mol, R. Nijboer, A. S. van Amesfoort, M. A. Brentjens, G. Marcel Loose, W. F.A. Klijn, and J. W. Romein. Cobalt: A GPU-based correlator and beamformer for LOFAR. *Astronomy and Computing*, 23:180–192, 2018. URL: `https://doi.org/10.1016/j.ascom.2018.04.006`, `arXiv:1801.04834`, `doi:10.1016/j.ascom.2018.04.006`.