Programação Paralela e o Modelo Mestre-Escravo

Trabalho 1 - Programação Paralela e Distribuída

Nicolas Pereira do Nascimento

Estudante de Engenharia de Computação

Pontifícia Universidade Católica do Rio Grande do Sul

Porto Alegre, Brasil

nicolas.nascimento@acad.pucrs.br

Gabriel Chieza Chiele

Estudante de Engenharia de Computação

Pontifícia Universidade Católica do Rio Grande do Sul

Porto Alegre, Brasil

gabriel.chiele@acad.pucrs.br

*Abstract*—This paper presents the implementation of a parallel algorithm using the master-slave paradigm and the MPI libraries. It also compares the performance of algorithm when modifing the number of processes used to execute.

Keywords—Parallel Programming; MPI; Distributed Programming, Master-Slave Paradigm;

# Introdução

A construção de sistemas atuais se baseia em diferentes frentes. Dentre elas estão aspectos econômicos, legais e performáticos. Esta última, especificamente, é bastante relevante e é alvo de diversos estudos. Uma das alternativas que visa o aumento de desempenho é a aplicação de um modelo de programação paralela, que objetiva a realização de tarefas através de múltiplos processos executando em múltiplos processadores. Cabe ressaltar que o paradigma paralelo pode ser utilizado em sistemas com um único processador, contudo a execução das tarefas torna-se concorrente e o paralelismo é apenas aparente.

# Funcionamento

## Algoritmo

A fim de garantir a fidelidade dos resultados e visando medir o ganho de performance da mudança de paradigma exclusivamente, o algoritmo utilizado foi o Rank Sort. Este algoritmo é um algoritmo de ordenação de vetor e caracteriza-se por ter uma performance de ordem quadrática (O(n²)).

## Paradigma Paralelo

A programação paralela pode ser realizada de muitas formas. Especificamente à esse trabalho, usou-se o paradigma mestre-escravo. O modelo especifica uma hierarquia entre os processos de maneira que exista um processo “mestre” e diversos processos “escravos”. O processo “mestre” fica responsável pela divisão da tarefa total em sub-tarefas, pela distribuição das mesmas entre os processos “escravos” e pela integração dos resultados provenientes dos escravos. Aos processos escravos cabe realizar as sub-tarefas e, ao finalizarem-las, enviar as sub-tarefas completas ao mestre.

# Implementação

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Define abbreviations and acronyms the first time they are used in the text, even after they have been defined in the abstract. Abbreviations such as IEEE, SI, MKS, CGS, sc, dc, and rms do not have to be defined. Do not use abbreviations in the title or heads unless they are unavoidable.

## Units

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Number equations consecutively. Equation numbers, within parentheses, are to position flush right, as in (1), using a right tab stop. To make your equations more compact, you may use the solidus ( / ), the exp function, or appropriate exponents. Italicize Roman symbols for quantities and variables, but not Greek symbols. Use a long dash rather than a hyphen for a minus sign. Punctuate equations with commas or periods when they are part of a sentence, as in

*a* + *b* = γ (1) α + β = χ. (1) (1)

Note that the equation is centered using a center tab stop. Be sure that the symbols in your equation have been defined before or immediately following the equation. Use “(1),” not “Eq. (1)” or “equation (1),” except at the beginning of a sentence: “Equation (1) is ...”

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* The word “data” is plural, not singular.
* The subscript for the permeability of vacuum μ0, and other common scientific constants, is zero with subscript formatting, not a lowercase letter “o.”
* In American English, commas, semi-/colons, periods, question and exclamation marks are located within quotation marks only when a complete thought or name is cited, such as a title or full quotation. When quotation marks are used, instead of a bold or italic typeface, to highlight a word or phrase, punctuation should appear outside of the quotation marks. A parenthetical phrase or statement at the end of a sentence is punctuated outside of the closing parenthesis (like this). (A parenthetical sentence is punctuated within the parentheses.)
* A graph within a graph is an “inset,” not an “insert.” The word alternatively is preferred to the word “alternately” (unless you really mean something that alternates).
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* Do not confuse “imply” and “infer.”
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* There is no period after the “et” in the Latin abbreviation “et al.”
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An excellent style manual for science writers is [7].

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Headings, or heads, are organizational devices that guide the reader through your paper. There are two types: component heads and text heads.

Component heads identify the different components of your paper and are not topically subordinate to each other. Examples include ACKNOWLEDGMENTS and REFERENCES, and for these, the correct style to use is “Heading 5.” Use “figure caption” for your Figure captions, and “table head” for your table title. Run-in heads, such as “Abstract,” will require you to apply a style (in this case, italic) in addition to the style provided by the drop down menu to differentiate the head from the text.

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### Positioning Figures and Tables: Place figures and tables at the top and bottom of columns. Avoid placing them in the middle of columns. Large figures and tables may span across both columns. Figure captions should be below the figures; table heads should appear above the tables. Insert figures and tables after they are cited in the text. Use the abbreviation “Fig. 1,” even at the beginning of a sentence.

1. Table Styles

| Table Head | Table Column Head | | |
| --- | --- | --- | --- |
| Table column subhead | Subhead | Subhead |
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1. Sample of a Table footnote. *(Table footnote)*
2. Example of a figure caption. *(figure caption)*

Figure Labels: Use 8 point Times New Roman for Figure labels. Use words rather than symbols or abbreviations when writing Figure axis labels to avoid confusing the reader. As an example, write the quantity “Magnetization,” or “Magnetization, M,” not just “M.” If including units in the label, present them within parentheses. Do not label axes only with units. In the example, write “Magnetization (A/m)” or “Magnetization (A ( m(1),” not just “A/m.” Do not label axes with a ratio of quantities and units. For example, write “Temperature (K),” not “Temperature/K.”

##### Acknowledgment *(Heading 5)*

The preferred spelling of the word “acknowledgment” in America is without an “e” after the “g.” Avoid the stilted expression “one of us (R. B. G.) thanks ...”. Instead, try “R. B. G. thanks...”. Put sponsor acknowledgments in the unnumbered footnote on the first page.

##### References

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For papers published in translation journals, please give the English citation first, followed by the original foreign-language citation [6].

1. G. Eason, B. Noble, and I.N. Sneddon, “On certain integrals of Lipschitz-Hankel type involving products of Bessel functions,” Phil. Trans. Roy. Soc. London, vol. A247, pp. 529-551, April 1955. (*references*)

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1. J. Clerk Maxwell, A Treatise on Electricity and Magnetism, 3rd ed., vol. 2. Oxford: Clarendon, 1892, pp.68-73.
2. I.S. Jacobs and C.P. Bean, “Fine particles, thin films and exchange anisotropy,” in Magnetism, vol. III, G.T. Rado and H. Suhl, Eds. New York: Academic, 1963, pp. 271-350.
3. K. Elissa, “Title of paper if known,” unpublished.
4. R. Nicole, “Title of paper with only first word capitalized,” J. Name Stand. Abbrev., in press.
5. Y. Yorozu, M. Hirano, K. Oka, and Y. Tagawa, “Electron spectroscopy studies on magneto-optical media and plastic substrate interface,” IEEE Transl. J. Magn. Japan, vol. 2, pp. 740-741, August 1987 [Digests 9th Annual Conf. Magnetics Japan, p. 301, 1982].
6. M. Young, The Technical Writer’s Handbook. Mill Valley, CA: University Science, 1989.