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Advanced Computer Architecture

Parallel Programmer Productivity:

A Case Study of Novice Parallel Programmers

This paper attempts to analyze the efforts of developing software for high performance computing applications. It further breaks this effort into two subcategories: time spent developing, and time spent for actual execution. The case study looks at academic institutions across the nation and poses similar programming design problems to the students in the higher performance computing courses. The typical experience level of these students is that of a novice high performance computing (HPC) programmer.

The method used to gather data for the studies is through a special application developed by the authors and installed on the computers which students were using to develop their HPC code. Past research in this area has focused on lines of code to analyze the amount of effort put into developing problem solutions but this has proved to be an ineffective measure because of the different types of HPC applications being developed (serial and parallel). What is found by this study is that in general parallel applications, as expected, yields a higher number of lines of code. The cost in terms of time per line of code was also considered and based on the summary of results the amount of time spent per line of code on parallel applications is higher than with serial applications. It is however important to note that because the students are able to develop serial code on machines other than the lab computers, the serial time estimates may be misleading.

Although the method used to gather data seems relatively fair, it is important to realize that there are a number of questions to be asked about the validity of the results. The most important in my opinion was the small sample size used to gather the data. Their typical sample size ranged between 8-20 students for any given data measurement. This is a very low sample size and as a result, the analysis could be highly skewed. Another issue with the validity of the results is that there may have been a learning curve with earlier assignments which aided the design of later assignments.

Overall I found this paper to be a pretty interesting read, however the results obtained have not convinced me that they have found an accurate measure of development effort. In fact, the only thing I was convinced about was the fact that lines of code is not a solid measure of development effort. I would be very interested to read the follow-up paper which is mentioned in which they planned to repeat the same type of experiment with a more sophisticated developer group.