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VIGRE REPORT - FALL 2004

Research:

Currently, I am in the later stages of my graduate career and writing my dissertation. The fall semester was productive. I was able to clarify my dissertation project with many helpful discussions with my advisor, Professor Marek R. Rychlik. The crux of my dissertation is on designing and implementing parallel algorithms needed in Gröbner and involutive basis calculations. Fall semester saw the design of several promising algorithms that are presently being implemented and verified. Also, I have begun work on several applications of Gröbner and involutive bases for problems ranging from differential equations to algebraic coding theory.

For instance a Gröbner basis calculation can be broken down to several sub algorithms. These are: maintaining the list of generators, constructing S-polynomials, maintaining a list of check pairs, and normal form reductions. The present Gröbner basis multithreaded approach is done by implementing concurrent algorithms in each of these constituents. As final level production level code is not as complete at this time, no hard numbers can be given. But, the present approach should reduce computation time. Parallel implementations of these components is currently being undertaken.

It is my goal in the forthcoming semester to demonstrate the advantages of these algorithms. As such with the guidance of Professor Rychlik, these algorithms will be implemented in a C++ package using POSIX threads. This will allow a thorough testing on a variety of architectures.

Coursework:

Math 920 - Dissertation, 9 units, Grade: S

Vertical Integration Activities:

Fall semester found me assisting Professor Robert A. Indik by making several classroom recruiting visits. These visits consisted of being an advocate and promoter of VIGRE activities for undergraduates at the University of Arizona. In addition to helping recruit undergraduate researchers, I regularly attended the Monsoon Rain Water Seminar, the Math and Applied Math Colloquiums.

Presentations:

In December, I gave a presentation/tutorial for the Software Interest Group (SWIG) on C++ and generic programming. The tutorial can be found at "<http://math.arizona.edu/~swig/documentation/stl/>".