Rahulkumar Gayatri

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Summary

- Working in the area of HPC since 2007.
- Experience in sequential and parallel algorithm development.

  - Designed and implemented a Breadth First Search (BFS) algorithm that takes advantage of low memory on IBM's Cell B/E. processor.

  - Parallelized Graph500 benchmarks on an SMP machine using the StarSs programming model.

  - Experience in the design and parallel implementations of SPECFEM3D and linear iterative solvers such as Jacobi and Gauss-Seidel methods.
- Experience in the areas of compiler and runtime development for parallel programming models.

  - Introduced new compiler directives and the necessary runtime support in the StarSs framework to handle synchronization of multiple threads.
- Knowledge and experience in the area of Transactional Memory framework.

  - Worked extensively with the TinySTM library.
- Worked with Pthreads, OpenMP, OMPSs and MPI programming models.
- Published conference, workshop and journal papers in international formats.
- Familiarity with tools like valgrind profiler, gdb, google performance tools, latex software.
- Currently working Moose, a multi-scale simulation model of neuron connections in human brain.

  - It is a multiscale problem which provides an opportunity for both distributed and thread-based parallelism.
- Basic knowledge in the areas of GPU and Cuda Programming.

Education

1. **Doctor of Philosophy (PhD) in Computer Science** (2015)
   Barcelona Supercomputing Center
   Thesis Title - "Increasing Parallelism through Speculation in Task-Based Programming Model."
   URL - http://www.bsc.es/
2. **Master of Technology** (2009)
   Specialization in Computer Science, Sri Sathya Sai University (SSSU)
   URL - http://sssihl.edu.in/sssuniversity/Academics/DepartmentofMathemati
   Overview.aspx
3. **Master of Science** (2007)
   Specialization in Computer Science, SSSU
4. **Bachelor of Science** (2005)
   Specialization in Mathematics, SSSU

Publications

1. "Loop level speculation in a task based programming model." http://ieeexplore.ieee.org/xpl/login.jsp?tp=&arnumber=6799132&url=http%3A%2F%2Fieeexplore.ieee.org%2Fxpls%2Fabs_all.jsp%3Farnumber%3D6799132

2. "Transactional access to shared memory in StarSs, a task based programming model." http://link.springer.com/chapter/10.1007/978-3-642-32820-6_51#page-1

3. "Analysis of the overheads incurred due to speculation in a task based programming model." http://research.ac.upc.edu/multiprog/papers/multiprog-2015-3.pdf

4. "TERAFLUX: Harnessing dataflow in next generation teradevices." http://www.sciencedirect.com/science/article/pii/S0141933114000490

5. "Rahulkumar Gayatri, Pallav Baurah Parallelizing Breadth First Search Using Cell BE. HiPC, Student Symposium, 2008"

6. "Presented a Poster on the benefits of using CellSs (a programming model for Cell Processor) in the ACACES 2010 summer school of HiPEAC."

Projects

1. **Doctoral Thesis** - Focussed in the area of parallel programming models. Specifically on providing compiler and runtime support for synchronization of multiple threads in StarSs, a task-based programming model. To achieve this, an optimistic approach is adopted based on the Transactional Memory framework. An external Software Transactional Memory (STM) library is integrated into StarSs. This approach along with improving the performance and the efficiency also offers an opportunity to exploit higher degree of parallelism from an application. Papers published in this project: [1],[2] and [3].

2. **StarSs** - A task-based programming model to make parallel programming easier. It consists of compiler directives and the required runtime support. It generates a task-dependency graph at runtime based on the data-flow principles. My contribution to the project was to maintain the runtime framework and resolve conflicts when new directives and their required implementation were introduced. I also worked on design and implementation of applications such as Specfem3D, NQueens, Matrix Multiplication, Linear iterative solver, Gmeans, Kmeans for the StarSs application repository.

3. **Teraflux** - It was a project supported and funded by European Union which focused on exploiting dataflow parallelism in a Teracomputing device. The project proposes a set of programming model, compiler analysis and a scalable, reliable architecture that will be able to harness large scale parallelism in an efficient way. My contribution to the project was to introduce STM-based concurrency to handle simultaneous access to shared memory.
Papers published in this project: paper [4].

4. **MTech Thesis** - An efficient Breadth First Search (BFS) implementation that exploits memory locality in the IBM's Cell.B.E architecture. Poster[5] presented the results achieved in this project.

Professional Career

Doctoral student at Barcelona Supercomputing Center -
September, 2009 - March 2015

Technical Specialist, Wipro Infotech
September 2015 - present day

Honors

Received a Pre-Doctoral scholarship, FI AGAUR grant, by Generalitat de Catalunya

Programming Languages and Models

Languages:	C,C++
Scripting:	Shell, LaTeX, Sed, awk, gnuplot
Programming Models:	StarSs, OpenMP, Pthreads, MPI, STM
Operating Systems:	Microsoft Windows, Linux
Software:	Eclipse, Visual Studio 2010, GIT
Profiling Tools:	gdb, Valgrind

Languages

English, Hindi, Spanish.

References

Rosa Maria Badia, Project and group manager at Barcelona Supercomputing Center.
Relation: PhD supervisor, email: rosa.m.badia@bsc.es,
Web-page: http://personals.ac.upc.es/rosab/

Eduard Ayguad, Computer Sciences Department Associate Director at Barcelona Supercomputing Center.
Relation: PhD supervisor, email: eduard.ayguade@bsc.es,
Web-page: http://people.ac.upc.es/eduard/

Pieter Bellens, Senior researcher at Barcelona Supercomputing Center.
Relation: Present colleague, email: pbellens@gmail.com