Real Time Visualisation of HPC Java Codes

David Henty

February 2, 2001

Description

One of Java's many advantages as a language is the ease with which it is possible to draw graphics and design graphical user interfaces (GUIs). Although mainly used to write applets for the WWW or front-end GUIs for desktop applications, there is also the possibility of using Java's graphical capabilities to visualise HPC applications. By using a separate thread for visualisation it need not interfere with the performance of the main application, for example if an extra CPU is reserved for this purpose.

The purpose of this project is to develop simple real-time visualisation techniques for Java applications using the standard swing class library. A simple two-dimensional molecular dynamics (MD) code will be supplied; this code will be written in Java and already parallelised using Java threads. MD codes simulate the motion of many interacting particles, and even simple simulations can produce striking results (see SS-2000-06: "Visualisation of 2D and 3D Discrete Element Models using OpenGL"). By integrating the visualisation with the application, there is also the possibility of changing the parameters of the simulation while it is running (so-called "Computational Steering"). For MD, the temperature of the simulation might be altered or perhaps new particles could be introduced via the GUI.

If the project is successful, there is ample opportunity for futher work, eg

- investigation of performance issues, eg running visualiser on local workstation and communicating with application via RMI
- visualisation of additional Java applications
- visualisation of non-Java applications use JNI

1 Workplan

The planned work by weeks is:

1. training
2. familiarisation with HPC application and swing
3. write plan for design of GUI
4. implement basic visualiser
5. implement basic visualiser (cont)
6. verify on a range of platforms

7. include computational steering
8. extend functionality of visualiser
9. finish verification and documentation of full code
10. write final report

2 Skills

Essential skills Java programming

Preffered Skills graphics experience, computational science knowledge

3 Resources

Supervision supervised by David, co-supervised by Lindsay for Java graphics skills

Java MD code to be supplied

Computing access to lomond and bobcat

Courses basic HPC, Java if available