http://www.stephenbrooks.org/muon1

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Muon1 Distributed Particle Accelerator Design Project reaches 20 Quadrillion Milestone

The Muon1 Distributed Particle Accelerator Design Project proudly announces that today, at 08:07GMT, it reached the 20 quadrillion (20,000,000,000,000,000) particle time-steps (pts) milestone. This is the amount of work needed to simulate a particle for 55 hours, 33 minutes and 20 seconds, which at an average of 90% of the speed of light (0.9c) would cover a distance of 360 Astronomical Units - ten times the average distance between Pluto and the Sun, and three times further than the most distance man-made object (Voyager 1) has traveled.

The Muon1 project attempts to assist in the design of the most efficient particle accelerator to form part of the Neutrino Factory project using the spare computing power available while volunteers' PCs are idle. It is run semi-independently by Rutherford Appleton Laboratory's Stephen Brooks on a shoestring budget.

The project works in a very different way to traditional distributed computing clients, as it does not use a standard work-unit allocation system to brute-force the task. While those systems are very efficient at dealing with small (10^{15} permutations) projects," explains project head Stephen Brooks, "each of our design ranges is at least an order of magnitude bigger with between 10^{300} and 10^{900} possible design points. It's just not possible to work in that way."

Genetic algorithms allow for extremely rapid progress in design work, as designs with potential are examined closely, while designs that don't perform as required are given a basic investigation and stored for later use, significantly reducing the amount of processing time wasted on unproductive designs. In some tasks, it has already been found to increase yield efficiency three-fold over the best designs traditional methods have devised.

The flexible design process also means that as new theories or hypothesis are made or published the field, the project can be returning results within as little as six hours. This enables the project to stay at the cutting edge with minimal modifications. There is also the ability for end-users to manually enter designs to be simulated with no physics knowledge needed, allowing people at any level of expertise to positively interact with the client.

Muon1 has won acclaim for its accurate and colourful 3D visual mode, which allows the viewpoint to be manipulated at will and has supported stereoscopic 3D viewing (via red-blue glasses) for many years. The client can be run in visual, command-line, hidden, and screensaver modes. Alternatively it can be run though the BOINC client.

As the Muon1 project reaches this milestone, 9 years from it's humble beginnings with a handful of people, it has expanded into the cutting edge of distributed computing design. In another nine years, will this method of massive computation be the de facto standard?

About Muon1

Muon1 is a Windows-based distributed computing project that was started in 2001. Initially simulating 2500 particles, with a handful of people, now thousands of computers run the client simulating tens of thousands of particles at a time. Simulations are run using 0.01 nanosecond increments, which define the project's workload measure - particle-timesteps, or pts. An internet connection is preferred, but not required to participate. The client requires no integration with windows, and can be run from a portable drive, and switched between computers as required.

The average size of a simulation run is 308 Million particle timesteps, and will take between 15 and 45 minutes for a typical modern computer, depending on hardware.
Further information about the project can be found at http://www.stephenbrooks.org/muon1/info/

About Stephen Brooks

Stephen Brooks, 26, is a research associate with the UK Neutrino Factory project, based at Rutherford Appleton Laboratory (RAL) in Oxfordshire. He studied mathematics, computation and mathematical physics first at the Open University and then at Oxford, graduating in 2001 and 2003, respectively. Research interests centre around the application of numerical analysis methods to scientific and engineering problems, currently in particular the simulation of particle beams in accelerators.

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