Leiden university

Computational Astrophysics  
Assignment 4: Hydrodynamics

Bernie Lau and Luuk Visser

6th March, 2013

Abstract

A stars behaves like liquid spheres when interacting with another star, and those we treat with hydrodynamics. Gravity is obviously also important, but for this experiment we adopt the built in gravity solver in the hydrodynamics codes (that is easier, and sufficient for our current assignment). We first generate the Plummer gas spheres. After that we run it until equilibrium and convergence. At last we smash two Plummer model spheres together and see what happens.

# Generate Plummer gas spheres

## What is the maximum integration error, and when does it appear in your simulation?

To calculate the maximum integration error, we first have to define it. We define the integration error as the difference between the initial total energy of the system (kinetic and potential) to the total energy of the system at a time step in the integration of the orbit. The maximum integration error is the maximum absolute difference between the initial total energy and the total energies during all time steps.

## Do you consider your integration sufficiently accurate to perform a detailed analysis and draw conclusions?

Based on the small integration error we found in question 1, we can say to

Figure 1: Dummy chart to illustrate fonts and captioning

# Run until equilibrium and convergence

# Smash them up

# Conclusion

We can say

# References

|  |  |
| --- | --- |
| [1] | "JPL Close-Approach Data: (2012 DA14)". 2013-02-19 last obs (arc=362 days (Radar=7 obs); Uncertainty=0). Retrieved 2013-02-19. |
| [2] | M. J. Morley, *Modelling British Rail's Interlocking Logic: Geographic Data Correctness*. LFCS Report Series: ECS-LFCS-91-186, Dept. Computer Science, University of Edinburgh, Nov. 1991. |
| [3] | D. Taubner, "Finite representations of CCS and TCSP programs by automata and Petri nets," *Lecture Notes In Computer Science*, vol. 369, p. 168, 1989. |
| [4] | R. Fehling, "A concept of hierarchical Petri nets with building blocks," *Lecture Notes in Computer Science*, vol. 674, pp. 148-168, 1993. |
| [5] | J. M. Fernandes, "VHDL generation from hierarchical petri net specifications of parallel controllers," *IEE Proceedings: Computers and Digital Techniques*, vol. 144, no. 2, pp. 127-137, Mar. 1997. |
| [6] | J. L. Peterson, "Petri Nets," *ACM Computing Surveys*, vol. 9, no. 3, pp. 223-252, Sep. 1977. |