In the name of God

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ADVANCED METHODS ON COMPUTATIONAL PHYSICS

Exercise Set 12

(Date Due: 1399/03/15)

1. Decaying simulation: suppose the probability of decaying are $p = \lambda\Delta t$ and $p = \lambda\Delta t/t$. For both of them write down programs that simulate these phenomena.

2. Using Stone throwing method, compute the value of pi (π). Check your algorithm for various values of sampling, N.

3. Based on Variational theorem in the quantum mechanics, write a variational Monte-Carlo program to estimate the ground state of 1D harmonic oscillator.

4. Fitting formula: Using file which is called *fitinput.txt* and consider $y_{theory} = ax^H$ compute a, H and their errors using MCMC method. Compare your results with those values determined in Exercise Set 3.

5. Hamiltonian Monte Carlo method for data modeling: Using file which is called *fitinput.txt* and consider $y_{theory} = ax^H$ compute a, H and their errors using HMC method.

Good luck, Movahed