Hermite integrator for N-body problems

Using Hermite solver for 2- and 3- body problems

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Concept

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Predictor-corrector integrator with sceme:

$$r' = r + v \cdot dt + adt^2 + j \cdot dt^3/6$$

$$v' = v + a \cdot dt + j \cdot dt^2/2$$

$$a2 = (-6 * (a - a') - dt(4j + 2j'))/dt^2$$

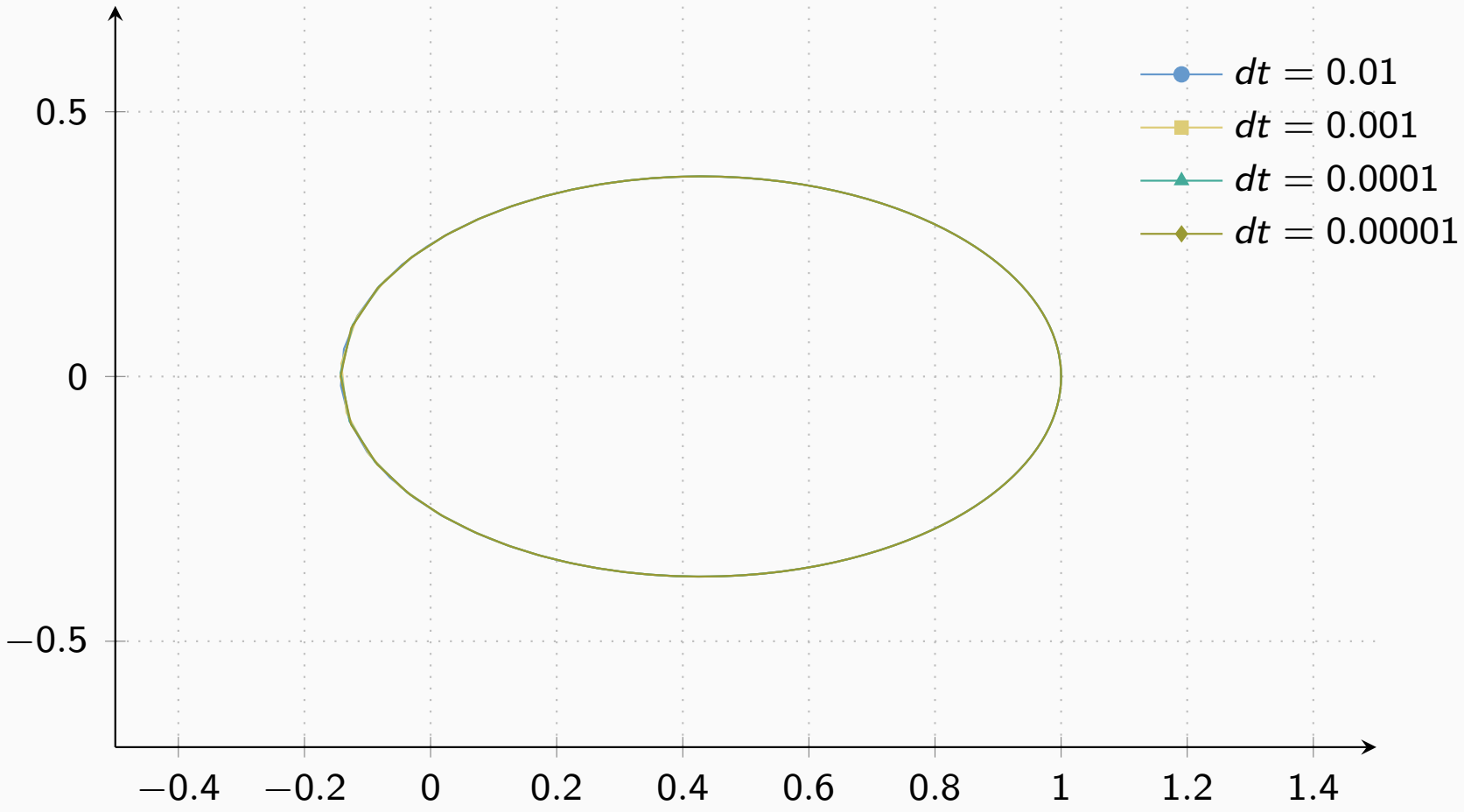
$$a3 = (12 * (a - a') + 6dt(j + j'))/dt^3$$

$$r'' = r' + dt^4 a2/24 + dt^5 a3/120$$

$$v'' = v' + dt^3 a2/6 + dt^4 a3/24$$

Numerical results

Numerical results



Second order

Table 1: Second order method precision

dt	x on t=T
0.01	0.99990396505489586956220 39
0.003	0.99999539771797662978838 92
0.001	0.99999949958584159039672 51
0.0003	0.99999995489750472455093 4
0.0001	0.99999999999996228482707 0
0.00003	0.99999999954999636252757 51
0.00001	0.99999999999999999962291 1
0.000003	0.99999999999999999999908 4
0.000001	0.99999999999999999999999 6
exact	1.0

Second order

Table 2: Second order method precision

dt	v on t=T
0.01	0.49999584279505615533333393
0.003	0.49999779139056997683016 48
0.001	0.49999975016707912030506 99
0.0003	0.49999997749578281151718 67
0.0001	0.50000000000000194540310 67
0.00003	0.49999999977499819026527 83
0.00001	0.50000000000000000001945 09
0.000003	0.50000000000000000000004 73
0.000001	0.50000000000000000000000 2
exact	0.5

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