

Pseudocode of CMC code

r - radial position in the cluster
vr, vt - radial and tangential velocity component
mass - mass of star/binary
rad - stellar radius/semi-major axis
E - Energy of star
J - Angular Momentum of star

```
////////////////////////////////////////  
// Time Step Calculation  
////////////////////////////////////////
```

```
for all stars  
    calculate relaxation time scale using sliding averages of mass,  
    rad, vt, vr of surrounding 20 stars
```

```
Relaxation Time Step = minimum (relaxation time scale of all stars)
```

```
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```

```
calculate velocity dispersion (sigma) for innermost Nc stars  
calculate average mass, <m> for innermost Nc stars  
calculate average of square of radii, <rad^2> for innermost Nc stars  
calculate central density of the cluster nc = Nc/Vc for innermost Nc  
stars  
(Vc - Volume inside outermost of the Nc stars)  
(Nc is 300 currently in the code)
```

```
calculate Strong Interactions Time Step using nc, sigma, <m>, <rad^2>
```

```
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```

```
Stellar Evolution Time Step = Total Mass / (mass lost/prev time step)
```

```
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```

```
Time Step = minimum (Relaxation Time Step, Stellar Evolution Time  
Step, Stellar Evolution Time Step)
```

```

////////////////////////////////////////
// Relaxation and Strong Interaction
////////////////////////////////////////

for all pairs of stars
    calculate strong encounter probability

    generate random number
    if random number < enc prob
        if at least one star is a binary
            do direct integration
        else
            do strong encounter/physical collisions (merge stars in
most cases)
    else
        do relaxation

    obtain new vr, vt, mass
    calculate new E, J

```

```

////////////////////////////////////////
// Stellar Evolution
////////////////////////////////////////

for all stars
    if binary
        calculate new mass, rad, semi-maj axis, eccentricity, and
other variables
    else
        calculate new mass, rad

```

```
//////////////////////////////////////////  
// Computing new positions and orbits  
//////////////////////////////////////////
```

```
for all stars  
    if E is positive  
        strip star
```

```
    calculate new rmin, rmax by bisecting Q which is a function of  
E,J, and potential U (NlogN operation)  
    calculate the new orbital position r using rejection technique
```

```
    if rmax > tidal radius (tidal radius is a parameter that  
determines if a star is bound to the cluster or if the force of the  
galaxy is more dominant)  
        strip star
```

```
//////////////////////////////////////////  
// Account for inconsistencies  
//////////////////////////////////////////
```

```
for all stars  
    correct E and J to account for energy conservation (due to  
inconsistency of potential during new orbit calculation)  
    correct velocities vr and vt to account for energy conservation  
(due to inconsistency of potential during new orbit calculation)
```

```
//////////////////////////////////////////  
// Sort Stars and repeat  
//////////////////////////////////////////
```

```
do QuickSort by r on all stars
```
