Research Assignment 2

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1 Proposed Topic

The topic of my research assignment is the fate of stars at the Sun's location, but on M31's disk. I will be looking at how the positions of the stars (8 kpc from the center of the Galaxy) will change as a function of time in the merged remnant versus today. The study of Galaxy Evolution is an ongoing field of study today, it is important to look into this field due to it is something we still don't have a solid understanding on. Since we don't have solid understanding on this field of study, simulations are important, our own Galaxy is on its way to merge with M31, and to understand and plot what will happen internally to the structure of the Galaxies over time, especially to stars at our Sun's location, will help us to understand the merged Galaxy stellar structures we do observe and how they may evolve.

The simulation data to help me answer what will happen to stars within M31's disk that are at a similar position to our Sun in our galaxy are the text files for modeling the Galaxies that are given to me. I will use multiple Snap shots (corresponds to points in time) for the Galaxies. Within these text files I can generate separate values for the particles' position, and velocity in its 3D coordinates which will help in selecting the distance I will be looking at.

The code I will be developing will be in python. I will reuse previous codes we developed in class, as they helped simulate our Galaxy as well as M31. I will need a code however, for the Galaxies eventual merger. I have a code for their orbits, but nothing that tell me what is going on internally to their stars as they merge. Within that code or in an other code, I need to create a function that will return the orbits of stars of M31 and how will they change as they merge with MW. I will then need to plot that over time (using multiple Snap shots) for stars within 8kpc.

2 Pseudo Code

The py code Orbits gives me COM of disk particles, will I need Halo and bulge?
"COM=CenterOfMass('VLowRes/'+filename, 2)"

The fileout of Orbits gives me for each Galaxy the time, 3D position and 3D velocity, which I will be using for this assignment, but I must make correction to older codes.

"Outline" of Code

1: import my modules ← ie: ReadFile, CenterOfMass, MassProfile, maybe Orbits
2: editing or stating:
3: $OrbitCOM("MW", 0, 800, 2)$ ← compute MW orbit
4: $OrbitCOM("M31", 0, 800, 2)$ ← compute M31 orbit
5: editing CenterOfMass:
6: $COMP(self, delta, VolDec)$:
7: "... after line 104"
8: $pindex = np.where(RMAX2 < 8)[0]$ ← for stars at 8 kpc
9: $pxnew = XCOM[pindex]$ ← index for y,z...

OR

1: *editing CenterOfMass*:
2: $COMV(self, COMX, COMY, COMZ)$:
3: "...at line 119, replace 15 kpc with 8 kpc"