ASTR 400B Research Assignment 1

Ansh Gupta

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The ASTR 400B course involves the completion and analysis of a computational project involving a simulation of the of Milky Way/M31/M33 system. A topic of fascination for many astronomy enthusiasts surrounds the long-term fate of the Solar System. Although it will take billions of years for the collision between the Milky Way (MW) and Andromeda Galaxy (M31) to occur, any lifeforms which inhabit our galaxy far enough into the future will be able to witness the spectacular merger unfold.

On the other hand, it is equally interesting to consider the fate of stars in M31 which are at a similar distance from their galactic center as the Sun is from the center of the Milky Way. These stars may experience similar kinematics and dynamics as the Sun will in the far future; alternatively, it would also be noteworthy to see if such stellar components experience vastly different outcomes. These "M31 Solar particles" could be displaced from their galactic position into a chaotic orbit, cast out of the merging system, or perhaps even captured by M33.

Because of my interest in this scenario, I choose to investigate the sixth research topic from the project descriptions listed in the research assignment document. The statement of the area of investigation is as follows:

What is the fate of stars at the Sun's location (8 kpc from center of the Galaxy) - but in M31's disk?

To guide my investigation of this topic, I aim to answer a specific set of questions regarding the eventual fate of M31 Solar Particles. Because of my affinity for astronomy education, and my personal interest in visual media and video production, I'm interested in creating a visualization. So my primary specific research question is to address the second bullet point under my selected topic:

Visualize the night sky from the perspective of an observer on an M31 Sun throughout the merger. (Visualize the location of components of the original galaxies within the merged remnant, or visualize kinematics).

Furthermore, if time allows for an expansion of the scope of this project, I would like to analyze the specific fate of M31 particles as guided by the first bullet point under this topic:

Do M31 Solar particles get ejected from the system or captured by M33? Lie at larger or smaller radii? Move faster or slower?