A Look Into The Collision Of Galaxies

New Mexico

Supercomputing Challenge

Final Report

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Team #19

Sandia Preparatory School

Team Members

Uriah Armendariz
Amaru O'Brien

Teacher

Mr. Aase

Project Mentor

Mr. Aase

Our group is trying to understand the collision of galaxies, and how colliding galaxies change over time. We wanted to create a space simulation that had 2 formations of bodily objects colliding against each other. Their gravitational pulls between each other would be simulated, causing the objects to constantly move towards each other.

Our group has been successful in making two objects in space gravitate towards each other. Using the equation $F = G * M_1 * M_2 / r^2$, where G is the gravitational constant (6.6743*10^-11), M_1 and M_2 are the mass of the objects being simulated, and r is the separation between the two masses, we can then calculate the gravitational pull between the two objects.

Through this simulation, we realized that if the two objects moving towards each other have a high enough acceleration, they will fly right past each other, even with gravitational pulls. However, based on our own simulation and other simulations we have reasearched, we think that high mass objects (such as galaxies) will create orbits around each other. We believe that this information is useful, and simulations such as these, can help humans understand and even predict spatial movement. Although we didn't fulfill our expectation to simulate the gravitational pull of multiple objects, we overall think this project was a success.

I want to thank the Super Computing Challenge staff, especially Karen Glennon for setting up this challenge. Also, I would lijke to thank Christopher Hoppe and Harry Henderson for their help and resources and all the other SuperComputing Challenge staff. Both Amaru O'Brien and I enjoyed working on this project, and we both hope to next year do the Supercomputing Challenge again. We have certainly learned a lot about how simulations are insightful.

Of course, we used a plethora of resources to help us code our simulation. Universetoday.com gave our group the gravitational constant and the equation for calculating gravitational pulls between objects. This information was better understood through Harry Henderson's notes on n-body simulation. His notes helped our group apply these ideas in our code. Christopher Hoppe's resources showed us past simulations of galaxy collision, which helped our group predict what the end result of our simulation would reveal. We also reaserched two other simulations similar to ours, which helped us determine the end result of our simulations.

Resources:

https://www.universetoday.com/34838/gravitational-constant/

https://bit.ly/3k1uIZ7

https://www.youtube.com/watch?v=LZEkjx4suVg

https://github.com/EnguerranVidal/Galaxy-Collision