On the Concept of Negative Mass

SJCHS23

San Juan College High School

Johndenmyr Mendoza

Dena Burgurt

Proposal

On the Concept of Negative Mass

The universe consists of many particles and atoms. All of them interact with one another in some way, such as gravitationally, electromagnetically, or by the bonds of atoms. This project describes negative mass, the negative, repelling force within gravity.

Executive summary

Negative mass is one of the physical phenomena that envelops the scientific community today. You may not typically hear of negative mass often, but you've most likely heard of dark energy. Dark energy is one the "force" that defies known physical laws. Instead of pulling things together, dark energy pushes things away. Negative mass CAN (does not necessarily mean that dark energy is negative mass) be used to describe dark energy, all with a simple math equation and simple coding.

Introduction

The main problem that I tried to solve is how do objects with negative mass behave? What I've hypothesized and concluded is that positive mass attracts positive mass, negative mass attracts negative mass, and negative mass repels positive mass. This can all be seen from Newton's Law of Universal Gravitation. With this in mind, I can see how negative mass SHOULD behave, the next step is to visualize it with coding.

Methods and Materials

I used a premade project in Net-Logo to complete this project. In the program, the user can place objects with differing masses (including negative masses). The experiments I did were very simple. I simply used

two objects, both with positive masses. Then another set of two, both with negative masses and again, two sets, one with negative, another with positive. There are some bugs in the program, the bugs were introduced when the negative masses are introduced into the code.

Results

While the results of the program are mostly observations, the mathematics are shown:

$$F=\frac{GM_1M_2}{r^2} \qquad F=m\frac{d}{dt}v$$

$$F_g=\frac{GMg_1M_{g2}}{r^2} \qquad F_i=m_i\left(\frac{d}{dt}v\right)$$

$$F_{i_1}=m_{i_1}\left(\frac{d}{dt}v\right)$$

$$F_{i_1}=m_{i_1}\left(\frac{d}{dt}v\right)_1 \qquad F_{i2}=m_{i2}\left(\frac{d}{dt}v\right)_2$$

$$if\ m_1>0, and\ m_2>0, then\ F_g\ and\ F_i>0$$
$$if\ m_1<0, and\ m_2<0, then\ F_g>0\ and\ F_i<0$$
$$if\ m_1<0, and\ m_2>0, then\ F_g>0\ and\ F_i=|F_i|$$

$$F_{i_1}=m_{i_1}\left(\frac{d}{dt}v\right) \qquad F_{i2}=m_{i2}\left(\frac{d}{dt}v\right)$$

$$F_{i_1}=(m)\left(\frac{d}{dt}v\right) \qquad F_{i2}=(-m)\left(\frac{d}{dt}v\right)$$

Discussion

The data I collected does support my hypothesis. Mass does behave as I thought it would, albeit this is only on a computer, not on real life.

Conclusion

Based on the data gathered, positive mass attracts positive mass, negative mass attracts negative mass, and negative mass repels positive mass. This can be seen through the program. This can also be used to describe the behavior of negative mass

Personal Statement

I understand that I am not the first person to think of negative mass. There are many others before me who also had the idea of negative mass. I am no revolutionary, I am not saying I have made a break through or that I am the first to think of negative mass.

Acknowledgements

There weren't many people who helped me in this project. There were however, two people who helped me throughout this project. I want to acknowledge Dr. Michael Ottinger of San Juan College who gave me the most help in this project. He was the one who did most of the mathematics for the project and the one to suggest on using an absolute value for inertial mass. I also want to thank my friends, especially M. Davidson who kept suggesting ideas to use and add on the project.