Mathematical Applications in the Determination of Orbits of Satellites

AIS CHALLENGE FINAL REPORT

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Team # 81
Santa Fe High School

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Area of Science: Astronomy

Executive Summery

Astronomers are frequently called upon to calculate the path a body in space will take. Weather it is to calculated the path of a shooting star, or a meteor that might smash into the earth destroying all life, as we know it. Yet there are many factors that come into play when making such predictions. These factors include its initial velocity as well as the gravitational influence it receives from stationary bodies it might pass while soaring through space. Yet knowing these factors helps scientists study such astronomical situations. They can us their knowledge to conduct experiments, study behaviors of stationary and active bodies, and to predict the outcomes of such behaviors such as predicting a bodies position in a given time.

What our group has sought out to accomplish is to create such a program to help explain such a situation. Our program, using a two dimensional Cartesian plane, charts the path a body will take when pulled by the gravity of another body. It will be used to visually explain and act as an observatory to those who wish to study such astronomical situations.

Problem Solution

To solve this problem our group used Microsoft Visual C++ to write a computer program that will calculate the path of an orbiting body. We have to set up a visual graphic screen that can be exited with the press of a certain key. Our program will calculate the path of an orbiting body by predicting its position through its initial velocity, and the gravitational influence it experiences by another body. Our program uses simple vector physics coupled with Kepler's and Newton's laws. Each body within the program has been programmed to interact with each other taking in account all influenced that two orbiting bodies would experience in a real life situation. The visuals of what is happening are shown from an overhead view, and will be illustrated graphically.

Results

The program we have developed is capable of calculating and graphically showing the path of a body moving through space with gravitational influences acting on it in a 2 dimensional plane. The program is capable of predicting the trajectory and path of a body moving in space depending on mass position, and gravitational influences acting on it. We have increased the complexity of our program to strengthen our accuracy of our results by reducing our time step making it possible to predict positions in shorter time spans. Through the use of this program, we hope to put it to further use by applying it to a real life astronomical situation.

Conclusion

As a group, we are very satisfied with the program we have created. Though we may be a few steps away from selling our program to NASA, we have come up with a strong yet simple program that can be used to study the paths and behaviors of a real astronomical situation that occurs in our universe. We have had the pleasure of having the opportunity to experience a world of technology with endless possibilities. We were able to scratch the surface of the science world, teaching us how modern technology is used not only to solve bits and pieces of the mysteries that make up the universe, but how it is used to explain the unknown.

References

Worked Cited:

" The Motion of Comets." "The Motions of Comets." 10/30/01.

"Orbital Physics Equations." 11/1/01

"Solar System Background." World Book Encyclopedia 1994 ed.

"Summary of Kepler's Laws." 11/5/01.

Computer Program Used:

Microsoft Visual C++

The Most Significant Original Team Achievement

When thinking about the most significant original achievement our group has accomplished, we have concluded that we are most proud of the accuracy of our program. We are most impressed by the capability of our program to graphically illustrate the path of an orbiting body taking in account the major factors that come into play in a real life situation. We have been able to create an illustrative teaching tool that will help teach others about the behaviors of such orbiting bodies in space. Though it is common to imagine such behaviors by observing data collected from the use of renowned historical equations, using a visual model contributes heavily not only to a better understanding of the behavior of the universe, but sparks the imagination to solve the unexplained mysteries of the unknown world.

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