Rockets

New Mexico Adventures in
Supercomputing Challenge
Final Report
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Executive Summary

Fourteen thousand pounds of metal plummeting into outer space, this is what you would see if you were watching a rocket launch from Earth into the darkness of outer space. In our program we chose to find out how to launch a rocket into outer space. It will help in our future studies of astronomy by furthering mankind's knowledge of the stars.

Outer space is the limit for our project. We hope to get a rocket into outer space in hopes of forwarding human knowledge of astronomy. We found a rocket simulation that allowed us to test different types of rockets. Using different rocket simulations and programs, we tested different types of rockets with different engines.

Introduction

The Earth is getting over populated and space travel is not only new but long. If we could develop a rocket that could get there twice as fast and is less costly we could discover new and better ideas. Pluto of course is freezing cold, but what if we could develop gear to support life in other galaxies? Another reason is to see if there is life in other galaxies. Going to other galaxies to see if scientific theories are correct.

Description

In our project we spent many long hours testing rocket simulations and rocket engine simulations. After testing some rocket simulations we decided that it would be best to use a two-stage rocket with only three fins. In all of our testing we found that this combination worked the best. In several of our tests we got a model rocket out of Earth's atmosphere. Our project has taught us a lot about rocketry, kinds of rockets, how rocket work, and what rockets are made of. We also found a history of the rocket; where it originated, and how it was used for military purposes.

The gunpowder used for the first rocket was made in Ancient China. Rockets arrived in Europe around 1241 A.D. Contemporary accounts describe rocket-like weapons that were used against the Magyar forces at the battle of Sejo, which helped with their capture of Budapest on December 25, 1241. Also the Mongols were described as using a noxious smoke screen, which might be the first recorded account of chemical warfare Rockets are in Arab literature It says the Mongol invaders used them on February 15, 1258.

Results

Using various programs and simulations we tested different types of rockets and different wind speeds. We found that the highest we could get was 920 meters above sea level with a 25 mile an hour wind speed. That was our best flight. We found that a very skinny rocket got highest into the atmosphere. On one test, we had a skinny rocket with 3 fins on it. With that rocket we achieved 920 meters.

Conclusion

We think that space travel could be possible if we could get enough fuel to power a very strong and very fast. If we could accomplish this, we can only dream of the possibilities. If we could get to other galaxies, we might be able to find other forms of life and advanced civilizations. The only problem we can find that might not have an easy solution is the time it takes for space travel. It would take years to get to Jupiter. It would take an entire lifetime to reach Pluto or another galaxy. We hope that if someone tries this, in the future, they can solve this problem of time.

Our Experiences

During the AIS challenge we had many fun experiences. Such as going to the Kickoff in Glorietta, learning how to make a web page, and learning how to use Dreamweaver. We also learned a lot about rockets and outer space. We all have found this program to be very enlightening.

Our Source Code

This is the program we used to simulate a rocket and how high we could get it. It is supposed to simulate a rocket going into the atmosphere. It helped us very much in our research. The equations shown help explain Uniformly Accelerated Motion:

```
// projectile).cc:  Simple projectile motion under uniform gravity.
#include <iostream>
#include <math.h>
using namespace std:

#define g (9.8)  //constand definition
main() {
/* Declare all variable */
float x0, y0; //initial conditions
float v0, theta;
float vx0, vy0;
float x, y;
float t, dt, t_max;
?* Set initial position and velocity */
x0 = 0;
y0 = 0;
v0 = 75.0; // unit: m/s
theta = 60.0; // (degrees)
```

```
//Determine components of initial velocity vector.

vx0 = v0 8 cos (theta 8 M_PI/180.0); // theta is angle with hotizontal

vy0 = v0 * sin (theta * M_PI/180.0); // (M_PI is defined in math.h)

// Set parameters governing the numerical details.

dt = 0.1;

t_max = 5.0;

// Initialize the trajectory.

t=0;

x=x0;

y=y0;

printf (“%f %f/n”, x, y, t);

//Calculate the trajectory to time t_max, using the simple

//uniform accerlation formula.

while (t ,= t_max) {

// Step to the next time.

t= t + dt;

//Evaluate the new x and y.

x = x0 +vx-*t;

y = y0 + vy0*t – 0.5*g*t*t;

//Print results (for plotting).

cout << x << “ “ << y << “ “ << t << endl;

}

}
```

Mathematical Model

In the case of uniformly accerlated motion (in one dimension), with acceleration a, we know that a particle's position x and velocity v are given by

$x = x0$ to $v0t + ½ at2$

$v = v0 + at$

Bibliography

In Defense of Earth: Keeping Asteroids at a Distance
http://www.space.com

Rocket Simulation Links
http://www.strout.net/inifo/science/rocketsim/links.html