Baseball with Degrees

New Mexico
Supercomputing Challenge
Final Report
March 2007

Team 40
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Acknowledgments:

Mr. Randy Cabeen
We would like to thank Mr. Randy Cabeen for teaching us the formulas and helping us understand the equation. He helped us understand that we couldn't always get perfect results. We appreciate being allowed to come to his house to work on the equation.

Mr. Charlie Schlosser
How do you thank someone for patiently waiting for us to find him on the Monzano High School campus, setting up the equipment, standing out in the cold, and helping us put the information in logical order? Without Mr. Schlosser's help we would never have had our starting data.

Mr. Nick Bennet
Mr. Nick Bennet helped us by showing us Net Beans and helping us understand how to use the program. We appreciate him for coming after school and teaching us the program. We also appreciate that he picked up where Mr. Cabeen left off.

Mrs. Glennon.
Mrs. Glennon has been with us ever since we started. She told us what to do so we understand. We would like to thank Mrs. Glennon because she was there with us in Glorieta and when we presented our finals. She hosted all of our meetings.

If there is anyone that we forgot to mention we are sorry and would like to thank you.

Executive Summary

A lot of people have wondered what angle they should throw something like a baseball, so it would go the farthest. We were wondering too. We already know that the angle would be between 20 degrees and 50 degrees, so now we have to figure out the answer.

What angle is the best? Is there a different angle for every speed? How does gravity affect it? Does the shape of the ball matter? Would wind change the distance of the ball?

First, to solve the problem, we went to Monzano High School baseball field and shot baseballs from a pitching machine and recorded the data. We knew that the experiment would have a lot of variables like wind and speed, so we couldn't use Starlogo programming. In the end we decided to use Basic where it could use all the variables we need.

Now that we have added angles, wind, time, timestep and a lot of other variables we have the program that we are using today.

The program that we have shows the angle that you can change, the wind that you can change, gravity, and the timestep which allows you to see where the ball is at a certain time that you can also change.

Our program is very accurate and is easy to use.

The Code

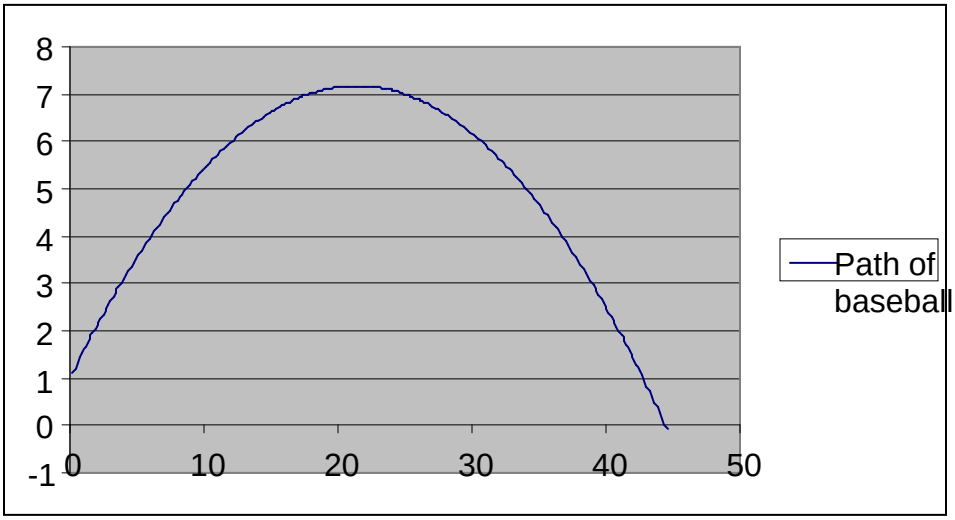
```
dim pi option explicit

dim angle
dim initialvelocity
dim gravity
dim time
dim xvelocity
dim yvelocity
dim xposition
dim yposition
dim timestep
dim file
dim fso
dim wind

pi = 4 * atn(1)
gravity = 9.8
timestep = 0.01
time = 0
xposition = 0
yposition = 1

angle = 40 * pi / 180
initialvelocity = 22

wind = 0 * 1609 / 3600
xvelocity = initialvelocity * cos ( angle ) + wind
yvelocity = initialvelocity * sin ( angle )

wscript.echo "xvelocity= " & xvelocity
wscript.echo "yvelocity= " & yvelocity
set fso = CreateObject("Scripting.FileSystemObject")
set file = fso.createtextfile("output.csv", true)
file.writeline "initialvelocity = " & initialvelocity
```

```
file.writeline "wind speed = " & wind
file.write "angle =" & (angle * 180 / pi)


file.writeline "time, xposition, yposition"
file.writeline time & "," & xposition & "," & yposition

while yposition >= 0

        time = time + timestep
        xposition = xposition + xvelocity * timestep
        yposition = yposition + (yvelocity - gravity * timestep / 2) * timestep
        yvelocity = yvelocity - gravity * timestep
        'wscript.echo "(" & xposition & "," & yposition & ")"
        file.writeline time & "," & xposition & "," & yposition
wend
file.close

wscript.echo xposition & " meters "
```

What the code does.

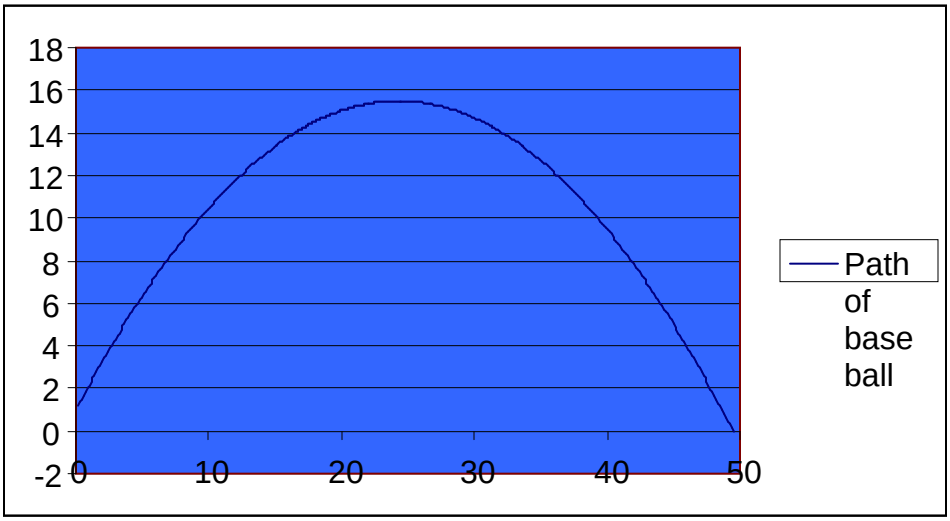
This section explains what our code does. Simply we have x axis and the y axis, if you have the angle too high or too low it will effect the x velocity, y velocity, and the initial velocity (over all velocity). Gravity brings the ball down giving you your distance, and wind speed affects you distance and velocity. By having positive wind it gives you a greater distance. A negative wind decreases the distance, and timestep gives you that distance.

30 degrees, the angle of the baseball when launched.
44.5 yards, the distance, in yards, of the baseball.



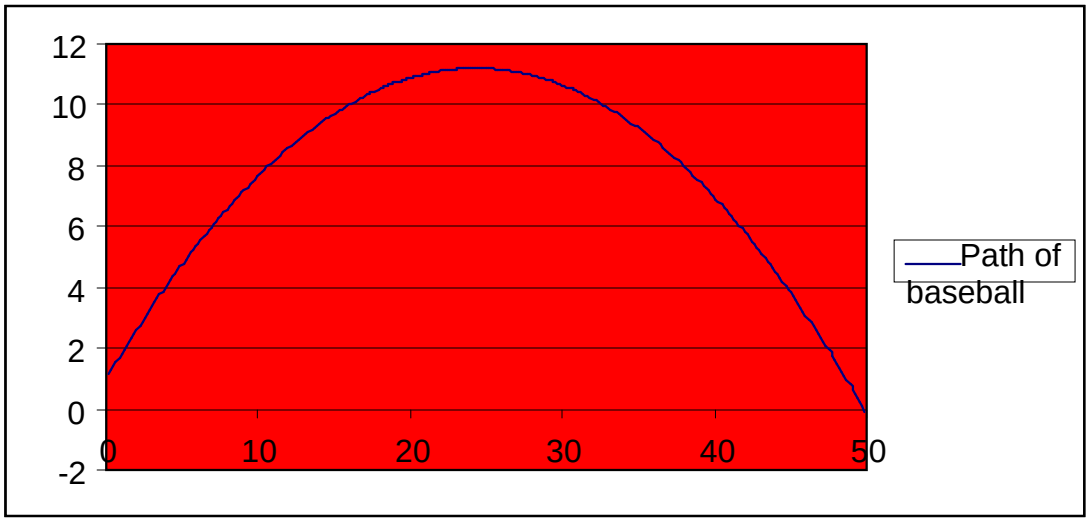
Distances in Yards.

35 degrees, the angle of the baseball when launched
47.9 yards, the distance, in yards, of the baseball.



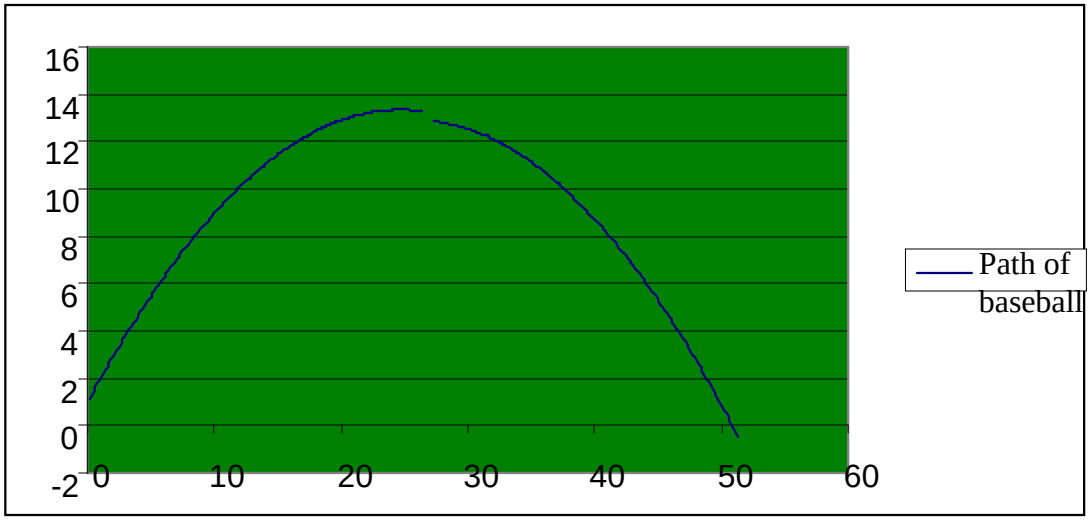
Distances in Yards.

40 degrees, the angle of the baseball when launched.
49.8 yards, the distance, in yards, of the baseball



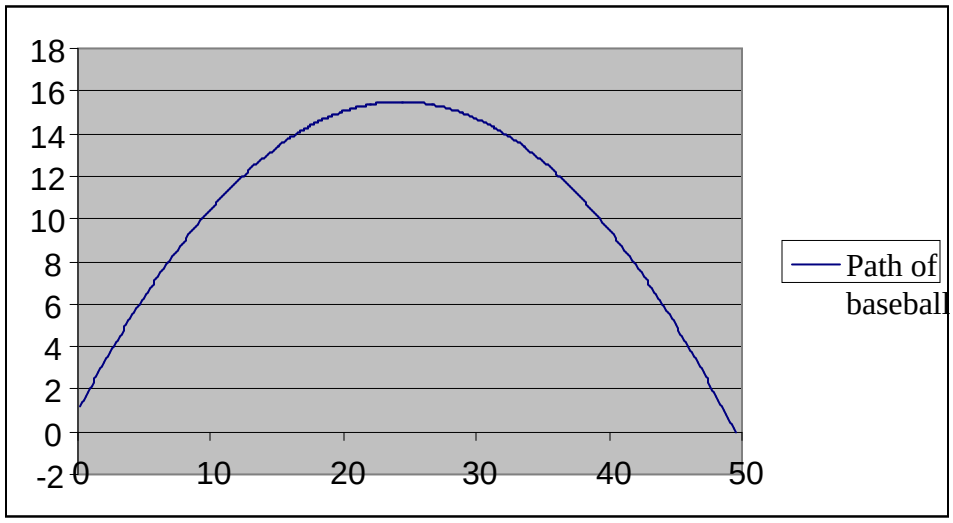
Distances in Yards

45 degrees, the angle of the baseball when launched.
50.1 yards, the distance, in yards, of the baseball.



Distances in Yards.

50 degrees, The angle of the baseball when launched.
49.1 yards, The distance of the baseball in yards.



Distances in Yards.

CONCLUSIONS

As you can see from the graphs, when the angles go up so does the distance until you get to 45 degrees, then the distance will slowly shorten, so that basically tells us 45 degrees is the best angle for distance.

This is What We Learned.

We have all learned a lot more about programming. We all knew just a little about programming but now we know a whole lot about Basic and it was so much fun.

This supercomputing challenge was very fun to me because we got to go to places like Glorieta and Sandia National Labs. I really had fun.

Ryan O'Rourke

I liked learning about computer programming; such as BASIC and Java/Net beans!

Marty Cabeen

It was interesting that 45* doesn't always make something go the furthest and I always thought it would go the farthest.

Kevin Kortkamp

I enjoyed learning programming at Glorieta, and becoming better friends with these three.

Aundre Huynh

References

Bennet, Nick: He helped us a lot at Glorieta and taught us a little about what our program should be and what we should put in it. He also helped us a lot on making our program.

Cabeen, Randy: Taught us about what we were dealing with and showed us some examples.

Schlosser, Charlie: pitched baseballs from a pitching machine at different angles and speeds at Monzano High School. October 2006, April 2007.

http://www.projectview.org/MathandBaseball/ScienceattheBallgame.htm November 17, 2006

http://library.thinkquest.org/11902/physics/range.html November 17, 2006 program allowed us to shoot baseballs at different angles and speeds and create graphs.