Bridge Destruction
New Mexico
Supercomputing Challenge
Final Report
April 7, 2010

McCurdy High School

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SUMMARY: The main idea for this project was to make several bridges and test their weight capabilities. Unfortunately our team was only able to build one bridge. This is due to the fact that it takes time to build the beams, let the glue dry, and glue every part together. The one bridge that we build was made of about 184 Popsicle sticks. Today April 7, 2010 we broke this bridge at about 9:57 am. The bridge broke at approximately 271 pounds. Our Bridge was 15 in. long, 4.5 in. tall, 4.75 in. wide. It was built with a 60 degree angle. We started with 150 lbs. when we started the testing of the bridge. We slowly added 15 lbs. after we were sure the bridge could hold more. We predicted that the bridge would hold somewhere between 235- 245 lbs.
We are now working on two new bridges that should be done in as little as four days. Each new bridge has a thicker beam, and we are now hoping that one of them can hold over 300 pounds. They have the same angle and are the same size as the one we tested today.

PROBLEMS: The main problem we faced was time. The time to build more bridges, and the time to test each bridge. We also had a problem to find a test location, and we were missing some equipment like a strain gauge, to get the precise amount of weight the bridge was able to hold.
We didn't have a video camera that could record the weight and to be able to see the sag during the destruction of the bridge.
We were unable to make a model of the bridge and the bridge under destruction on a computer. We were planning to use "*West Point Bridge Designer 2010."*

MATH PROBLEMS: One of our main goals was to try and find a math equation to fix the sag of the bridge. We study some equations found on the Internet:

Sag = Y squared Force = F Neutons = N Y radius in MM

Y squared x F / 2000(N-1)

Y squared / 2000(N-1) / sag in MM

We also study this equation:

$$F^2 = n\text{-}1 \,/\, \left(s^2 + \sqrt{(R2^2 - H^2)}\right)$$

These are just a few types of equations we are planning to use when the project is continued. We plan to test many more.

A METHOD TO SOLVE THE PROBLEM: All the problems we faced were really not fixed. We were going to use a 22cm. long spring instead of the strain gauge. The new idea of the spring was to measure the static weight, and that's were we meet another problem. When we first put the150lbs.the spring stretched about 6feet to the floor. Leaving us to find another way to test the weight. So we just put a 3.5ft cable that was able to hold the weight.

RESULTS: We found that the bridge held approximately 271 pounds.
We also found the cables stretched about 1cm in three different places, making it very weak, and easer to cut. This was found after we removed the 271 lbs.

CONCLUSTION: After seeing the results from the first bridge, we are now thinking of new ways to improve our project. A few weeks ago, we predicted how much weight it could hold, although we were wrong with our prediction, since then we have stated two new bridges. Each one is predicted to hold more then the last one (unfortunately they are still unfinished). We also tried to improve them by adding some new features like an extra beam support, and add a thicker beam of seven Popsicle sticks instead of five. Our team hopes these ideas can hold more weight when tested.

ACHIEVEMENT: The most significant achievement would be that we were able to test one of the bridges.

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