

Magnifying Solar Energy

New Mexico Adventures in
Supercomputing Challenge
Final Report
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Executive Summary:

The purpose of this project was to test out and create a Solar Panel with some modifications. One of the modifications are to take a one-fourth of an inch thick, magnifying glass that is twelve inches in diameter and use it to create various geometrical shapes, the shapes are the Circle, the square and the Triangle. The second modification is to place the magnifying glass on the solar panel. Then these shapes would be placed on a solar panel with a stand. The results would be used to generate data, and from the data generated a math model is generated.

The various geometric shapes of magnifying glass were tested to find if putting a magnifying glass actually does increase the voltage that a solar panel gives off.

A computer program written in Java was developed to demonstrate which geometrical shape of the three would actually increase the solar panels voltage. This model will continue to be modified to more accurately represent different geographical locations (i.e. Desert, Mountains, etc.) where the energy will be increased.

Hypotheses

We want to create a solar panel that generates more heat with the use of different light magnifying glass Our plans include the use of a: triangular prism, a square or rectangular magnifying glass, and a circular magnifying glass. To accomplish this, we will calculate the current distances between the solar panel and the light manipulator, in addition to testing the maximum energy that the panel will take in with out being damaged. After these initial tests and measurements, we will see if a certain item will produce more heat and energy than the others, and we will also be changing the distance between the panel and the prism and/or magnifying glass to see which has the largest effect. A Voltmeter will be used to measure the amount of energy is being absorbed. The program that we have designed will measure in inches. The user will input the integers in inches. The program will then output the results of the voltage that will be produced by the solar energy. This program will help the use accomplish better use of solar heat. Our program will then tell you the melting point of fiberglass. It will also tell you if the fiberglass melted.

Introduction:

Getting more energy at a less cost is very crucial in many states, that is the main problem. One way that many people save money is to use solar panels. Yes, they do lower the cost of electricity, but sometimes the energy that solar panels make is not enough. That is why we have devised a means to solve this problem. Some engineers designed different solar panels but the problem is the same. Everybody wants to more electricity at a less cost. We have devised a means for this problem using magnifying glass. Haven't you ever gotten a magnifying glass just to

play around with it, and saw that when you move it at an angle towards the sun that there is a beam close to the ground that when made shorter actually heats up things? We have and found that when put a magnifying glass to a solar panel the energy output goes really high even when it's cloudy outside it. The reason is that magnifying glass collect energy and bind it all into a compact space all in one to create a focused beam that will burn. So if put to a magnifying glass to the solar panel then all of the energy collected around the glass will concentrate on the panel. Any extra light will go around the panel and thus outputting even more voltage. That is how our individuals demanding more energy for a less cost will get the energy that they need or a little bit more than what they already have.

A computer program was developed using complex mathematical models, each for a different magnifying glass. The models have calculated the data that I had given them and proved that they are both fairly accurate. If you would like to see these results go to appendix B.

Materials and Method

We used one-fourth inch by twelve-inch magnifying glass shapes that we needed to complete the project. After testing out that shape, we cut the magnifying glass to create a ten by ten-square magnifying glass. Then went out and tested out that glass and after that we used that same glass to create the triangle. When we did this we also measured the heat of the beam that the magnifying glass gave off by using a high temperature thermometer. We looked up in the Internet for the melting point of fiberglass; we found that it is 1000 degrees Fahrenheit. We tested all of the data (this was the data that came from the solar panel) for five weeks and averaged all of the data. After getting the data, which we used a voltmeter to measure the increases. We used a graphing calculator to plot the graphs. Later after that we kept experimenting with different mathematical models to get more accurate results, which took us quite a while. After all of this was completed we came up with a more accurate models. These models will be found in the results section of the project. A program was written to tell the user the best possible solution to put the best panel that they wanted and how far they must put in order to get the best possible increase, this program will take any type of numbers from the user. The program will then output all of the information that the user needs to know about the distance from the solar panel and place them in a way so that if you were to have a fiberglass solar panel, it would not affect the panel in any way. All of the data is on the Results Page.

Results

The results that we had collected took a period of 5 weeks to get an accurate result. Due to our results the worst magnifying glass to use is a triangle which does not shoe too much of an increase. Also we saw that using magnifying glass that does not have a large round area will not collect as much energy, making the panel only a little stronger. The results are shown on the next page. The data is represented graphically in Appendices A and B. Our program is split up into five different pieces. Here are as follows: One - calling method: case switch structure. Two - Introduction, Three - Circle, Four - square, and the last piece is fifth - Triangle. The mathematical

model that we generated came from a graphing calculator. It gave some examples and we kept putting in numbers until the model was accurate.

RESULTS OBSERVED WITH SOLAR MODEL ON CIRCLE MAGNIFYING GLASS
MATHEMATICAL MODEL

$$Y = AX^2 + BX + C$$

$$A = -.0848368298$$

$$B = .9174055944$$

$$C = -.3692121212$$

Inches Results

0 0

1 0.46

2 1.13

3 1.6

4 1.94

5 2.1

6 2.08

7 1.9

8 1.54

9 1.01

10 0.32

11 0

12 0

RESULTS OBSERVED WITH SOLAR MODEL SQUARE MAGNIFYING GLASS
MATHEMATICAL MODEL

$$y = ax^2 + bx + c$$

$$a = -0.0682284382$$

$$b = 0.7252867133$$

$$c = -0.2432121212$$

Inches Result

0 0

1 0.41

2 0.93

3 1.31

4 1.56

5 1.67
6 1.65
7 1.5
8 1.2
9 0.76
10 0.2
11 0
12 0

RESULTS OBSERVED WITH SOLAR MODEL TRIANGLE MAGNIFYING GLASS
MATHEMATICAL MODEL

$Y = ax^2 + bx + c$
A = -0.0797435897
B = 0.8503776224
C = -0.2958787879

Inches	Result
0	0
1	0.39
2	0.94
3	1.33
4	1.56
5	1.63
6	1.54
7	1.29
8	0.88
9	0.32
10	0.23
11	0
12	0

Discussion

The results support the hypothesis, which the circle magnifying glass does make the solar panel give off the most energy. Some of the failures that happened were that we were unable to include many graphics in our project because we were unable to import them from the file that we had made. These results that we have received prove that solar panels without magnifying glass are obsolete. The worst combination is a triangle magnifying glass and a solar panel. The best one was the circle, because the larger the areas of a circular magnifying glass the better the collection of energy.

Recommendations

Given the rising cost of energy, the modifications presented in the project should strongly be considered in future development of alternative energy.

Acknowledgements

Thank you to Mr. Simon for his assistance in obtaining high quality programming from him, and helping us achieve such a great mathematical model.

Appendix A

Source Code: Calling Method

```
import java.awt.*;
import javax.swing.*;

public class choiceS extends JApplet {
    int choice;

    public void init()
    {
        String input;

        input = JOptionPane.showMessageDialog(
            "Enter 1 to go to the square\n" +
            "Enter 2 to go to the circle\n" +
            "Enter 3 to go to the triangle\n" );
    }
}
```

```
choice = Integer.parseInt( input );

}

{ switch ( choice ) {

case 1:
  circle();
  break;
case 2:
  Square();
  break;
case 3:
  Triangle();
  break;

}
}
}
```

Source Code: Introduction Method

```
import javax.swing.*;
import java.awt.*;

public class introduction {

public static void main(String args[])
{
    JOptionPane.showMessageDialog(null,"Welcome to " +
        "\nMagnifying Solar Energy " +
        "\nBy " +
        "\nJesus O. Lopez " +
        "\nNicholas Moore " +
        "\nCarl Williams " );
}
```

```
// Description of the program
JOptionPane.showMessageDialog(null,"In this program that you have executed you will have
to already have a knowledge of what a solar panel is." +
"\nYou will have to choose the option of which panel that you will like to be most
interested about." +
"\nOnce you have chosen the right panel then you are ready to begin inputting in the
inches so that the program will display the results." +
"\nThis program will calculate the volts that are magnified by the sun, it will also
calculate the temperature of the ray that is produced by the magnifying glass.");
}
}
```

Source Code: Circle

```
import java.awt.*;
import javax.swing.*;

public class circle {

public static void main(String args[])
{
    String firstNumber;    // first number declared as an integer
    int number1;
    double result1;
    double result2;

    JOptionPane.showMessageDialog(null,"You Have Picked the Circle Magnifying glass");
```

```

// get the number from the user
firstNumber =
    JOptionPane.showInputDialog(null,"Please Enter the distance in inches that the solar panel
is going to be at");

    number1 = Integer.parseInt( firstNumber );

    // Results in If / Else structures
    if ( number1 <= 10 ) {
        result1 = (( -0.848368298 * number1 * number1 ) + ( 0.9174055944 * number1 ) + ( -
0.3692121212 ) );
        JOptionPane.showMessageDialog(null," The total increase is" + result1 + " Volts. " );
        JOptionPane.showMessageDialog(null," The solar panels fiberglass will not melt!" );
    }

    else
        if ( number1 > 10 ) {
            result1 = 0;
            JOptionPane.showMessageDialog(null," The total increase is" + result1 + " Volts. " + "\nNo
Increase. " );
        }

    }

}

```

Source Code: Square

```

import javax.swing.*;
import java.awt.*;

public class square {

public static void main(String args[])
{
    String firstNumber;    // first number declared as an integer
    double number1;
    double result1;

```

```

OptionPane.showMessageDialog(null,"You Have Chosen the Square Magnifying Glass!");

firstNumber =
    JOptionPane.showInputDialog(null,"Please Enter the distance in inches that the solar panel
is going to be at");

    number1 = Integer.parseInt( firstNumber );

    // if else structures
    if ( number1 <= 10 ) {
        result1 = (( -0.0682284382 * number1 * number1 ) + ( 0.7252867133 * number1 ) + ( -
0.2432121212 ) );
        JOptionPane.showMessageDialog(null," The total increase is" + result1 + " Volts. " );
        JOptionPane.showMessageDialog(null," The solar panels fiberglass will not melt!" );
    }

    else
        if ( number1 > 10 ) {
            result1 = 0;
            JOptionPane.showMessageDialog(null," The total increase is" + result1 + " Volts. " + "\nNo
Increase. " );
        }

    }

}

```

Source Code: Triangle

```

import java.awt.*;
import javax.swing.*;

public class triangle {

public static void main(String args[])
{

```

```

String firstNumber;    // first number declared as an integer
int number1;
double result1;
double result2;

JOptionPane.showMessageDialog(null,"You Have Picked the Triangle Magnifying Glass");

firstNumber =
    JOptionPane.showInputDialog(null,"Please Enter the distance in inches that the solar panel
is going to be at");

    number1 = Integer.parseInt( firstNumber );

    // Results in If / Else structures
    if ( number1 <= 10 ) {
        result1 = (( -0.0797435897 * number1 * number1 ) + ( 0.8503776224 * number1 ) + ( -
0.2958787879 ) );
        JOptionPane.showMessageDialog(null," The total increase is" + result1 + " Volts. " );
        JOptionPane.showMessageDialog(null," The solar panels fiberglass will not melt!" );
    }

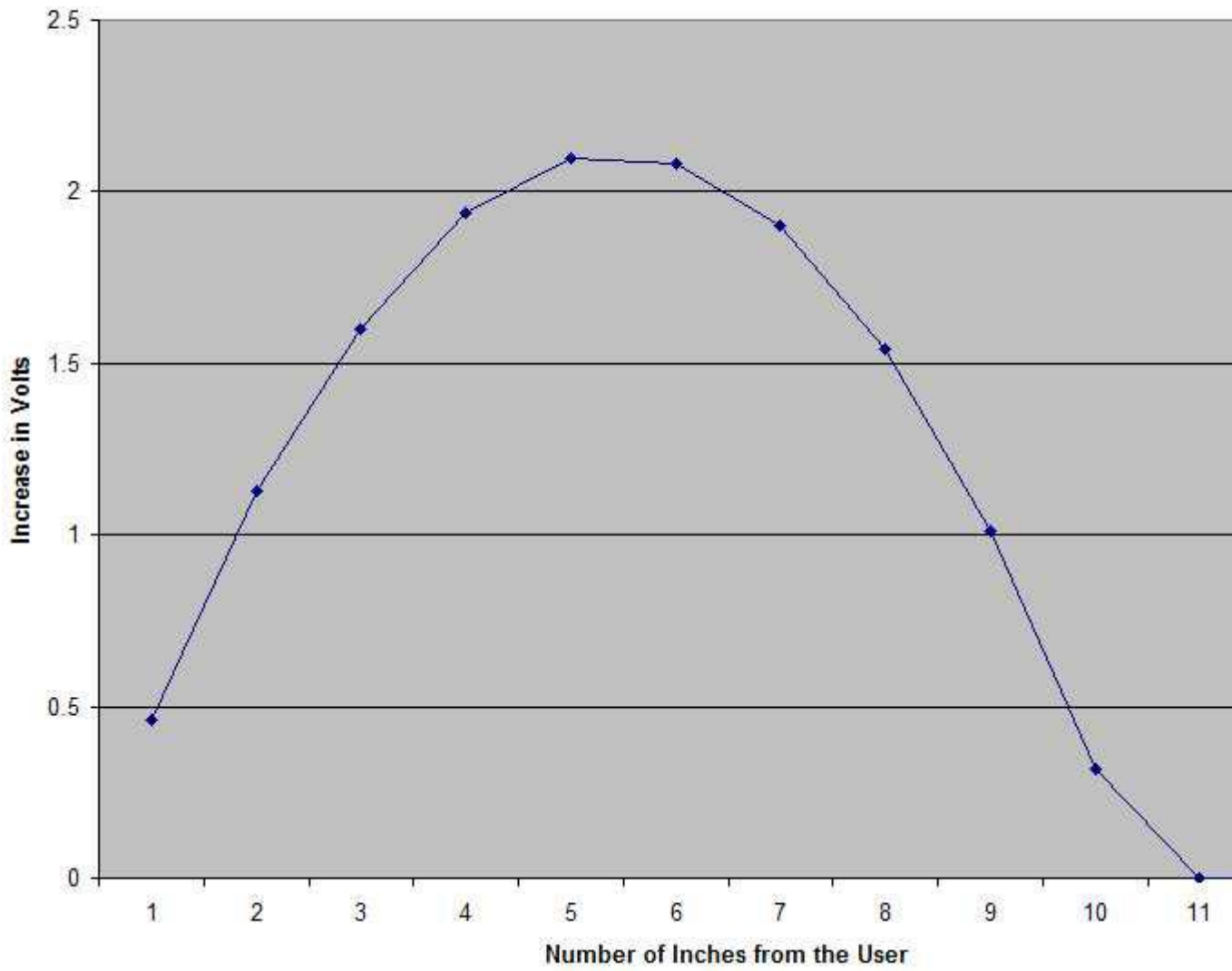
    else
        if ( number1 > 10 ) {
            result1 = 0;
            JOptionPane.showMessageDialog(null," The total increase is" + result1 + " Volts. " + "\nNo
Increase. " );
        }

    }

}

```

Circle Magnifying Glass

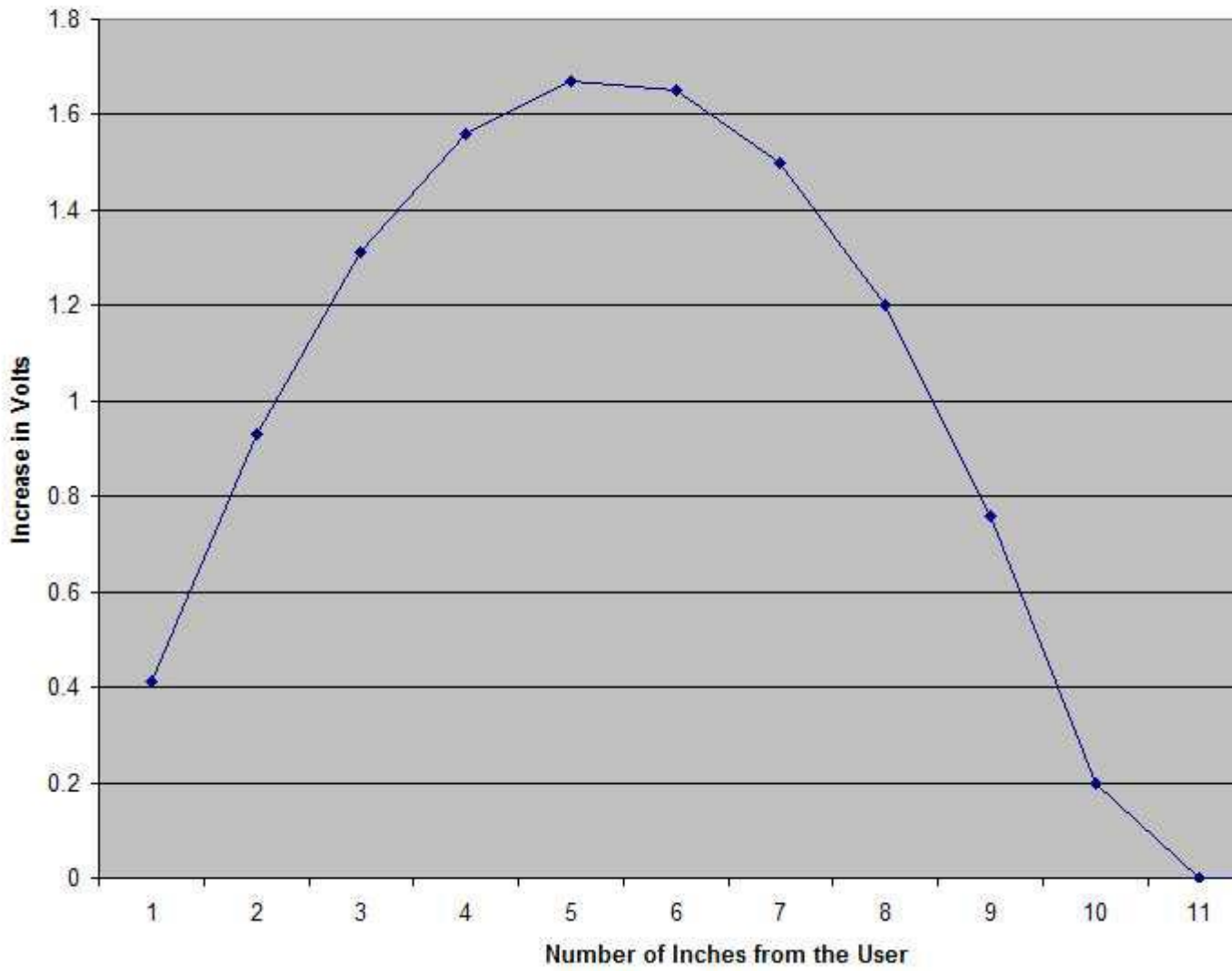


Circle Magnifying Glass

- 0.46
- 1.13
- 1.6
- 1.94
- 2.1
- 2.08
- 1.9
- 1.54

1.01
0.32
0
0

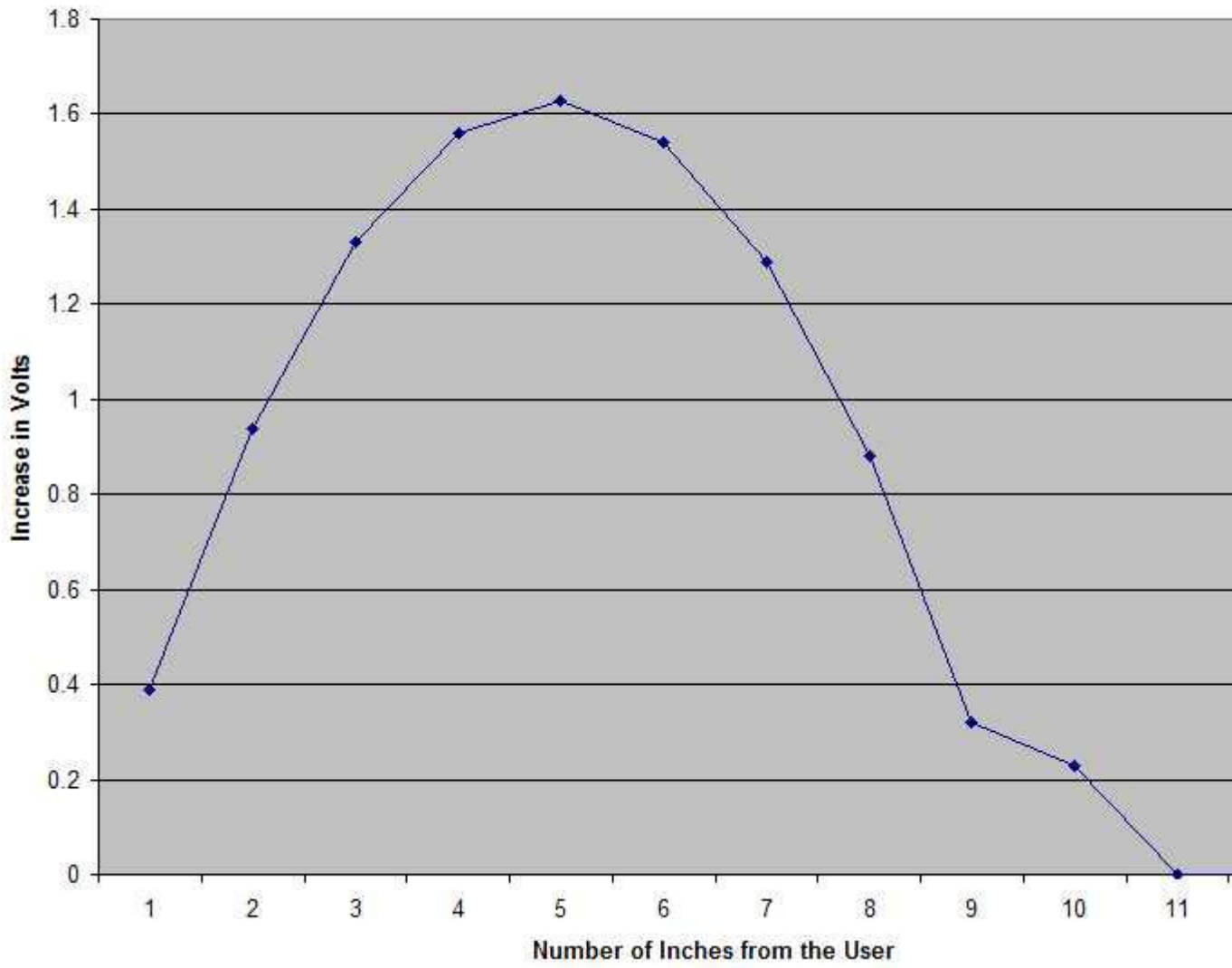
Square Magnifying Glass



Square Magnifying glass
0.41
0.93

1.31
1.56
1.67
1.65
1.5
1.2
0.76
0.2
0
0

Triangle Magnifying Glass



Triangle Magnifying glass

0.39

0.94

1.33

1.56

1.63

1.54

1.29

0.88

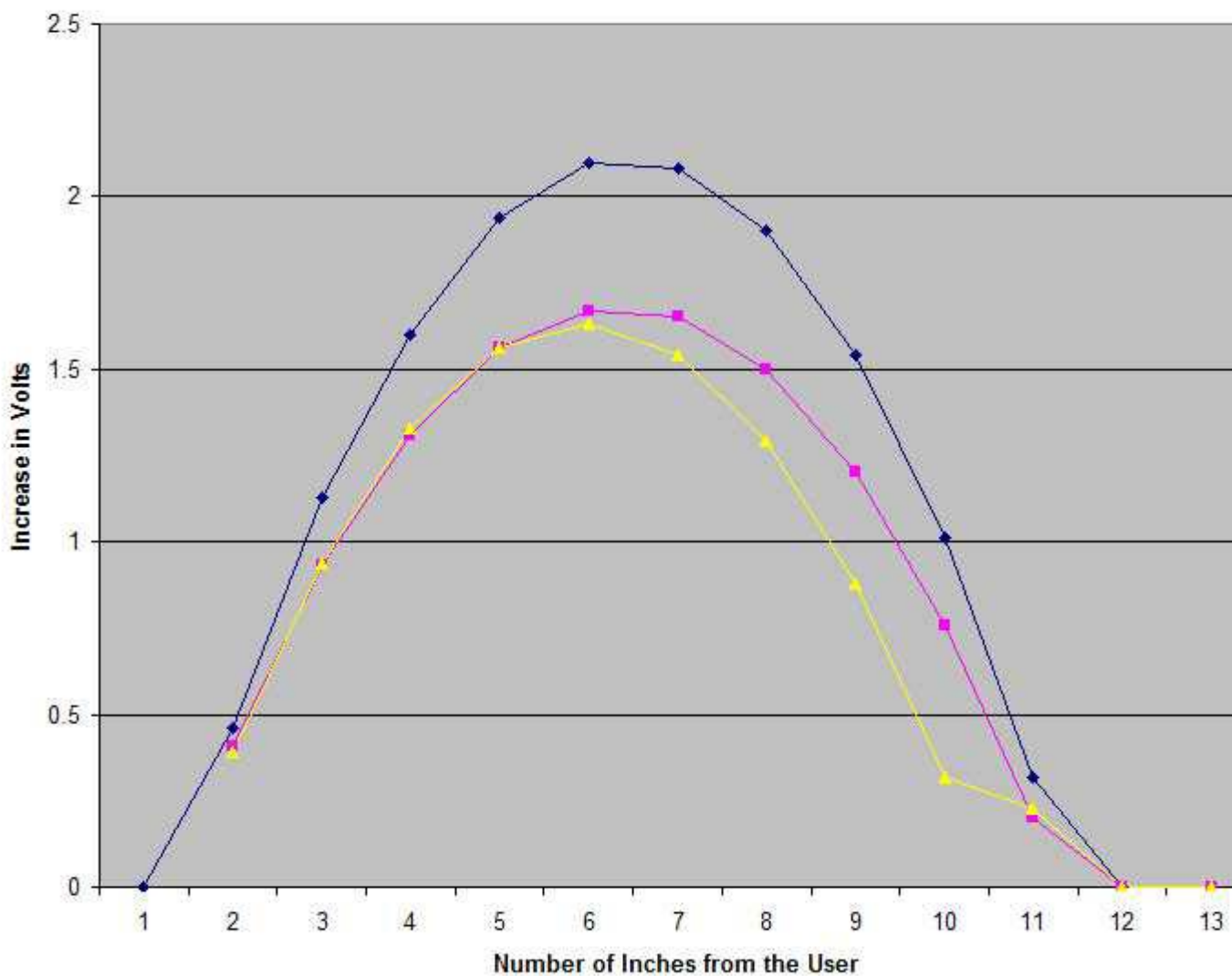
0.32

0.23

0

0

Comparison Between the Three Types of Magnifying glass



Full overview of the solar panels

0.46 0.41 0.39
 1.13 0.93 0.94
 1.6 1.31 1.33
 1.94 1.56 1.56
 2.1 1.67 1.63
 2.08 1.65 1.54
 1.9 1.5 1.29
 1.54 1.2 0.88
 1.01 0.76 0.32
 0.32 0.2 0.23
 0 0
 0 0