CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)
Luke A. Agajanian

Project Number
J0901

Project Title
Gauss Rifle: Magnetic Linear Accelerator

Abstract

Objectives/Goals
My project tested the velocity of a projectile based on the number of magnet stages used in a Gauss Rifle -- magnetic linear accelerator. I wanted to prove that the velocity of the projectile would increase as magnet stages increased.

Methods/Materials
A magnetic linear accelerator was built using Neodymium magnets and one half inch diameter, 8.4 gram nickel plated steel balls. Magnets and steel balls were placed onto a 4 foot wooden board with a groove in it. The magnets were secured to the wooden board. Two steel balls were magnetically attached on one side of each magnet. The experiment was performed with 2 magnets and the projectile velocity was measured using measured distance divided by time. The experiment was repeated for 3 through 8 magnet stages.

Results
By first performing the experiment with 2 magnet stages, I was able to determine the magnet spacing distance of 4 inches to produce the maximum velocity. A 4 inch magnet stage spacing was used when measuring velocities on magnet stages from 2 to 8. As the magnet stages increased, so did the velocity of the Gauss Rifle.

Conclusions/Discussion
My hypothesis was correct. With more magnet stages in the Gauss Rifle experiment, the steel ball projectile had more kinetic energy and it traveled farther. This meant that the velocity was faster.

Summary Statement
This experiment tested the velocity of the Gauss Rifle as more magnet stages were added.

Help Received
My father and brother helped in measuring the distance the steel ball projectile traveled from the Gauss Rifle.

CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)
Arjun V. Balasingam

Project Number
J0902

Project Title
Smart Medicine Cabinet: Using Homemade Sensors, a Microcontroller, and a Laptop to Help Patients Take Medicines on Time

Abstract

Objectives/Goals
I invented a medicine cabinet to address a pressing problem our society is facing today. The population of older people in the U.S. is increasing rapidly, and as people grow older they develop memory difficulties. So, older people might forget to take their medications on time, or forget that they have already taken their medications. Consequently, they miss doses of medicines, or take overdoses. To solve this problem I designed and built an electronic system, which can be installed in a medicine cabinet to keep track of a person's intake of medications. The design criteria I followed included (a) low cost, (b) ease of use, (c) reliability, and (d) compatibility with different cabinet types, and medicine bottles.

Methods/Materials
My invention consists of three subsystems, (1) homemade sensors installed on the cabinet shelves, (2) a microcontroller which repeatedly checks the sensor voltages in a loop, to see if a medicine bottle has been picked up, and (3) a laptop computer which generates visual and audio instructions for the patient based on sensor information gathered by the microcontroller. In this project, I used (1) wood and other supplies, and tools to build the cabinet, (2) some resistors, wires, LEDs, and related electrical tools to build the circuits which were installed on the cabinet shelves, and (3) a microcontroller, a laptop computer and some free software development tools I downloaded from the internet to build the audio-visual user interface. I designed and built the final model, as well as two prototypes using my skills in woodworking, staining, soldering, electrical wiring, and Algebra 1.

Results
In my final system when a user picks up a bottle from the shelf, a sensor voltage will change from high to low. This is sensed by the microcontroller via its analog pins. The microcontroller then sends this information via a USB cable to the computer. The computer will check, and update a database of medicine dispensing events. Then the computer will issue appropriate audio and visual instructions to the user.

Conclusions/Discussion
The final version of my system met all of my design criteria. The cost was low because I built inexpensive homemade sensors. My final version as well as the two prototypes were functional, but I used the lessons I learned while making my prototypes to refine the ease of use, and reliability of my final system.

Summary Statement
I invented a Smart Medicine Cabinet which assists people with taking the proper medications, at the proper times; this has the potential to decrease the cost of healthcare.

Help Received
I would like to thank my father, Dr. Pratheep Balasingam, for helpful advice, and Dr. Edgar Berdahl of the CCRMA at Stanford University for insights into interaction design. I would also like to thank my mom for purchasing the necessary materials for this experiment.

CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)
Will H. Baldwin

Project Number
J0903

Project Title
The Levitating Train

Abstract

Objectives/Goals
The goal of this experiment was to achieve the process of YBCO superconductors steadily levitating above a track of neodymium magnets when cooled using liquid nitrogen. Also test how much the amount of the liquid nitrogen effects the levitation height of two YBCO superconductors mounted on a small balsa wood box.(the train)

Methods/Materials
1.)Two 1# in diameter YBCO superconductors
2.)230 0.5###0.5##0.125## neodymium magnets (You can get 20 for $2.21 at CMS magnets.)
3.)One 1##1.5##0.125## STEEL sheet
4.)Liquid nitrogen (Available at most welding supply stores)
5.)One piece of 36###3###1/16## piece of Balsa wood
6.)Krazy Glue#
7.)Rubber Cement#
8.)Drawing Compass
9.)Measuring Tape
10.)A wide variety of tools including a Ban Saw

Results
Through the investigation, the average levitation height for the train was 4.9mm above the track, with the highest being 6mm, and the lowest being 3mm. The levitation heights showed that the amount of liquid nitrogen did effect how high. The train was able to stay steadily levitated above the magnetic track in a fixed position, but did have a little trouble on the turns. When the train would approach the turns too fast, it would fall off the track at the peak of the turn. The only way that the train would steadily go around the turns was to give it a slightly smaller push, so the train would approach the turns with less force allowing the magnetic field to hold onto the superconductors.

Conclusions/Discussion
The project turned out how I expected it to be. The train was able to steadily levitate above the track and slowly go around the track only by me giving it an initial impulse by hand. The amount of liquid nitrogen did greatly effect the height of levitation, but was very hard to measure due to the rapid evaporation of the liquid nitrogen. This shows that if scientists are going to one day make superconducting maglev trains that travel across cities, we will need to use incredibly strong track magnets and superconductors that will be able to hold the tremendous amount of weight of the train and passengers.

Summary Statement
The main point of this project was to achieve the mystifying task of floating a superconducting train above a track of neodymium magnets, and testing how the amount of liquid nitrogen effected the height of the levitation.

Help Received
My dad (Duff Baldwin) helped me lay the magnets on the steel board, and supervised me while using power tools and handling the liquid nitrogen.

CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)
Luc F. Bouchard

Project Number
J0904

Project Title
0 or 1: Who Knows?

Abstract

Objectives/Goals
Find out what an electronic adder is and how it works. I find the way computers add binary digits with an adder very interesting and I wanted to build one for myself.

Methods/Materials
First I designed my circuit using the PAD2PAD program on the Internet. Then, I printed out the circuit and ironed it on to a piece of copper. Then, I put it into a bath of ferric chloride and it ate away the copper not protected by the ink. Next, I wiped away the extra ink with acetone leaving the copper traces. I drilled the needed holes with a high-speed drill press. Finally, I soldered the components on the PCB.

Ferric chloride acid; Clothes Iron; Pencil; Double sided PCB copper; 2 74LSOO IC chips; Plastic Tupperware; Water; Stationary drill; .8mm drill bit; 2 100 ohm resistors; 2 470 ohm resistors; 2 LEDs 3mm; Laser Jet Printer; Computer; Saw; 4.5 volt battery pack; switches; toothbrush; Acetone; Powdered Bleach; Sponge; Sand Paper; Bread Board; Jumper Wires; Soldering Stand; Flash Light; Magnifying Glass; Multimeter.

Results
In the end, the PCB that I made didn#t work. When I tested the board with a multimeter I discovered the IC chip was read incorrectly. Since the PCB is a very important part of the experiment, I decided to recreate it on a breadboard. I got the breadboard version to work by making sure the chips faced the correct way. I used the circuit to add binary digits. I had to take more time to learn about the way the IC chip worked.
I learned that electronic devices are much more complex than I previously thought. I have gotten a better understanding from this experiment about how hard it is to design a circuit and get it to work. I learned to take more time to study the schematics and to make sure to make the circuit works on the breadboard before I solder it together. I don#t think I spent enough time making sure the circuit worked.

Conclusions/Discussion
In preparation for the County fair, I rebuilt the circuit again and this time got it to work correctly. I will be bringing all versions of my circuit at the State fair.

Summary Statement
I built a "half adder", which is the primary circuit that allows computers to do math

Help Received
Dad helped test and debug the circuit, friend's dad let me use his workshop and thought me how to use a drill press

CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)

Nicholas Denny; Jacob Zivonovich

Project Number

J0905

Project Title

Amazing Electric Currents

Abstract

Objectives/Goals

The purpose of this experiment is to find out which conductor works best with a rheostat dimmer, or more commonly known, a potentiometer. Scientific Question: What conductor works to light up a light bulb best? Hypothesis Nicks:I think that copper wire work best in this experiment Jacobs:I think that the silver cup will be the best conductor because it has the biggest size of all of the other variables and probably the most power.

Methods/Materials

Material list: Pencil, 6 volt battery, 2.4 volt bulb, 6 feet of insulated copper wire 2 paper clips, 2 tacks, 8 nails, 1 black board, Duck Tape, 2 1x6 pieces of wood 1 shoe box, Gold Ring, Silver Cup, Nickel 10 copper Wire

Method Part 1: 1.Straighten out two paper clips and at one end of each, form a loop somewhat smaller than the diameter of the bulbs base2.At the other end of each paper clip, make a tiny loop that will go around the pin of the thumbtack.3.Cut two 1 foot (30 cm) sections from the 6 feet (2m) of copper wire and scrape 2 inches (5cm) of insulation from the ends of these sections.4.Wrap four turns of the leaned off ends of one of these wires around the scraped thumbtack. Press this thumbtack into the center of the piece of wood. 5.Arrange the two paperclips so that both large loops are exactly above the scraped thumbtack in the middle.

6.Around one of these tacks, wrap the cleaned off end of the other wire too make contack with the thumbtack, and in turn, the paperclip.7.Place the bulb into the turned up loops of the paperclips at the center of the wood.

Part 2: 1.Split the pencil so that you expose the graphite interior.2. Attach the pencil to the second piece of wood.3.Cut the remaining four feet of copper wire into three equal sections. Strip the insulation from the ends of all pieces. 4.Attach a copper wire to the battery's other terminal. Then attach the other end of the wire to the graphite. 5.Move the unattached piece of wire along the length of the graphite to complete the circuit.6.Use the radiometer and box to record the number of seconds per revolution.7.Continue steps 4-6 using the other variables: gold, copper, salt, volcanic rock, silver and nickel.

Results

Silver produced the fastest Revolutions per seconds.It was shortly followed by the coin,followed by the Copper,and last came gold.

Conclusions/Discussion

The silver cup came in first which was followed by the coin, then the copper, and in last place was gold.

Summary Statement

My project is about Electric Currents, and how diffrent conductors effect the radiometer.

Help Received

Stephen Denny and Peter Zivonovich for cutting the boards

CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)
Mason E. Fordham

Project Number
J0906

Project Title
Optimal Coil/Core Geometry for Electromagnetic Accelerators

Abstract

Objectives/Goals
This experiment tested the relationship between coil and core length to achieve maximum velocity for electromagnetic accelerator applications.

Methods/Materials
Force as a function of core position in the coil was characterized by transferring the force on the core to a scale using a wooden plunger. Velocity was calculated from the measured force by approximating the acceleration to be piecewise constant by averaging each pair of adjacent data points. The tests were conducted for three coil lengths and a range of core lengths. Total wire length for each coil was held nearly identical, as was the resulting coil resistance, and therefore current in the coil.

Results
Overall, the longest core in the longest coil reached the highest calculated velocity of 98 m/s under the assumptions of zero friction and instantaneous current shut off. In the case of the shortest coil, the longest core also produced highest calculated velocity, but velocity vs. core length appeared to be at or near the maximum.

Conclusions/Discussion
However, for a fixed core length, the data set shows that the optimum coil length is a factor of 1.3 shorter than the core. This relationship will be used to design a multi-stage electromagnetic accelerator.

Summary Statement
The purpose of my project was to find the optimal coil/core ratio to maximize velocity in an electromagnetic accelerator.

Help Received
My father helped me use the drill press and the hand drill I used in this project and he explained to me how to derive velocity from acceleration. My mother helped me in the assembly of my board.

CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)
Miles D. Head

Project Number
J0907

Project Title
Guitar Pickups? That's a Wrap

Abstract

Objectives/Goals
I am testing to see if the number of wraps in the coil affects the volume of a pickup. I believe that as the number of wraps increases, so will the volume. My variables include the number of wraps and the volume. Some constants include strength of strum, placement of decibel meter and more. I made the pickups by winding them with a sewing machine. I fed the wire from a wood stand to the bobbin, which was attached to the side of the sewing machine with double sided carpet installation tape.

Methods/Materials
Materials: Cheap electric guitar to install test pickups on, guitar cable, guitar amplifier, decibel meter, reel of 42 AWG gauge copper wire, 3 plastic pickup bobbins, Alnico V magnets, lumber 1x2, 2x6, and 2x4, sewing machine, screws of various sizes, soldering iron and 60/40 rosin core solder, calculator, duct tape, masking tape, and carpet installation tape, clamps, and regular copper wire. I tested the pickups by putting a decibel meter in front am an amp, lifting strum machine and release. Next I recorded the volume on my record sheet. In my results as the number of wraps increased so did the volume.

Results
In my results, as the number of wraps increased so did the volume. The 5000- wrap pickup had an average of 87.6, the 6000-wrap pickup had an average of 87.7, the 7000-wrap pickup had an average of 95.1, and finally the control pickup (which I estimate to have 8000 wraps) had an average of 97.8.

Conclusions/Discussion
My hypothesis was correct because of this. I think the results of my project help anyone who wants to make their pickups louder or softer. You can also save money by doing it yourself instead of paying lots of money to guitar shops.

Summary Statement
I built and tested guitar pickups to see if the number of wraps in the coil affects the output volume.

Help Received
Parents supervised the winding of pickups, Dad supervised and assisted with soldering of pickups into the guitar.

CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)
Paul H. Lego

Project Number
J0908

Project Title
Secrets of a Digital Display: Boolean Logic in a Seven Segment Display

Abstract

Objectives/Goals
Computers, even simple ones in digital clocks and calculators, use binary arithmetic and need to convert binary, which most people can not read, to decimal. The purpose of my project was to use Boolean algebra, including truth tables, Karnaugh Maps and logic diagrams to create the logic to run a seven segment display that converts binary to decimal for the numbers 0-9.

Methods/Materials
For my experimental method, I:

1. Labeled each segment of the display a-g.
2. Drew what each digit (0-9) looks like on the display
3. Made a Boolean algebra truth table for each segment
4. Used a Karnaugh map to simplify each truth table to its Boolean equation
5. Using the Boolean equation, made a logic diagram for each segment
6. Following each logic diagram, breadboarded each segment using TTL logic and a 7-segment display.
7. Tested the outputs and troubleshooted, if necessary (it was necessary!)

My materials included a digital breadboard and lots of jumper wires, a very large LED seven segment display, 7400 Series TTL integrated circuits for the AND, OR, and NOT gates, switches and LED's for each of my 4 binary input variables, and a master switch, batteries and a 5V voltage regulator to power the circuit.

Results
I successfully used Boolean algebra equations to design the logic to convert binary into decimal using a seven segment display!

Conclusions/Discussion
The Karnaugh maps really helped me simplify the equations and the number of gates needed for each segment of the display. I also found that, by not putting an extra segment on the numbers 7 and 9, it simplified the number of gates you needed. Finally, since some segments shared common logic, you did not need to repeat gates.

Summary Statement
I used Boolean algebra to convert binary to decimal numbers shown on a seven segment display.

Help Received
My science teacher gave me suggestions; my dad taught me basic knowledge of the subject and helped do some of the wiring; my mother helped with the poster board layout

CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)
Anthony J. Martin

Project Number
J0909

Project Title
The Effect of Core Size and Wire Size on Electromagnet Strength

Abstract

Objectives/Goals
My objective is to find out the effect of core size and wire size on electromagnet strength.

Methods/Materials
A 20cm length of wire was wrapped 17 times around a nail. The ends of the wire were stripped to attach to a battery. One wire end was attached to the positive side of a battery, the other wire end was attached to the negative side of the battery. The nail was placed into a pile of 100 paperclips for 2 seconds, and lifted so that the number of attached paperclips could be counted. This was repeated 100 times with the thick wire (12 gauge) and then with a thin wire (14 gauge). Next the core size was tested by wrapping a 12 gauge wire, 17 times around a thick nail and connected to a battery as stated above. The nail was placed into a pile of 100 paperclips for 2 seconds, and lifted so that the number of paperclips could be counted. This procedure was repeated with a thin nail.

Results
The electromagnet with the thick wire (12 gauge) consistently held more paperclips than the electromagnet with the thin wire (14 gauge). The difference however was not a significant one. The electromagnet with the thick
core cosistently held more paperclips than the electromagnet with the thin core. For this portion of the experiment there was a significant difference.

Conclusions/Discussion
My conclusion is that the electromagnet with the thick core is stronger than the electromagnet with the thin core. Wire size did not make a significant difference in electromagnet strength.

Summary Statement
My project is about the effect of core size and wire size on the strength of an electromagnet.

Help Received
Father helped by teaching me how to strip the wire ends.

CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)
Justin R. Myers

Project Number
J0910

Project Title
Speed of DC Motors

Abstract

Objectives/Goals
The objective of my experiment is to determine if the speed of a five pole dc motor will change if the voltage is changed. I hypothesize that as I increase the voltage the speed of the motor will also increase.

Methods/Materials
I used 1 wooden dowel rod, 1 wooden board, 4 corner braces, enameled copper wire, 5 lag screws, 2 round slotted wood screws, 2 neodymium iron boron permanent magnets, 5 small pieces of brass shim stock, solid copper wire, a bicycle speedometer, 2 zip ties, a 1 inch ceramic magnet, double sided tape, a small piece of steel that weighs about the same as the ceramic magnet, small rubber tubing, a digital multi meter, and a dc power supply. Using these materials I built a five pole DC motor. Using the power supply I ran the motor at 10, 15, and 20 volts. With the bicycle speedometer I measured the speed of the motor at each voltage. I also recorded the current from the digital display of the power supply.

Results
My hypothesis was correct and the speed of the motor increased with the voltage. I also found that the current increases with the speed and voltage as well.

Conclusions/Discussion
I conclude that the speed of the motor increased with the voltage because increasing voltage increases the strength of an electromagnet which increases the attraction and repulsion between the poles and the field magnets thus causing the motor to spin faster.

Summary Statement
My project was to determine the speed of a DC motor depending on the voltage supplied to the motor.

Help Received
Father helped drill holes and solder wires

CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)
Todd G. Porter

Project Number
J0911

Project Title
Solar Charging Your iPhone or iTouch for Dummies

Abstract

Objectives/Goals
For my experiment, I asked myself this question: Can one or more solar panels be connected to produce enough energy to charge an iPhone in the same amount of time it would take to charge an iPhone from a USB port or an Apple Power Adapter? I predicted that if enough solar panels are configured in parallel, then the amount of energy generated should be equivalent to, or exceed the amount of energy produced by a USB port or an Apple Power Adapter.

Methods/Materials
To test my hypothesis, I created a solar panel iPhone charging circuit that allowed me to measure charge current for three parallel solar panel configurations. For each configuration, the theoretical charge time and the measured charge times were obtained. The theoretical measurements were taken to verify the validity of the calculated charge time derived from the measured charge current. The calculated charge times were then plotted against the USB port and Apple Power Adapter theoretical charge times to verify that the one or more of the solar panel configurations would produce enough energy to be equivalent or better than that produced by the a USB port or an Apple Power Adapter.

Results
My hypothesis proved to be correct. The triple solar panel experiment parallel configuration charged the iPhone in comparable time to the USB port and Apple Power Adapter energy sources. Although the experiment verified my hypothesis, the test results were not completely expected for the iPhone charging from an Apple USB Power Adapter. The power adapter should have produced twice the amount of charge current as the USB port, but did not, given the internal regulation in the iPhone charge circuit that limits the charge current to approximately 500 mA. Therefore, the USB port, the Apple Power Adapter, and the triple solar panel configuration, all charged the iPhone in roughly the same amount of time, because of the maximum charge current limitation. Given this limitation, if more solar panels were configured in parallel, the iPhone charging time would not decrease significantly.

Conclusions/Discussion
As result of this experiment, I learned that solar panels can be a very efficient method of charging an iPhone. The small solar panels that I used in the experiment provided an impressive amount of energy, and I was able to show that the triple solar panel configuration charged the iPhone in comparable times to the USB Port and the Apple Power Adapter.

Summary Statement
My science project verifies that if a sufficient number of solar panels are configured in parallel, then the amount of energy generated should charge an iPhone or Itouch in a less time than a USB port or Apple Power Adapter.

Help Received
On this project, I received help from my science teacher and my father. My science teacher provided insight throughout the project and my dad helped me with electrical concepts, taught me how to solder, and how to make a schematic using Microsoft Visio.

CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)

Iman H. Siddiqi

Project Number

J0912

Project Title

Effective RF Shielding with Partial Faraday Cages

Abstract

Objectives/Goals

My project was to determine whether an enclosure based on the Faraday cage principles can still be effective in reducing the strength of radio frequency (RF) radiation when it does not completely enclose a radio device.

Methods/Materials

I constructed three Faraday cages using metals commonly used for Faraday cages in electric shielding. I designed a transmitter to broadcast a 1000 Hz tone being played on an iPod Shuffle at a 1000 kHz carrier frequency. I set an AM radio to channel 1000 kHz to receive the signal, and connected an oscilloscope and multimeter to the radio's speaker to measure the voltage of the radio signal. I measured the strength of the radio transmission first without any barrier, then when the transmitter was fully enclosed in the Faraday cage, and then using 12 other varying configurations on the Faraday cage. I repeated each configuration experiment for three trials per Faraday cage material.

Results

Decreasing the Faraday cage enclosure configurations or shielding resulted in a progressively cleaner sine wave of the broadcasted tone, and a higher RMS voltage. I observed that signal blocking with a fully enclosed cage and one with only the top removed is about the same (90-100% shielding). I also observed that a three-sided enclosure can block approximately 85% of RF radiation, and that removing the bottom of a cage significantly increases signal strength, as compared to removing the top.

Conclusions/Discussion

My conclusion is that a partially-enclosing Faraday cage can be effective at reducing RF radiation and, additionally, that such cages can potentially directionally reduce RF radiation. My conclusion gives rise to the possibility of constructing practical solutions for reducing RF radiation exposure, including from mobile phones.

Summary Statement

Can an enclosure based on the Faraday cage principles still be effective in reducing the strength of radio frequency (RF) radiation when it is not completely enclosed?

Help Received

I conducted my experiment using lab equipment at the UCI Physics Lab. My uncle provided me with a diagram for my transmitter and helped me to construct it.

CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)
Nathan P. Storey

Project Number
J0914

Project Title
Gauss Gun: Multi-Stage Magnetic Linear Accelerator

Abstract

Objectives/Goals
To test and demonstrate the effects of magnetic acceleration

Methods/Materials
(1) 6 foot aluminum rail
(10) steel, 1/2 inch, ball bearings
(12) Neodymium, 1/4 inch magnets
Plastic tie wraps
Tape Measure
Eraser

Results
By allowing the first ball to be attracted to the first magnet, it set off a series of events that ultimately caused the final ball bearing to be shot off at increase velocity. I noticed that three magnets secured at 6 inch intervals launched the ball bearings the farthest. The best shot was the three magnets at six inches which shot the ball bearing 46 inches.

Conclusions/Discussion
I learned that magnetic propulsion is an efficient method of transportation. It is also more environmentally friendly than coal or petroleum. It can be scaled up to be applied to propel magnetic levitation trains. I have included a small scale example of a magnetic levitation train that could be propelled by magnetic acceleration.

Summary Statement
To test and demonstrate the effects of magnetic acceleration

Help Received
My father cut the aluminum rail and helpled build the mag lev train box. My mother helped draw on the display board.

CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)

Benjamin Yeh; Christopher Yeh

Project Number

J0915

Project Title

Prizefight Processors vs. Muscular Memory

Abstract

Objectives/Goals

This experiment tests the performance speed gains or losses in a computer between doubling the CPU clock speed and doubling the amount of RAM.

Methods/Materials

-One 2.8GHz AMD dual-core CPU -One 2.8GHZ AMD single-core CPU -One Compaq PC and one Self-Built PC containing the following: *Windows XP Pro, SP3 *WinZip 11.2 *MATLAB *Microsoft Office 2007 PowerPoint *Windows Defender *AppTimer *PC Boot Timer *One folder of 62,500 identical text files *One 12.9MB PowerPoint Presentation with 30 slides *One MATLAB script that records the time elapsed to run itself;

With the AMD single-core CPU and only one RAM module in each PC, run PC Boot Timer, AppTimer, Windows Defender, and MATLAB to observe the computers' startup times, file opening times, scan times, and data processing times. Repeat the tests two more times, and add one RAM module to each computer. Repeat the tests three times on the new hardware. Change the processor to the dual-core CPU and remove a RAM module. Repeat the tests three times on the new hardware. Rerun all of the steps two more times. A total of 216 tests should have been performed.

Results

Overall, the dual-core CPU hardware configuration was faster than the configuration with 2GB of RAM. This statement is true in most circumstances, with a few exceptions such as MATLAB tests on the Self-Built PC. On average, the dual-core CPU hardware configuration outperformed the configuration with more RAM by a range of 1.1% to 38.6%.

Conclusions/Discussion

The test results prove the hypothesis that "doubling the CPU clock speed is more effective in gaining computer speed performance than doubling the amount of RAM." This is most likely due to the methods that software use to access hardware resources. It can then be concluded that a computer system depends more on its CPU than RAM for most of its tasks. Third-party benchmark tests by ZDNet and Tom's Hardware support the results too, indicating that RAM upgrades often show minute improvement regarding a computer's performance. A further study of CPU and RAM upgrade options could include synthetic benchmarks, multitasking and multimedia tests. Super-scaling and cache sizes could be taken into consideration. All of the tests can help consumers determine the best upgrade to match budget and performance needs.

Summary Statement

This experiment compares the performance benefits between doubling the CPU clock speed and doubling the amount of RAM in a computer.

Help Received

Father helped buy parts.

CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)
Davina J. Zamanzadeh

Project Number
J0916

Project Title
Determining the Data Track Spacing on CDs and DVDs Using a Red and Green Laser Pointer

Abstract

Objectives/Goals
The conduction of this experiment is to prove that the data track spacing of a DVD is less than the data track spacing on a CD. Using this mark, researchers can compare the advancement rate in digital technology among other periods of time in history. Scientists and researchers will be able to compare the DVD to the CD with more information, and on a deeper level.

Methods/Materials
First a red laser pointer was used to measure the data track spacing on all of the CDs. Then a green laser pointer was used to measure the data track spacing on all of the CDs. A red laser pointer was used to measure the data track spacing on all of the DVDs. After that, a green laser pointer was used to measure the data track spacing on all of the DVDs. Finally all of the data track spacings were averaged and a result was concluded.

Results
The DVDs' data track spacing ended up to be smaller than the CDs' data track spacing. The average data track spacing on the DVDs was 766 nm,and the average data track spacing on the CDs was 1532 nm. This makes the data track spacing of the DVD exactly half of the data track spacing of the CDs.

Conclusions/Discussion
The average data track spacing on the DVDs was half the number of the average data track spacing on the CDs, thereby showing the hypothesis was backed by the data. The experiment will prove tha the data track spacing of a CD is greater than the data track spacing of a DVD. If using a green and red laser pointer to measure the data track spacing on CDs and DVDs, then the data will prove that DVDs have smaller spacing than CDs, because DVDS withhold a greater amount of information than CDs. In future testing, it would be recommended to realize how extremely difficult this project is and be able to take it head on, so it can b done neatly and carefully. Other follow up experiments could see if drawing with a sharpie over the CD/DVD will affect how the laser reads it.

Summary Statement
The conduction of this experiment is to prove that the data track spacing of a DVD is less than the data track spacing on a CD, which would be proven by measuring the data track spacing on the CD and DVD using a red and green laser pointer.

Help Received
Father helped understand trigonometry symbols.