CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Michael H.H. Beitman

Project Number
J0701

Project Title
How Does Exposure to Magnetism Affect Recorded Media Such as CDROMs, Videotapes, Zip Discs, Audiotapes and Floppy Disks?

Abstract

Objectives/Goals
I wanted to find out how magnets affected recorded media such as CDs, videotapes, Zip discs, audiotapes and floppy disks.

Methods/Materials
A weak magnet (1 pound pull), a medium magnet (5-8 pound pull), a strong magnet (35 pound pull), an audiocassette, VHS videotape, a CD-ROM, a Zip disc, a floppy disk, a tape recorder, a video cassette recorder, and television and computer with floppy and Zip and CD drives.

Results
The weak magnet had no effect on any of the media at any distance. The medium magnet only affected the cassette tape at a distance of ¼ inch and the videotape at a ¼ inch. The medium magnet had no effect on the floppy disk, zip disc and CD. The strong magnet affected the cassette tape at a distance of ½ inch and the floppy disc and the videotape at ¼ inch. The CD-ROM and the Zip disc were not affected by the strong magnet, or any magnet, at any distance.

Conclusions/Discussion
Electronic products are not as vulnerable to magnets as I thought. The CD-ROM is unaffected by magnetism. This was expected because it does not use magnetic recording to store information. I was wrong in my hypothesis about the Zip disc. Although it uses magnetic particles to store data, the Zip disc somehow was unaffected by even the strongest magnet when touching it. As I hypothesized, the other magnetic media can be completely erased by a magnet if it is strong enough and close enough to the media. However, they did not lose data until the magnets were very close i.e. ½ to ¼ inch away. So perhaps magnets aren't as dangerous to electronic products as people commonly think.

Summary Statement
The durability of magnetic media when exposed to magnetism at varying strengths.

Help Received
My dad took digital photos of me performing my tests. I could not find wooden blocks, so I asked my dad if he could obtain them for me.

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Kyle S.F. Boots

Project Number
J0702

Project Title
Robotic Control: Wireless Control of a Robotic Claw using Bend Sensors

Abstract

Objectives/Goals
The purpose of this project is to create a bend sensor glove that can control a robot over a long distance without wires connected between the two.

Methods/Materials
A Power Glove (with bend sensors in it), Wires and Shrink tubing (for re-wiring the power glove), Lego Mindstorms programming system, 2 Lego RCX bricks (miniature computers with infra-red sensors built into them), 2 motors, Lego bricks, Lego rods & gears, and tape.

Results
I was able to create this robot by using the two RCX bricks to communicate by sending and receiving infra-red messages. The messages were sent when the electrical resistance from the gloves bend sensors reached a certain level. These messages were converted to commands used to control the robot.

Conclusions/Discussion
My invention could be expanded to create robots controlled from one location, for use on the other side of the world. A bend sensor glove controller, like the one I built, would be useful when rescue workers need to search a collapsed building or when workers need to investigate in sewers and other places that are not easily accessible.

Summary Statement
To make a claw robot that can be controlled by a bend sensor glove, using infra-red signals instead of wires running between the two.

Help Received
Mom helped me buy needed materials. Dad taught me how to solder wire connections.

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
David G. Burban

Project Number
J0703

Project Title
Determining Air Pollution

Abstract

Objectives/Goals
My objective for this project was to find out if you can measure/detect air pollution by using a simple instrument, a laser and components you could get at radio shack.

Methods/Materials
I used a couple of resistors, a photosensor, a LM124 chip, and a Class II laser. After I build the device I turn the device on and record the "0 = " reading, then I turn the laser on and wait around 5-6 minutes until the reading is stable, and then I record the result.

Results
I found out that the device does detect changes in air pollution from one place to another. I have found out that Santa Monica and Pandora has the highest amount of air pollutants (A reading of 3.81). I also have found out that it is safer to breath in the Century City Shopping Center parking lot (A reading of 4.09) that in downtown (6th and Normandy)(A reading of 3.82).

Conclusions/Discussion
My conclusion is that you can use a simple device to measure air pollution. This could be used in a person's home that is allergic to pollution (e.g. asthma patient). It could be used in airports to determine if it is safe for a plane to land or go to the closest airport.

Summary Statement
My project is about using a simple device to detect and measure air pollution.

Help Received
Grandpa helped with the schematics. Mom and grandma helped with the board.

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Rebekah Cesmat; Pamela S.T. Stevenson

Project Number
J0704

Project Title
It's All Inside Solar Power

Abstract

Objectives/Goals
To show that it is possible to give light to a house that is not connected to a local Electric company.

Methods/Materials
We took pictures of a real solar panel at Mrs. Russell's house. We set up the wires, lights, and panels. We tested the house.
Wooden dollhouse.3 Solar panels.2 size D batteries.battery holder.12 light bulbs.1 ceiling fan. 4 switches. wires. Hot melt glue. solder. shrink tubing.

Results
The house was found to work fine on battery and ok on solar Power, Primarily from the batteries there is enough light to light the whole house at once. When the light is operating off the Solar panels primarily, then it gives enough power to run only one floor at a time at a reasonable brightness. If you turn three ligts on it is dim, and all the lights on, the the Solar power turns off.

Conclusions/Discussion
As a result we learned that conservation was required, and with wise use of our electrical devices the system could be used successfully.

Summary Statement
To show it is possible to give light to a house that is not connected to a local electric company.

Help Received
Neighbor-Kevin Bailey -electric arm light- Lance Stevenson-purchase supplies, solder where needed, attach and help install lights, and switches-attach Solar Panels- Tirzah Stevenson-Mom-help set up display-typed up application.

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Colleen C. Cross

Project Number
J0705

Project Title
Hidden Power

Abstract

Objectives/Goals
My goal was to build a generator (like Lord Kelvin's electrostatic generator) that runs on the power of falling water droplets, see if it worked, and see how long regeneration of the generator took.

Methods/Materials
An electrostatic generator was built by using 3 different sizes of cans (2 of each size), copper wire, Styrofoam, and clipheads. The generator was turned on and was grounded. While running, a light bulb was held to the generator to see if it would light. Also while running, regeneration times were tested.

Results
The electrostatic generator worked proving that a generator can be built that runs on the power of falling water droplets. 80% of the time the light bulb went on and produced light.

Conclusions/Discussion
Lord Kelvin first build his generator in the 1800's and many versions have been made since. With my generator, the length and power of the light is reflected on how much regeneration it had.

Summary Statement
There is energy and electricity all around us and we can put this electricity to good use.

Help Received
Father helped explain properties of some materials; Science teacher helped by correcting errors in the first draft of report.

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Jennifer Davis; Rochelle Flores; Deynira Tellez

Project Number
J0706

Project Title
Static Electricity

Abstract

Objectives/Goals
We wished to discover what materials we could rub with plastic strips to produce easily observed static charges. Our intention was to identify those materials that would produce the strongest charges.

Methods/Materials
We used scissors to cut 5 cm. by 20 cm. strips of plastic from a clear plastic report folder. These strips were rubbed with various materials and then checked for static charge. The charge indicator was a large paper clip standing upright in a walnut size piece of modeling clay. After rubbing, the plastic strips were brought near the paper clip. It was noted if the clip moved, or if there was an electric discharge. Each material tested was tested multiple times.

Results
Our measurements indicate that not all materials produce the same amount of static charge when rubbed with plastic. Some materials do not produce any charge that is detectable using our method of detection.

Conclusions/Discussion
Different materials produce different strengths of static charge when rubbed with plastic. We learned which materials of those tested we can rub with plastic to produce static charges measurable by our method and which ones of those tested produce the most static charge.

Summary Statement
Our project measures static charges produced by rubbing test materials with plastic strips.

Help Received
Our families provided project materials and encouragement. Mr Singleton provided opportunity for us to work together and direction on how to construct our display.

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Evangeline J. Fleischaker

Project Number
J0708

Project Title
Acoustic Thermometry

Abstract

Objectives/Goals
To build a circuit that will allow me to generate a sound signal at point A and time how long it takes to reach point B.

Methods/Materials
List of Materials- Equipment included an, Oscilloscope (HP 54501), a frequency counter, a power supply (+/- 12V) and breadboard, calipers, a large oven, a calibrated thermometer.
Major Electrical Components included are LM555 (oscillator), 4013 (flip-flop), 4098 (one-shot) Ultrasonic transceiver pair (Panasonic)

Method:
1) To build the circuitry to drive the piezo electric crystals. Build an amplifier to detect the pulse signal.
2) To characterize this devise and to assure myself that is functioning properly.
3) To calibrate it preform by looking at its response at different temperatures.

Results
The time required by the pulse to travel from the transmitter to the receiver decreased with temperature. That time decreased by approximately 10% over the temperature range between 20 and 80 deg C. Because the speed of sound at room temperature is approximately 335 m/s (750 miles/hour) the time to travel between the two sensors is very short and hence the further the two sensors can be placed apart the more accurately the measurement can be made.

Conclusions/Discussion
I was able to show that a simple device consisting of a matched pair of piezo electric ceramic crystals, a pulse generator, a transistor amplifier, and an oscilloscope to measure the time between the pulse and the response from the ceramic receiver could be used as an acoustic thermometer.

Summary Statement
I was able to show that a simple device consisting of a matched pair of piezo electric ceramic crystals, a pulse generator, a transistor amplifier, and an oscilloscope could be used as an acoustic thermometer.

Help Received
Used electronics equipment, calibrated thermometer, and large oven at Vista Biologicals Corporation

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Ian R. Girard

Project Number
J0709

Project Title
Fuel Cells: Power of the Future?

Abstract

Objectives/Goals
I did this project to test a simple hydrogen proton exchange membrane (PEM) fuel cell designed by the Schatz Energy Research Center. I wanted to show that the simple fuel cell works just like full-scale power fuel cells. I also wanted to show that the fuel cell could be run and tested in a junior high school classroom so that kids can learn about how hydrogen fuel cells work.

Methods/Materials
I assembled a PEM hydrogen fuel cell and tested it under different working conditions. Through my background research I found variables that should affect he current and voltage output of the cell. My variables were hydrogen pressure, airflow, moisture of the proton exchange membrane and compression of the fuel cell.

Results
Hydrogen pressure did affect the performance of the cell. The correlation between hydrogen pressure and current was almost -1. The correlation between airflow and current was -0.5. Compression made the biggest difference. The correlation was 1 based on estimated factors for compression. Moisture had a noticeable affect on the power output of the cell. The power output dropped about a half of a percent per minute if I didn't add water to the cell.

Conclusions/Discussion
My fuel cell did perform like the full-scale fuel cells for two of my variables, cell moisture and compression. My fuel cell results for hydrogen pressure and airflow did not compare well with full-scale cells.
My results did show that students can assemble and test simple fuel cells and there is a lot students can learn, I know I did.

Summary Statement
I assembled a proton exchange membrane hydrogen fuel cell and tested it under different working conditions.

Help Received
Received help from Schatz Energy Research Center in cell assembly and testing. My dad helped me with the backboard.

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Kendra Hansen; Katelyn Yoder

Project Number
J0710

Project Title
Hydrogen: A Future Fuel Source? At Home Solar Panel Efficiency in Electrolyte Hydrogen Production for Fuel Cell Autos

Abstract

Objectives/Goals
The objective was to determine if the electrolyte hydrogen production through the use of solar panels was an affective and affordable way to produce energy at home for the hydrogen fuel cell powered automobile.

Methods/Materials
A 13"x14" solar panel and a 4"x12" solar panel were tested 10 times simultaneously by using two Hoffman Electrolysis Apparatus to find out how much hydrogen was produced by each panel in 30 minutes. Because the 13"x14" solar panel is 2.8 (280%) times larger than the 4"x12" solar panel, we compared the results of the 10 trials to determine if the comparative hydrogen production outcome of the two panels was within the vicinity of 280%. Mathematical calculations were then used to determine the number of solar panels needed in approximately a 24-hour period to produce 31.1 gallons of hydrogen at 3,000 psi for use in the fuel cell hydrogen powered automobile.

$$v2 = \frac{(3{,}000 \text{ psi})\ (31.1 \text{ gal})}{14.7 \text{ atmospheric pressure}} = 6{,}347 \text{ gal} = 23{,}951 \text{ Liters}$$

Results
The 13"x14" solar panel produced .042 liters of hydrogen per 30 minutes, whereas the 4"x12" solar panel produced .016 liters. The results indicate that the larger solar panel produced 268% more hydrogen than the smaller panel in 30 minutes. Due to these results being 96% accurate to our 280% goal, we used this data for mathematical calculations. Using the average of .042 liters of hydrogen per 30 minutes, we multiplied these results by 10,000 and found that at 420 liters per 30 minutes it would take 395 solar panels of 4'x8' size a little over a day to produce 31.1 gallons of hydrogen at 3,000 psi.

$$\frac{420 \text{ Liters}}{.5 \text{ hour}} = \frac{23{,}951 \text{ Liters}}{X \text{ hours}} = 28.5 \text{ hours} = 1.18 \text{ days}$$

A 1300"x1400" Solar Panel = 1,820,000 sq. in. = 12,639 sq. ft. = 395@4'x8'

Conclusions/Discussion
Through the use of solar panels, hydrogen can affectively be produced at home through electrolysis. Is it affordable? No. At home the general public cannot afford to purchace, install, and maintain 395 solar panels of 4'x8' size.

Summary Statement
Hydrogen was produced by connecting 13"x14" and 4"x12" solar panels to two Hoffman Electrolysis Apparatus to determine if this is a affective and affordable way to produce energy at home for the hydrogen fuel cell powered automobile.

Help Received
Paul Evert RV Comapny loaned us 2 solar panels; Mother helped by driving, editing, and typing; Science Teacher helped in mathematical calculations, asking questions, and creating solar panel testing board.

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Briana C. Howard

Project Number
J0711

Project Title
Somewhere Under the Rainbow! The Effects of Angle, Elevation, and Type of Light on the Efficiency of Solar Power Cells

Abstract

Objectives/Goals
My project was to determine if the angle, elevation, or type of light striking a solar panel would affect the output of the panel.

Methods/Materials
I used a solar panel from a K-NEX kit and a digital volt meter. I designed a stand for the panel and a ferris wheel to measure RPM. To measure angles in 15 degree segments I used wood to build an apparatus with an adjustable dial. Lighting gels and a lamp were used for different types of light. Multiple readings were taken and averaged for variables of angle, elevation, and light. Sunlight readings were taken at midday between 11AM and 2PM.

Results
My data showed the optimum angle for a solar panel is 90 degrees, with the best range between 45 and 135 degrees. Sunlight performed better than any colored or artificial light. Elevation increased output, but with a narrower range of performance. Readings at 1000' in the San Fernando Valley were lower than sea level, possibly because of pollution. In comparison of volts to RPM, RPM remained fairly constant until volts dropped below motor requirements.

Conclusions/Discussion
My hypothesis was correct. Angle, elevation, and type of light do affect the efficiency of solar panels. The results show the importance of location and proper installation of solar panels. Also, the effect of pollution on some results shows the effect a clean atmosphere has on the purity of sunlight and solar energy.

Summary Statement
My project is about achieving the highest efficiency from solar power and the importance a non-polluted atmosphere has on solar energy.

Help Received
My mom helped with typing and cutting for the display. My dad supervised the building with power tools and did the driving. He also advised on making computer charts and graphs.

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Brendan C. Jonesrebandt

Project Number
J0712

Project Title
What Interval Timing Is Best for an Electromagnetic Propulsion Device?

Abstract

Objectives/Goals
I found out that the Superman ride, at Magic Mountain, was powered by electromagnetic propulsion. I built an eletromagnetic propulsion device that worked the same way. I wanted to find the optimal timing interval of the electronic pulses for the propulsion device. My hypothesis was the longer the pulse the further the object will travel because it will have the most time to build up speed.

Methods/Materials
I built several models using magnet wire coils and various power sources, propulsion objects, and timing variations. For my final model I had a soup can with segments of tape determining when the brushes touched the can and made a connection. The power source was a car battery.

Results
A nail somewhat longer than the coil worked the best as the propulsion media. The furthest I got the nail to travel was over 8 feet. I got a lot of travel from the nail when I had 4 coils that were sequentially timed. With one coil that was very well timed you could shoot the nail nearly as far as you could with four coils that weren't timed very well. Adding each additional coil required the timing of it's pulse to be relative to the coils sequentially before the new coil. Adjusting the interval between the pulses became more and more difficult as additional coils were added.

Conclusions/Discussion
My hypothesis stated that the longer the pulse, the further the object would travel. This was true only up to a certain point. The object did move very quickly if the pulse was elongated, but after I reached a certain pulse length, it began to slow the object down because it would pull the nail back into the magnet. Also the length of the pulse had to be adjusted relative to which coil it was in the sequence.

Summary Statement
Perfecting the interval timing of an electromagnetic propulsion device.

Help Received
Mother bought backboard and proofread my papers; father let me use his tools and gave me some expertise; a friend helped me perform experiment.

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Wayne J. Karim

Project Number
J0713

Project Title
How Do Different Batteries Affect the Power of a Simple Motor?

Abstract

Objectives/Goals
My goal is to determine what effect various batteries have on a simple motor. My theory is that this will be decided by their various voltages and current outputs. It will also need to be determined which battery offers the best performance overall with respect to factors such as coil weight and size, battery voltage or current on our simple motor.

Methods/Materials
This project begins with the construction of a simple motor consisting of magnets, a coil of wire, and different batteries. The motor works by placing a magnet under the coil of wires. When electrical current is then passed through the wire, a magnetic field is created around the coil which is repelled by the magnets under the coil and causes the loop to flip over. The wire is only stripped halfway so that the wire loses electrical contact once it completes this half turn. The inertia of the first turn helps it complete a rotation. This then repeats the cycle and henceforth the coil spins. This simple motor is then powererd by different batteries with various voltages and currents. The C, D, AA, AAA, 6V and 9 V batteries were used. The amount of turns resulting from the spinning was then counted by an odometer.

Results
The 6V battery proved to provide the greatest power and henceforth turned the coil on the motor the fatest. The AAA battery provided the least amount of power.

Conclusions/Discussion
Based on the data collected the 6V battery optimized the motor's performanace compared to all the other batteries. Voltage alone did not win this contest, as I had initially suspected. It was the combined product of current and voltage. This is why the 6V beat out the 9V battery and also why the 1.5V D battery beat the 1.5V AAA.

Summary Statement
Project is about construction and theory of simple motors and relationship of voltage and current with respect to power.

Help Received
Father helped with electrical connections and mom gave suggestions for layout of board.

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
E. William Kintzele, IV

Project Number
J0714

Project Title
Lights On, Lights Off: Energy Conservation with the L.M.T.

Abstract

Objectives/Goals
To find a way to consistantly save energy in domestic applications, by using an invention that consists of a light sensor, motion detector, and timer.

Methods/Materials
A motion detector, light sensor, and timer, with both AC and DC components, were circuited together to form an energy saving invention. The final result of the invention, the L.M.T., was then wired to a light in five different rooms. The amount of time that the light was on with and without the invention was recorded by using a video camera, and then documented to find whether or not the invention saved energy.

Results
The L.M.T. invention saved from 40% to 10% of the amount of energy that was being used. In areas with heavier traffic, the result was less conservation, but, in areas with low traffic, the energy conservation was much higher.

Conclusions/Discussion
By using the L.M.T. in domestic lighting and possibly heating/cooling applications, one could save up to half of the energy being used. An example of a possible heating/cooling application that this invention could be used in, is the thermostat, which is always on, even when the owner is on vacation.

Summary Statement
This project is an attempt to conserve electricity by using a light sensor, motion detector, and timer.

Help Received
Dad helped teach how to solder and teach basics of circuiting.

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Asmita Kumar

Project Number
J0715

Project Title
Comparison of Photovoltaic Effect in Silicon and Natural Dye Based Cells using Different Light Sources

Abstract

Objectives/Goals
The objective is to compare the performance of home made natural dye based organic photovoltaic devices with commercial inorganic silicon based photovoltaic devices in sunlight and colored artificial light.

Methods/Materials
Chlorophyll and anthocyanin organic dyes extracted from citrus leaves, raspberries and blackberries were absorbed onto nano-crystalline titanium dioxide coated on conducting glass slides. Photovoltaic devices were made with an iodide/triodode electrolyte separating a graphite coated conducting glass slide from the dye coated slides. The voltage and current characteristics were measured in sunlight and colored artificial lights and compared to those observed for commercial silicon based photovoltaic devices.

Results
The open circuit voltage (OCV) for anthocyanin based cells in sunlight averaged 371 mV and the short circuit current (SCC) averaged 0.43 mA/cm2 and the maximum power in sunlight was 0.03 mW/ cm2. The average sunlight OCV for chlorophyll dye cells was 451 mV. The average SCC was 0.21 mA/cm2 in sunlight providing maximum power of about 0.015 mW/ cm2. The silicon photovoltaic devices provided an average 380 mV open circuit voltage (OCV) and 6.6 mA/cm2 short circuit current (SCC) and average maximum power was 1.37 mW/cm2 in the sun.

Conclusions/Discussion
Organic dye based photovoltaic cells can be made at home using chlorophyll and anthocyanin dyes. These cells capture energy from sunlight and indoor light of sufficient intensity. Commercial silicon cells are considerably more efficient than the home-made photovoltaic devices.

Summary Statement
Natural organic dyes can be used to make home made cells for the capture of solar energy.

Help Received
Dr. Greg Smestad, creator of the dye-sensitized solar cell kit, provided tips by e-mail. Mr. M. P. Reidy gave conductive glass plates. Applied Films sent heat shield glass and Drs. Kaustav and Sonali Das gave Triton X 100. Mother took notes during outdoor measurements. Father helped wire the circuit board and

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Matthew A. Lessig

Project Number
J0716

Project Title
Are Electromagnetic Guns Practical?

Abstract

Objectives/Goals
My project objective/goal was to learn more about electromagnetism and the practicality of electromagnetic guns. My hypothesis is that electromagnetic guns are practical.

Methods/Materials
Several different prototype guns were built. All of the results are based on the latest prototype. All of the prototypes had the same basic structure. There is a barrel, a solenoid, a micro switch, a fire switch, and a battery. There are also other mounting parts but they do not affect the gun. The results were determined by doing two trials of the same procedure. In each trial I fired the gun and then my father would measure the distance the projectile flew. I recorded this then I checked the voltage of the battery. I recorded the voltage, reconnected the wires, fired the gun again and repeated the procedure. There were ten fires in each trial. The battery was recharged between trials. Based on the distance the projectile flew, the velocity was calculated.

Results
The final prototype worked reasonably well but not as well as I had thought it would at the beginning of the project. The projectile flew between 27 and 36.50 inches. The velocity of the projectile was between 3.5531 and 4.8032 miles per hour. Those figures are between both trials. I was expecting better results but this are pretty good.

Conclusions/Discussion
As I stated in my results I was expecting better results but they are still good. Based on my research, experimentation and the results of the project I believe that there is a bright future for electromagnetic guns. Right now I do not think that they are practical but I do think that someday electromagnetic guns will be practical.

Summary Statement
The goal of my project is to study the practicality of electromagnetic guns, and learn about electromagnetism

Help Received
My mother helped me with my presentation board, and report. My father helped me with the presentation board, report, building the device, and experimentation.

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Sean C. Locko

Project Number
J0717

Project Title
Upgrading Your Computer's Performance: What Works Best?

Abstract

Objectives/Goals
My objective is to determine the best electronic upgrade for a computer. I want to improve my computer's performance instead of buying a new one. My hypothesis is that installing faster processor (CPU) is the best performance upgrade rather than adding memory which most experts recommend.

Methods/Materials
I used one computer, three chips of memory, and two AMD K6-2 processors. The SDRAM memory chips were 32Mb (megabytes), 64Mb, 96Mb, and 128Mb. I combined the 96Mb and the 32Mb to make the fourth memory size of 128Mb. The CPUs that I used were 350mhz (megahertz) and 550mhz. Megahertz measures how many million cycles the computer can process per second. I tested each of the CPUs with the four different combinations of memory to determine the best performance. I used the Internet to search for the best benchmarking programs to download to my computer. A benchmarking program gives you an overall score for your computer. After I downloaded them I loaded them on my computer and ran the tests. Each time that I ran a test, I had to take apart the computer and find the slots to insert the memory chips or CPU. I timed how long it took the programs (game and Microsoft IE browser) to load up, and then I recorded the results.

Results
My results showed that the computer performed better by installing a higher mhz CPU, rather than by adding more and more memory. The tests I finally used measured the computer's speed and time to load up programs. My results showed the computer actually slowed down and took longer to load when I put in higher amounts of memory. The new CPU was the best upgrade because it made the computer run faster, and showed the most improvement in the computer#s performance.

Conclusions/Discussion
My conclusion proved my hypothesis correct. Rather than buying a brand new computer, the best way to get increased performance from your existing computer is to install a faster CPU, rather than keep increasing the amounts of memory. My research books all stated that you can never have too much memory, and my project proved these theories to be incorrect. You can have too much memory, and it can slow down your computer. I also learned that benchmarking programs are not the best and only way to test your computer's performance. You can test it's performance better using a few simple applications and timing how long it takes for them to load and run.

Summary Statement
My project determined the best way to upgrade a computer#s performance by comparing the results of installing faster CPUs and adding combinations of more memory.

Help Received
My teacher, Mr. Kuhn, made sure I followed the rules and reviewed my project. I learned how to install CPUs and memory from the Internet, and my Dad helped me learn how to use Excel software.

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Samir Mehrotra

Project Number
J0718

Project Title
Search for the Sun

Abstract

Objectives/Goals
The purpose of my project is maximizing the efficiency of a solar panel. This is achieved by being able to have a tracking system that can always calculate the location of the sun from any place on earth at any time. My science fair project is a combination of programming and mechanics. I have completed the development of the solar-calculator software and will demonstrate mechanical control of the solar panel.

Methods/Materials
The programming part of my project has been done in the language called Scheme. I wrote and debugged over twenty programs and 3 structures to build my software solar-calculator. The software program takes in the date of a particular day, the time, the standard longitude of the area, the longitude of the city, and the latitude. The program will output the Azimuth location and the Altitude of the Sun. This information is fed to stepper motors that can move the solar panel to make them always perpendicular to the rays of the sun. The program also outputs the Sunrise Angle so that the stepper motor can be reset to the sunrise for the next day. Materials include:
1. Laptop
2. Dr. Scheme (software)
3. Voltage Meter
4. Soldering Iron
5. Solder
6. 2 Bread Boards
7. 30 Reinforced Wires
8. 2 Stepper Motors
9. Parallel Port
10. Internet
11. Resistors

Results
My program works as it was designed. I have verified that the results of my program with visual observations of the sun.

Conclusions/Discussion
In conclusion, my project has a large potential for further uses and work. This method can be used to improve efficiency of solar panels.

Summary Statement
My project tracks the location of the sun, maximing the efficiency of solar panels.

Help Received
My mentor helped me with my programming, my mother proof read my report, my father helped and taught me how to solder

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Patrick D. Mobley

Project Number
J0719

Project Title
Electrostatics: Dirod Enhancement

Abstract

Objectives/Goals
My goal is to make the dirod, an electrostatic generator, the most effective it can possibly be. The first step that I took towards this goal was to test the rod material to try to improve it by testing different metals. The most effective will replace the previously used rod material, and I will continue my goal.

Methods/Materials
I constructed a dirod out of what materials I could find and began testing. I tested aluminum, brass, and copper rods to a total of 10 trials each. I chose these metals because they are commonly used in generators and electric appliances. I tested the materials by running the generator for exactly 15 seconds with a 6mm spark gap. After testing them, I gathered my results.

Results
The material brass, was the most effective at creating sparks in a given amout of time. Aluminum performed the worst but still aquired a good number of sparks.

Conclusions/Discussion
My conclusion is that brass is the most effective rod material for the dirod. Also, by comparing rod prices, I figured out that brass is also the most expensive.

Summary Statement
My project is about testing and observing different rod materials to make the most effective dirod.

Help Received
Dad helped build dirod; brother helped with graphs.

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Stefan R. Owechko

Project Number
J0720

Project Title
Are More Cell Phone Towers Needed in Newbury Park?

Abstract

Objectives/Goals
The Thousand Oaks Planning Commission approved putting 12 cell phone antennas from Sprint and Cingulair on the Orbis water tank on one of the hills behind my house. I wanted to see if we really need more cell phone antennas. I also wanted to see if we currently have adequate coverage, and if not, which areas of Newbury Park have the weakest coverage. I believe that Newbury Park does need more cell phone antennas, but maybe not in that particular spot.

Methods/Materials
To test my hypothesis, I used three cell phones, from Sprint, Verizion, and AT&T. I went to 110 pre-determined spots in my city surrounding the water tower, and measured the signal strengths of all 3 phones at each spot. I then recorded the strengths on a spreadsheet in Microsoft Excel on my computer at home. Then, I used Matlab (a computer program that uses formulas to perform difficult math-based tasks) to plot the strengths on a color-coded map.

Results
My results were that Sprint, with an average of a 43% signal strength throughout the city, had the worst coverage out of the three phones. Coming in second was Verizion, with an average of 83% strength. Last, AT&T had the best coverage, with an average 94% strength throughout the city. As a whole, all the signals are unmistakably worse south of the water tower. The only point where any of the phones reached zero was in one area about the size of a street block, directly south of the water tower. In this spot, there are two points where Sprint dropped to zero coverage.

Conclusions/Discussion
In conclusion, I believe that the proposed towers are needed, but not where they are proposed to be. If they are put on the water tower, they will face and direct their signal northward. I believe they would cover more of the city if they are placed in an area south of the water tank, where we need them the most. Therefore, my hypothesis is correct.

Summary Statement
My project is to see if Newbury Park really needs a group of proposed cell phone antennas, which I tested by taking signal strengths around my city with three different phones in 110 different locations.

Help Received
My parents drove me to the 110 locations, my father taught me how to use Matlab, and my neighbors lent me their cell phone.

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Aden H. Rogerson

Project Number
J0721

Project Title
Incandescent vs. Fluorescent Measuring Amperage and Heat

Abstract

Objectives/Goals
I wanted to find out how much electricity will be saved if fluorecent light bulbs are used for lighting instead
of incandescent bulbs. I also wanted to find the out the diference in heat out put between the two kinds of bulbs.

Methods/Materials
I used a amp. meter to measure curent flow at 120 volts. I used the formula amps x volts = watts to measure
total electrical consumption. I used an Igloo ice box, with a volume of 1,105 cubic inches. I used a thermometer
to measure temperature change, also a drop light for a portable lamp.

Results
I found that the 75 watt incandescent produced a 80 degree rise in temperature with in the igloo 30 minutes and it used .6 amps. The equivalent fluorescent bulb produced a 20 degree rise in tempature and used .1 amp. The 60 watt incandescent bulb produced a 60 degree rise in temperature and used .4 amps. The equivalent fluorescent bulb produced a 15 degree rise while only using .1 amps. It should be noted that the amp meter would register no lower than .1 amps. However the 75 watt equivalent fluorescent bulb measured slightly more than .1 amps so I feel the measurement is accurate.

Conclusions/Discussion
Flourescent bulbs are more energy efficient and produce less heat than incandescent bulbs. However it would appear that flourescent bulbs produce more heat per .1 amp used . But since they use less amps for equal light output they produce less heat. My experiment shows that every .1 amps produces a16 degree rise in the given volume of air, from the results of the 75 watt incandescent bulb. The 60 watt incandescent produced a 15 degree rise per .1 amp . The 75 watt fluorescent equivalent produced a 20 degree rise from .1 amps. From this last result we can deduce that the 15 degree rise from the 60 watt equivalent fluorescent would mean that it would consume 25% less amps than the 75 watt equivalent fluorescent, or .075 amps. The difference in amperage use between the 60 watt incandescent and the fluorecent equivalent would then be .325 amps, or 18 degrees per .1 amp. Thus more heat was produced per .1 amp from the fluorescent bulbs.

Summary Statement
Comparing the heat produced and electricity used between incandescent and fluorescent light bulbs.

Help Received
Teacher helped paste information on poster board.

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Yuvaraj Sivalingam

Project Number
J0722

Project Title
Air: It's Shocking!

Abstract

Objectives/Goals
My project was to determine the characteristics of both the Solar and Methanol Fuel Cells and find out if the Solar Fuel Cell was more efficient than Methanol. I believe that the Solar Fuel Cell will be better because it receives unlimited energy from the sun and is much cleaner than Methanol.

Methods/Materials
The power characteristics of both the Direct Methanol Fuel Cell and the Solar Proton Exchange Membrane Fuel Cell were determined using variable output resistance loads and using multimeters to measure the output voltage and current. The Solar Cell was connected to the Electrolyzer to produce the Oxygen and Hydrogen from distilled water needed to produce power at the Fuel Cell. The Direct Methanol Fuel Cell was injected with 3% Methanol. The power input to the Solar Cell and the power output by the Solar Fuel Cell were measured using the multimeters which gave the efficiency of the Solar Fuel Cell. The Direct Methanol Fuel Cell was weighed at the start and at the end to note the amount of Methanol consumed, and its energy is compared to the output energy from the Fuel Cell using voltage and current readings against time to obtain the efficiency. This was repeated for each Fuel Cell at different resistance loads. Using a stopwatch, the time was noted for the fuel cells to start producing power and then cease to produce power. This gave the ramp up and decay time.

Results
The efficiency readings of the Solar Powered Fuel Cell at between 7.51% to 36.42% were higher than the Methanol Fuel Cells# readings at 5.45% to 18.36% for both HHV and LHV. However, Methanol efficiency was higher than that of the Solar Fuel Cell at resistance loads 10 and 33 Ohms. They both had excellent power ramp up times of 1 second. The Solar Fuel Cell continued to produce power for 16 minutes after the fuel source was removed, while Methanol produced power for 1065 minutes with 1 gram of Methanol injected.

Conclusions/Discussion
The experimentation proved for the most part that the Solar Powered Fuel Cell was more efficient than the Methanol Fuel Cell, except between the output load conditions of 10 to 33 Ohms. The efficiency readings are high given the fact that the Fuel Cells used were small energy producing units as such with high internal resistance. The power producing response for both Fuel Cell types was very quick at 1 second and both kept supplying power even after the fuel sources were depleted.

Summary Statement
To find whether the Solar Powered Proton Exchange Membrane Fuel Cell or the Direct Methanol Proton Exchange Membrane Fuel Cell is more efficient.

Help Received
Father helped make Methanol Solution

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Max Terry

Project Number
J0723

Project Title
AA Alkaline Batteries: Capacity Testing

Abstract

Objectives/Goals
My objective was to find out which brand of AA alkaline batteries lasts the longest under a fixed load. My hypothesis was that the Energizer Advanced Formula brand would last the longest because their commercials always say they do.

Methods/Materials
I created a test circuit which included a battery holder, a precision resistor, and an on/off switch. I repeated the circuit 18 times. My procedures were: I measured each battery every half an hour for two hours. Then turned off all the switches and repeated the same process 24 hours later. I did this for seven days. Lastly, I graphed the data.

Results
13 out of 17 brands performed about the same. The other 4 did poorly. Of the 4 that did not do well, two of the brands were "heavy duty" batteries.

Conclusions/Discussion
- My data did not support my hypothesis. The Energizer Advanced Formula brand battery preformed only average (about the same as most of the other brands).
- One of the cheapest batteries, the Safeway Select brand, did as well of the Energizer Advanced Formula.
- There is no relation in how well the batteries did and their price.

Summary Statement
It is about AA battery life spans.

Help Received
My dad helped guide me to build my circuits.

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Niclas A. West

Project Number
J0724

Project Title
Does a Solar Panel Do Better under Different Conditions?

Abstract

Objectives/Goals
The objctive of my project is to deterime what conditions a solar panel will do best in.

Methods/Materials
4 different colored plastic sheets identical in size and shape were placed over a solar panel that was collecting light from a lamp. The lightbulb that I used was a 60 watt lightbulb, and also, for the heat variable, I used a 120 watt lightbulb. To get how volts the solar panel produced I hooked a voltage tester up to the solar panel.

Results
In my project I found that the heated variable produced the most volts. The controlled variable produced the second to the most volts, and the filtered variable produced the least amount of volts.

Conclusions/Discussion
My conclusion is that, the different climates that you put a solar panel in is important if you want to get the maximum voltage out of it.

Summary Statement
My science project is about how different climates affect a solar panel.

Help Received
Mother,Father,Grandfather

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Ian Y. Wong

Project Number
J0725

Project Title
Resistance and Resistivity

Abstract

Objectives/Goals
My objective was to study the resistivity of different types and sizes of leads. I also determined the resistivity of certain beverages relative to water.

Methods/Materials
1 multi-meter, 1 potentiometer, 1 Lego setup, 1 AA battery, 10 wires, 0.3 mm-0.9 mm leads of different types, traditional pencils, known resistors, and beverages.

Construct the Wheatstone Bridge consisting of two(one) given resistors, the potentiometer, and the lead(beverage). Adjust the potentiometer until the galvanometer reads 0, and then measure the resistance of the potentiometer. Repeat five times for each type of lead.

Results
a.) The resistivity of the mechanical leads did not follow a clear trend for the lead types, but the resistance clearly got larger as the thickness decreased.
b.) The resistivity of sour drinks was among the lowest of the beverages tested.

Conclusions/Discussion
a.) For the mechanical leads, the resistivity did not appear to relate unambiguously with the hardness, whereas for the traditional pencils, resistivity increases with hardness. The skinnier the lead, the larger the resistance.
b.) The acidity in a beverage substantially reduces its resistivity relative to water.

Summary Statement
This project studied the relation between resistance and the properties of leads and beverages.

Help Received
Father helped buy all the leads and resistors for this project.

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Michael Wong; Tiffany Wong

Project Number
J0726

Project Title
Wind Power: The WONG Way

Abstract

Objectives/Goals
The purpose of our project was to prove that various sizes and numbers of windmill blades will have an effect on rpm (revolutions per minute), milliamp power, and voltage change. There are various speeds of winds; therefore, it is important that we test the various types of windmill blades to get an accurate reading to prove our hypothesis.

Methods/Materials
A testing unit was designed and built to gather data from various types of windmill testing. We assembled windmill blades in various sizes: 12 cm, 15.2 cm, and 17.8 cm. Blades were also assembled in various numbers: 2 blades, 4 blades, and 6 blades. The first test was conducted with an electric fan producing wind at three different speeds to turn the windmill blades, then rpm measurements are taken with a tachometer. The second test was run by using a constant power supply (a motor and battery) to turn the windmill blades, then take rpm measurements. The third test was run by using an electric DC motor and artificial wind source to measure milliamp power produced and voltage changes.

Results
The first test indicated that the 15.2 cm blades produced the highest rpm. The later two tests both indicated that the 12 cm (6 blades) fan produced the highest rpm and milliamp power. Data for voltage will be submitted with project addendum to LA County entry.

Conclusions/Discussion
Our studies conclusively proved that the size and number of blades directly affects rpm. The study also confirms the following findings: 1) 15.2 cm blades (2, 4, and 6 blades) all produced the highest rpm using wind power, 2) the 12 cm with 6 blades was the most efficient in producing the highest rpm using a constant power supply. The findings and conclusion for voltage will be submitted with project addendum to LA County entry.

Summary Statement
Improving wind power to produce more energy.

Help Received
Mothers helped with cut and paste on project board; Father helped with wood cutting and electrical wiring; field trip made to wind farm to learn about wind power.

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Robert G. Wright

Project Number
J0727

Project Title
Making a Stronger Electromagnet

Abstract

Objectives/Goals
Objective: The objective of my experiment was to determine how certain variables affect the strength of the magnetic field of an electromagnet. I tested the variables of electrical power (voltage and amperage), wire gauge, number of wire wrappings, and rod width.

Methods/Materials
Materials and Methods: An electromagnet and a crane structure to hold it, with the electromagnet hanging downwards. A platform that can rise very slowly and can stop and hold its position. The object to be lifted by the electromagnet, a ball bearing, sits in a hole in the platform. Relative magnetic power of the electromagnet is determined by raising the ball bearing on the platform under the electromagnet. When the ball bearing gets lifted off of the platform, it is stopped from raising any further. Measure the distance from the top of the platform to the end of the electromagnet rod. Conduct five tests, each one testing a different variable.

Results
Results: In the Voltage Test, the strength of the magnetic field increased as the voltage increased, but the increase was small compared to the large increase in voltage. The amperage increased slightly when I added more batteries. It seemed that the increase in amperage was causing the increase in the strength of the magnetic field. In the Amperage Test, the strength of the magnetic field increased more than in the Voltage Test because the amperage affects the electromagnet more than the voltage. The increase seemed to be a logarithmic curve. As the amperage went up, the strength of the magnetic field did not change proportionally as much. In the Wrap Test, the strength of the magnetic field increased as the number of wraps increased. It seemed as if concentrating the wraps at the end of the rod increased the magnetic field. In the Wire Size Test, changing the wire gauge did not substantially affect the strength of the magnetic field when the number of wraps was the same, or the length of wraps was the same. In the Rod Width Test, a wider rod would increase the strength of the magnetic field.

Conclusions/Discussion
Conclusions: Increasing the electrical current (amperage), increasing the number of wire wrappings, or increasing the rod width makes the magnetic field of an electromagnet stronger. Changing the gauge of the wire did not substantially affect the strength of the magnetic field.

Summary Statement
Determine how the variables of electric power, wire gauge, number of wire wrappings, and rod width effect the strength of the magnetic field of an electromagnet.

Help Received
Father provided some assistance in building the electromagnet and conducting the tests.

CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Matthew I. Wunderlich

Project Number
J0728

Project Title
Which Is Faster: DSL or Cable?

Abstract

Objectives/Goals
My objective was to find out which was a faster modem, DSL or Cable. My hypothesis was that DSL would be faster.

Methods/Materials
To perform my experiment, I tested the connection speed of several computers: eight (8) with DSL connections, two (2) with cable connections, and one (1) with a 56-K dial-up modem. I measured connection speed two ways: (1) Using an on-line modem speed tester (http://tech.msn.com/internet/speedtest.asp); and (2) Timing, using a stop watch, how long it takes to download a standard file (The Enron Special Investigation Report # 8.6 MB).

Results
Cable was the fastest, followed by DSL, and then, at a much slower speed, a 56-K modem. Cable was about twice as fast as DSL. DSL speed did not vary at different times of day, but cable speed varied by almost a factor of two. File downloads rates were about 8 times slower than connection speed. The type of Internet connection was much more important than computer speed or RAM.

Conclusions/Discussion
Cable was the fastest, although it varied by time of day. At its slowest, it was about the same speed as DSL. The effective speed of using the internet is slower than what providers say in their advertisements.

Summary Statement
I determined that cable modems are faster than DSL modems.

Help Received
Dad helped type report and discussed the tests with me; friends tested their computers and filled out the data form I gave them.