MCCE NEWS

MONTANA COUNCIL FOR COMPUTERS AND TECHNOLOGY IN EDUCATION

Vol. 18, No. 3 **May 2006**

In This Issue

Economical WiFi Rover

by Kenneth Aycock

I recently had the opportunity to participate in Deaconess Science Expo 2006 on March 17-18. It turned out to be a great and rewarding experience. Many of the younger projects were surprisingly advanced. Austin Eastman, a middle school student, displayed a handcrafted remote control submarine that looked something like a cross between a manta ray and a spaceship for his continuation project dubbed "Yellow Submarine - Phase 2: The Dynamics of Underwater Propulsion." Kaylssa Youde, a first grade

winner, demonstrated fingerprinting forensics by comparing the marks of family and friends. These projects and others promise great things for science fair in the years to come.

The top two winners in the high school division qualified for an all-expenses paid trip to the Intel International Science and Engineering Fair, this year held in Indianapolis, Indiana. Mike Hughes, of Billings Senior High, took first place with his project called "The Optimization of Natural Selection in a Digital Environment." Mike wrote a program in Java that used an algorithm to evolve a pseudo organism

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Greetings Technology Friends

by Staci Auck

This time of year I am sure that we have all been posed with "the question" from someone at sometime in our teaching career… "are you excited for the year to be about over?" it always reminds me that I am not where I had hoped to be by this time of the year so I find myself actually wishing for more time and I have to answer "No."

It seems I keep adding more and more projects into my courses hoping to incorporate as much technology as possible into the curricula. This also has me wondering if my students are truly tech-savvy. I know that most are quite literate when it comes to downloading music and instant messaging but are they really able to make good use of technology when necessary. We call this "technology literate" but even though we all know it is important to have in today's modern age, it is still very difficult to measure.

The nonprofit Educational Testing Service (which also designs and administers the SAT) is creating a test that will measure traditional skills such as reading and math but with a technology twist. For example, they may be asked to query a database, seek information on the Internet and see how reliable it is, compose an e-mail or use a simple program to create a graph. It will be interesting to see how or if this test will one day become a part of our assessment routine. So even though I may not be quite where I want to be in my curricula at times I do feel all the technology that I am incorporating into the class is helping to meet another goal for them, to not just master the "three 'r's" but to succeed in a tech-heavy 21st century workplace.

Just another reminder that MCCE is excited to be bringing in a dynamic keynote speaker to MEA-MFT this fall, John Kuglin. If you have ever heard him present before, you know it will be very informative and interesting. He will be discussing how new learning tools are formed, and as a result be able to form greater insights toward finding technological solutions for education. As well, he is providing a couple of sessions that educators of all discipline areas will find useful because technology affects all curriculum groups, not just the computer classes. So I am sending out a plea for members to please encourage all of your colleagues to join MCCE and attend the MEA-MFT conference this fall because we all are trying to prepare students to thrive in a technological society.

John Kuglin

MCCE NEWS

***MCCE NEWS* is published several times per year by the Montana Council for Computers and Technology in Education.**

Next Submission Deadline: September 12, 2006

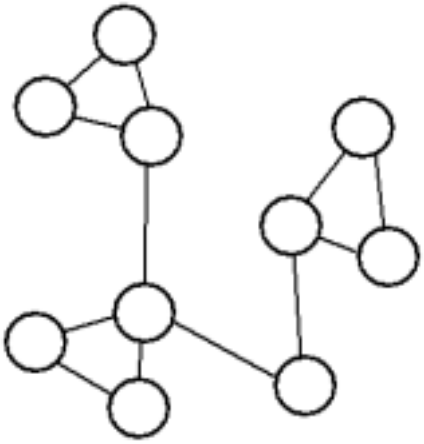
This and past issues of MCCE News are available on the World Wide Web at: http://senior.billings.k12.mt.us/mcce/

Students Embrace Social Networking

by Vince Long

Social networking in the information age is nothing new. The term, social networking, was coined in 1954 by J.A. Barnes and refers to how people assemble themselves into groups and how the bonds in these groups are formed. Sociologists indicate that social networks average in size of about 124 individuals. With the rise of the Internet, new tools have facilitated new social networks which are not bound by geography.

In its simplest sense, Internet-facilitated social networking can be as simple as an email-based mailing lists or a Usenet discussion group. However, recent innovations have radically changed the model of social networking with the development of instant messaging, blogs, wikis, and social networking web sites. Even the online gaming world can be considered a form of social networking as users form clans or teams and work together to accomplish a set of tasks and achieve various goals.



The first social networking web site, classmates.com, founded in 1995, allows participants to reconnect with schoolmates from their past. This was followed by a variety of other sites including sixdegrees.com, friendster.com, and in 2003, the rapidly expanding myspace.com. Sociologists suggest that these sites provide the same attraction as traditional, non-technology driven networks. Social capital is gained, either for the network or the individual. The largest of these sites is myspace.com with, as of this writing, over 75,000,000 users. Last year, it was reported that myspace.com receieved more page views than Google.

While each of the social networking sites has its own tools and attractions, myspace.com, has, just by its sheer number of users, become the current standard and is certainly the most popular with high school students. What myspace.com is, is a place for users to create their own web sites. To those web sites they can add pictures, sounds, and links to friend's sites. By filling out questionnaires they can include information about themselves, some of which can be quite personal. The friends section contains a "Top 8" list over which there is fierce competition on some pages to receive a high ranking and be included in that "Top 8." The site also contains a "Who'd I Like to Meet" section that it used to attract other users.

Myspace.com is not without its share of controversy. Recent news stories has disclosed that sexual predators use myspace.com to locate their next victims and several disappearances of teens have been linked to contacts made through the site. Law enforcement agencies report that various gangs have used myspace.com to recruit or intimidate other users. On the positive side, a potentially violent attack at a school was prevented when the planning of it was discovered on myspace.com.

Whether it is good or bad, social networking web sites are extremely popular with students. Left unrestricted, some students would spend entire class periods accessing the site which has caused many school districts to block access to the site entirely. One college blocked access when it was discovered that 40% of the school's bandwidth was used to access the site. However, creative students find their way around the blocking software to get their daily fix of chat with friends.

What many users do not think about when using these sites is that what goes on the Internet can remain there forever. With sites such as the Wayback Machine at www.archive.org, which creates copies of a large part of the world wide web, it is difficult to remove something from the web even if the original site is taken offline. Employers and college admissions workers report that it is increasingly common to search the social network sites as part of doing background research on potential candidates. One of the common topics of these sites is the user's "partying" habits, something that most would not put on a college or job application, yet is easy enough to find online.

Social networking sites are here to stay and, as educators, we need to make our students aware of the impacts that come with the use of the technology. They need to be made aware of the potential of contact with predators, the importance of not disclosing personal information, and that not everything one sees online is true. It's the same old lesson, just repackaged for the lastest technology.

Students Learn Ways Around Content Filters

by Vince Long

To some it's an impediment to the free flow of information, to others it's a necessity to protect the young from objectional content, and to the computer geek it's a puzzle to be solved. This is the attitude toward content filters on the Internet, also known as censorware. These filters exist on virtually all K-12 school systems and an increasing number of college and workplace systems. While it might be obvious why K-12 schools filter content, it may not be as obvious why colleges and corporations are also signing up for these services.

In colleges, it is not unusual for the bulk of network bandwidth to be used for non-academic related activities, such as file sharing, streaming videos, and the downloading of large files. Since bandwidth costs money, restrictions are put on what students can do on the school's network, even from their dorm rooms, including outlawing and blocking the use of peer-to-peer file sharing networks, such as Limewire, Kazaa, and similar tools. Schools are not only concerned about bandwidth usage, they are receiving pressure from the recording and motion picture industries to employ the block or be considered accessories to the copyright violations committed by their students.

While the copyright issue is also a concern in the workplace, corporations are more concerned about the loss of productivity when workers are off-task surfing the web, shopping on eBay, gambling, or managing their fantasy sports teams. When this takes place the companies lose money and, if a worker accesses sexually explicit material to share around the office, the company could find itself embroiled in a sexual harassment lawsuit. Security issues can also arise as employees use chat tools and other software that can compromise the integrity of company networks.

The various filtering solutions available today have become quite sophisticated, allowing for a great deal of customization. The type of filtering that takes place can be changed during the day to allow greater employee freedom during off-work hours or for specific computers to be granted different types of access. Yet, with all this sophistication, the filters are still known to block legitimate sites. This writer regularly finds blocks on sites from our school system that cover topics as benign as robots and electronics.

While this can be frustrating, for the student computer geek this is just a puzzle to be solved. Plenty of web sites have "how to" instructions for getting around the filter and granting access to blocked sites. As filtering companies race to keep up with the latest hacking techniques the geeks figure out another way around them.

Of the various methods employed, the proxy server is probably the most popular means for circumventing a filter. A proxy server is a computer on a network that allows other computers to make indirect network connections, that is, it redirects requests for web pages. For example, a user goes to the proxy server, requests a web site and, instead of delivering the site to the user's computer directly, the site is delivered to the proxy server which then delivers it to the user. Since the filter sits just upstream of the user, it sees information as coming from the proxy and not the original site. Two popular web-based proxies are www.helpmehide.com and www.hidemyass.com.

While proxy servers have this ability to bypass the filter, they have many legitimate functions as well. In fact, the filter itself is usually a type of proxy server. Proxies can also be used to reformat web-based content to better fit a browser, for example, those used by cell phones. Web caching proxies can be used to store web data locally allowing users to access the data quickly and reliably. In some countries, where Internet access is filtered for political reasons, proxy servers facilitate the free flow of information.

Proxy servers are readily available at co cost as part of the open source software movement. Setting one up is relatively easy for even the most fledgling hacker. Some students will run these "anonymous proxy servers" on their home computers and access them from school to eliminate the blocking of school filters. All they need is their home computer's IP address and they can use the proxy from anywhere in the world. Some users allow others to access their proxy servers and have them listed on the myriad of web sites that share this type of information. However, there are risks to running and using anonymous proxy servers. For the user, they must keep in mind that the proxy is not providing a secured connection and it could trap confidential information such as credit card numbers and passwords. For the person running the server the risks include security problems on their own machine to being implicated if the connection they provide is involved with criminal activity.

Another way around the filter is the CGI Proxy, which is a web site that allows others to access web pages through

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Economical WiFi Rover

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based on its digital alleles of ones and zeros. The program also plotted how long the algorithm ran and how optimized the organism had become in that time on a graph. Similar projects have not only shown the potential to replicate natural selection digitally, but even the ability to actually optimize computer instructions themselves! Further research in this area may bring strange and exciting advancements in the realm of artificial intelligence.

My project, the "Economical WiFi Rover," won second place in the high school division. It demonstrated the ability to construct a vehicle capable of remote operation over the Internet for a little under $103. Due to its modular design, anyone can easily construct their own rover and adapt it to their needs. I added a camera, microphone, digital compass, and GPS for my experimentation, but the possibilities are endless. The project took a great amount of research and many hours of work to develop - it was not realized overnight. In fact, it grew from a dream I had years ago.

In my younger years, I aspired to enter the once popular BattleBot competition. I never seriously attempted to build a "Bot," but I did construct a beefed-up remote control car from a servo kit at the hobby shop and some touchy hand-made electrical contacts. Eventually, my early ambitions matured into more interesting ideas. I began to think of extensions of my projects with other technologies, the most significant being wireless Internet.

Thanks to my father, I started to gain a background in simple programming (QBASIC) when I was only eight years old. This gave me an exceptional foundation in computer science, an interest I have pursued throughout my life. Recently, while working with Linux, an open-source alternative to Windows or MacOS, I realized how easy it would be to program a remotely operated vehicle and interface it through the Internet. This was extremely exciting to me; it meant that I could create something that could be controlled from practically anywhere in the world!

At this time I also hoped to further my study of Physics at Billings Skyview High by enrolling in an independent study class under Rich McFate's supervision. He suggested that I take my ideas for the project and develop them into an entry for Deaconess Science Expo. There were quite a few obstacles to overcome, but I had plenty of resources and a drive to succeed.

I first needed to determine what I would use as a medium between my components. Many electronic devices now have built in wireless Internet interfaces. EVDO, a newer cell phone Internet technology, can transmit within ten miles of any cell phone tower. This would allow for the greatest mobility. Unfortunately, it is only available to bigger cities for now. Hobbyists have also used SMS text messaging on cell phones to communicate with weather balloons by relaying GPS coordinates and other data. Even so, a cell phone would still be difficult to program and would have limited data transfer. GUMSTIX, a microcomputer with USB and serial interfaces about the size of a stick of gum, was another possibility. This type of device is becoming more popular for robotics but is still fairly expensive. In the end, a laptop computer proved to be the easiest to work with and the cheapest to obtain; in fact, the hardware I used was seven years old, saved on its way to the trash.

Building the motor controller proved to be the most daunting task. It was not the most complicated component of the rover, but it did involve areas in which I had little experience. After some research, I determined that the easiest way to interface the laptop and the controller would be through the computer's parallel port, generally used for printer communication. The parallel port uses simple digital signals and has many inputs and outputs available. The output signals were used to control an H-bridge relay circuit to drive the motors while the inputs allowed communication with the digital compass.

The motor controller also needed speed control. I implemented this by placing a MOSFET transistor in series with the power source on the way to each motor, acting as a gate for the electrical flow. The MOSFETs were then driven by the computer through the parallel port via PWM (pulse-width modulation). PWM sounds quite complicated, but it is comparable to quickly turning off and on a light switch. Normally, electricity moves continuously; but, it can be pulsed to control the overall flow. The resulting voltage level from a PWM signal is proportional to the ratio of off and on time. For instance, if a bulb was repeatedly powered on for one-tenth of a second, and off for nine-tenths of a second, the bulb would be given the equivalent of 10% of the full voltage, and shine about one-tenth as bright. In electrical systems, this method of regulating power works more efficiently than simply restricting output by electrical resistance. PWM is especially useful in high power systems due to the excess heat generated when

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Content Filters

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them. These can easily be set up on any web site that supports CGI and is implemented using short programs written in PHP, PERL, or other CGI compliant language. The user accesses the site, types in the URL of the site they wish to access, and the CGI program loads that site, usually in a separate frame, browser window, or tab. This writer was shown how easy this was to accomplish by a 9th grader who wrote one in 15 minutes.

Another way around the the filter is the use of "remote control" software, such as Virtual Network Computing (VNC), a free tool, or PC Anywhere. These programs generally come with two parts, the client or viewer and the server. The server is installed on a remote system, such as the student's home computer, and the client is installed on the school computer or carried on a USB memory stick. The home computer's desktop appears on the school computer and the student can freely access any web site.

In some filter implementations, the censorware runs on the school computer. Some parents also set up their home computers this way to restrict their children's access to inappropriate material. A popular way to get around this is to restart the machine using a "live CD" which contains an alternate operating system. When booting from a live CD, users usually run a version of Linux without making changes to the original hard drive. Some users can even accomplish this by booting the system and forcing it to run from a memory stick inserted into the USB port. These methods are easy to prevent if the machine is configured not to allow booting from any device other than the hard drive.

To system administrators all these attempts at foiling the filter create headaches and consume time that can be used productively elsewhere. However, they cannot let their guard down and must try to stay a step ahead of the hackers. For those who defeat the filters it is a victory they love to share and web sites abound with their exploits. It is a relationship that will endure for years to come.

Economical WiFi Rover

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using resistors.

The rest of the project was fairly straightforward. Open-source software was used to connect to the computer (SSH), stream the webcam and audio feed (palantir), and communicate with the GPS (GPSd). Using SSH, known as SecureSHell, opened up many possibilities. This program allows for a network connection to a configured terminal in which commands can be executed, files changed - practically anything that one could do if they were physically using the workstation.

The project works well enough for now, however, I could make many improvements. Experimentation with the GPS did not explore automatic navigation, an area I hope to work on soon. The motor controller would function much better if it did not rely on the computer for the PWM signal. This would free up some of the laptop's processing power as well. In the future, the project could be transformed into a more user-friendly and completely modular system in which one would simply need a functional laptop computer with a free USB port to make use of the rover. The operating system could be moved onto a Live-CD, in which the software is loaded into memory upon booting and no files are altered whatsoever. This would mean that anyone could make exciting use of unused hardware even with only a basic understanding of computers and electronics.

Kenneth Aycock is a senior at Billings Skyview High School. He was featured in a story about the Science Expo in the Billings Gazette on March 17, 2006. That article is available online:

http://www.billingsgazette.net/articles/2006/03/17/news/local/35-young-science.txt

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Software Reviews,
Classroom Technology Tips, Student-Written Stories, Web Site Reviews

Annual ISTE Affiliate Meeting

Monday, July 3, 2006
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Marina Ballroom G
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If you are interested, contact:

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Using the Mimio xi Technology and video tutorials to provide math support

by Desireé Caskey

Whether students need a refresher while studying for a test, missed a day of class and need to get notes, need extra assistance with a particular concept or just like math…some Skyview math teachers are providing them with the tools to review lessons via the Internet. Mary Ann Byrd, Jen Moore, and Tony Riehl are members of STILT (Skyview Teachers Integrating & Learning Technology) who chose to focus on the creation of video tutorials as a way to help their students outside of class.

You might be asking, "what is STILT?" It's is a staff development program at Skyview where teachers are given technology equipment, training and time to learn how to integrate technology into the classroom. Now you might be asking, "What is a Mimio xi?" Think of a SmartBoard, but… you don't need a special board; you can use your classroom white board. The Mimio xi is a device that suctions to your whiteboard and records your pen (marker) strokes onto your computer. Later, you can play the session back on your computer or export them out to different formats.

The Mimio xi uses regular dry-erase markers that are held in capsules. It also has an eraser, whose every stroke is recorded as well. The marker capsules transfer the pen strokes to the Mimio xi for download later to your computer; or you can have it directly transfer to your computer on the fly. It comes with a USB connection cable or you can purchase a wireless adapter. We chose to use the wireless piece.

The Mimio xi works with Macs or PCs with very little difference. On the Mac, you can export your "board" directly to iMovie sans audio. It is then ready to add audio, titles and other effects. On the PC, there is no movie or animation mode you can save it to unless you purchase an extra piece of software; and then it records the video and audio for you directly into an .avi file. These three math teachers already had Mac ibooks and were using iMovie and DV camcorders to record their math tutorials. The Mimio xi seemed like a natural transition.

So how does it work? Here is where it gets a bit technical. First, you attach the Mimio bar (takes up about 9" of your white board) vertically to the upper left corner of your white board. Next, you slip each marker into a color-coded capsule. Each capsule transmits an ultrasonic signal that's picked up by the bar. The four capsules send a slightly different signal, so the Mimio xi knows which color you're writing with. There's also an electronic eraser that's shaped like a hockey puck. It has a felt-covered bottom, so you really do erase with it. Now here's the magic: As you use the markers and eraser, the Mimio bar receives those ultrasonic signals and records them. Once you have your recording, you can export out as an image, html, EPS, QuickTime, DV, iMovie, or SVG. The PC version doesn't have quite as many export choices without the extra software purchase.

The Skyview math teachers will be exporting their Mimio sessions directly to iMovie. From here they will add audio tracks, titles, and any special effects. They will then be exporting it out to our web server and adding a link to the tutorials on their web sites. Students that don't have access to the Internet or have a slow connection will be able to check out DVDs that contain the same lessons that will be posted online.

These teachers have received some attention for their innovation and efforts. As a result, they will be receiving more equipment and will be reimbursed for their time to create these tutorials. The finished products will be made available via the Skyview web site starting next year. You can take a look at some earlier attempts at video tutorials and will be able to access future tutorials at the Skyview math department web site:

http://skyview.billings.k12.mt.us/?s=departments/math/index

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