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Senior Thesis Projects Spring 2008

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1. Bluetooth Enabled Flash-Disk RAID Array

By: Douglas Hoff, Jason Lavalleur

The Wireless RAID Flash Storage Device is based on a standard USB flash drive with a few added features. The use of a RAID algorithm (RAID 4) and multiple flash cards allows the device to back up data automatically. If any flash card fails, the user is notified immediately by an LED. All of the data can still be accessed and recovered from a single card failure. Wireless options of Bluetooth (using Xmodem) and WiFi (802.11b using FTP) have been added to allow the user to easily and quickly send files to the device without physically connecting it to a computer. A basic implementation of FAT file system was added to allow the files to be accessed by a normal PC.

2. Web-Controlled Snow Blower

By: Donell Brown, Edward Dale, Mark Huebner

This project is to design a wireless internet controlled snow blower-robot with driveway perimeter sensing capabilities. The robot is controlled via wireless connection through a web page GUI. The web page is created to display the video feed, gasoline powered engine statistics, and controls for the entire snow blower system. The machine is able to detect the perimeter of a driveway and cease forward motion when grass/dirt is detected. All features of the snow blower is automated, including ignition, startup, choke, prime, and clutch. The graphical user interface displays information such as snow blower engagement status, engine-speed, temperature, ignition, battery level, and video-feed. The sensors are able to remotely monitor the statistics of the snow blower system. Additionally, the perimeter sensor module determines the difference between the concrete driveway and the turf, or lawn.

3. Remote Hardware VNC Server

By: Kyle Hovorka, Drew Rash, Jennifer Stephens

The Remote Technician Emulator (RTE) is intended to allow remote control of a computer system that is geographically separate from the technician who needs to work on or repair it. The RTE allows the technician to view the screen output of the remote computer and send it keyboard commands, over the Internet. It is possible to connect to remote computers using other software and hardware implementations, but the RTE is unique in that it does not require any specific operating system, such as Windows or Linux, to be up and running on the remote system. The RTE even allows the technician to work on the remote computer's BIOS or within DOS based software screens, enabling remote repair that other implementations lack. The Remote Technician Emulator connects directly to the remote computer's monitor and keyboard ports. The technician then logs into the RTE via the Internet to view what is on the monitor of the remote computer, and is able to control the remote computer using local keyboard commands.

4. Wireless Music Director

By: Jimmy Lohrman & Reginald Dawson

The musical transitions incurred by a 7+ member church choir are directed by the keyboard player. The keyboard player uses hand signals, which are relayed to the rest of the singers by an individual singer nearest to the keyboard player. However, there are times in which the singers become out of sync or miss the hand signals which are relayed. Also, there are times, especially during the Christmas season, when a drama play wooden structure becomes in the way of the keyboard player. Therefore, positioning of the hand signal relay must be changed to accommodate these obscurities. This project is to design and build a wireless music director. The control panel reads song data from flash memory, and the user chooses which song to load against the eight touch-sensitive buttons. Each button, depending on the song chosen, has assigned to it the different transition characteristics for that particular song. The singers will have a receiver that is basically an LCD. When the control panel user selects one of the touch sensitive buttons, the text data associated with that button is sent wirelessly to all the LCD receivers. The LCD receivers will display words of the musical transition desired by the keyboard player.

5. Universal Remonster

By: Daniel Norman

This project implements a projector remote control system for Papillion-LaVista High School. It utilizes the building's 802.11 network and has two types of units. The classroom controllers are standalone units that control the projector and VCR in the classroom. These classroom controllers take commands from the master controller and return information to the master controller. The master controller has a 1-button start to activate all of the classroom controllers. It also interfaces to a computer to provide a web interface that can issue commands to individual classrooms or blocks of classrooms and display information obtained from the classrooms.

6. RPrice – RFID Price Scanner

By: Whougie Lo and Ryan G. Beck

This project helps retail stores to integrate further their ability for automatic checkout. Every year stores spend money updating price-tags, maintaining their cashier manned checkout stations, and managing their complex inventories. This project integrates RFID technology into item based inventory and checkout. Every product inside of a store is coded using a passive RFID tag instead of a UPC bar code label. These products no longer be priced using the current paper tag system. Instead a mobile scanning device called RPrice® accesses the store's inventory database real-time; enabling the user to have up to date pricing information at the push of a button. This device incorporates automatic checkout into the process by allowing users to setup an online store account or a temporary in-store account using cash or a credit card.

7. Robotic Clock

By: David Bates

The Robotic Clock is an analog clock with the traditional Roman numeral indications for the hours 1 through 12. The unique feature of the clock is that the numbers I through XI can have their positions adjusted, or be electrically placed around the clock face by a robotic mechanism. When the distance between the numbers is altered, the clock is adjust the travel speed of its hands to traverse the distance in the appropriate amount of time. The clock has different modes for the spacing of the numbers to include typical clock spacing, both an exponentially increasing and a decreasing spacing, a Fibonacci Sequence spacing, a random mode and a mode where the user can manually drive the numbers where they please. Super modes would instruct the clock to hourly randomize the numbers or switch between modes with predefined spacing.

8. Pressure Sensitive Signature Pad

By: Matthew Birrell, David Smith

Most signature pad devices usually only store or display signatures to print on a receipt or document. However, some are used for security purposes. These security devices have the capability to store and check signatures for validity based on image recognition techniques. However, with some effort you can counterfeit/forged signatures. To fix this issue we have devised the Pressure Sensitive Security Pad (PSSP). A person willing to forge someone else's signature can do so easily with enough practice, but it is almost impossible to mimic how a person writes their signature. This has led us to incorporate pressure data through time along with the signature image to validate a signature.

9. A Portable Doppler guided Ultrasound Needle

By: A.K.M.Shafiqul Islam

A portable Doppler guided Ultrasound needle is designed for this project. This portable ultrasound needle is user friendly and enables the doctors to integrate the device in their Catheterization usage. Since the detector would be mounted on top of the needle, recording the results and disposing of the needle would become much easier. Aside from its usage in Catheterization, this device expedites the detection of artery in emergency cases. Easy comprehend visual result is enable the nurses to perform an artery check instead of involving doctors in it. Above all, accuracy of this device is greatly reduce any damages to the artery and save time in detecting it.

10. Wireless Media Transmitter

By: Matt Kovar, Giang Nguyen

The wireless media transmitter will wirelessly transmit the screen of a computer monitor over a wireless network to be displayed on a standard television. It will allow the end user to view any content from a computer on a larger screen without physically connecting or moving the computer near the television. Video and audio will be sent over the network connection, which will allow end users to take full advantage of media applications, such as viewing movies and pictures on the big screen.

11. Smart Fridge

By: Justin Bogenreif, Casey Deyle, Cowan Wasser

No longer will you have to wonder what you need for your fridge while you are at the store. No longer will you need to make boring shopping lists. With the smart fridge you can check the inventory of your fridge from any pc, or pocket held pc, by checking the up to date inventory posted on the on-line server. The smart fridge will track the inventory of your fridge regularly. It will read tags associated to specific products, and send this information to an online server. This server is accessible from any internet port, providing the perfect consumer tool. The fridge is also track weight information, providing information as to exactly how much of a specific item you have left, to warn you if you are low. . If there is an item that is getting low, the microcontroller could tell the server to send a SMS message to the user through the Internet.

12. Gait Sensor Slip-On

By: Demaka I. Adams

Gait is the study of movement. Gait is used to analysis how a person walks to diagnose neuromuscular problems. The basis of the gait analysis begins from the stance when the foot is fully on the floor. The analysis is from the time the foot is lifted until the heel returns to the ground. During this analysis the speed, stride and cadence is analyzed to determine normal and abnormal. For this thesis, a new sensor is designed to replace the FlexiForce Sensor that is currently inside the shoe. The sensor is able to operate outside of any shoe and send analog data to mimic the data sent by the FlexiForce Force Sensors.

13. Microcontroller Module for Orthopedics Surgical Saw

By: Albert Nguyen

Orthopedic implant surgery involves attaching a jig to the bone in order to precisely and accurately cut the bone with a saw to fit the implant. Dr. Haider at the University of Nebraska Medical Center has developed a system using infrared cameras and infrared reflectors mounted on the knee and saw that combined with MRI/CAT scans of the patient can allow the surgeon to view the operation rendered in 3D on a computer display. It also can plot the intended cuts to be made through the bone and detect deviation from these paths. This Computer Aided Orthopedic Surgery system helps the surgeon perform the surgery, to an extent that it may be possible to perform the surgery free hand, without jigs attached to the bone, to minimize incisions and therefore trauma and recovery time. This thesis puts a microcontroller module on an orthopedic bone saw intended to be used with the CAOS system. It communicates to the CAOS system wirelessly through Bluetooth, provides I/O on an LCD touchscreen relating to saw orientation and navigation relative to the intended cuts, and control the maximum saw speed based on deviation from the intended cut.

14. Parking Lot Monitoring System

By: Ryan Luedders

This project is a web-based system that monitors a series of overhead images of a parking lot, and using image processing techniques analyzes them to see which pre-defined spots contain cars, and which do not. Using this information, the system is able to provide both real time data and statistics about past parking lot availability, through an easy to use, web-based user interface.

15. AutoBAR

By: Gretchen Gonzales, William J. Yost

The AutoBar is an automated bartender that dispenses the straw, ice, and liquids into a centralized cup. The drink order is created through a wireless touch screen menu that will provide the user with updated prices, the opportunity to create their own drink, and receive assistance on choosing a drink that suits them. This information will be sent to the Server and forwarded to the AutoBar. The Server will contain a database of the menu, updated prices, and customer orders. This allows for orders to be accepted over the internet as well. The AutoBar is an efficient way to alleviate the need of both the thirsty customer and the smart establishment owner.