

Proposal for E-lock Hardware Redesign

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December 2, 2003

Introduction

For my electrical engineering senior project, I propose to design and implement a new embedded hardware platform for the electronic-lock system on the Walla Walla College campus. I feel this project is necessary because the current system lacks the reliability that a security system should have. There are also certain features that need to be added and other hardware related bugs that need to be removed.

I believe that I have the knowledge and skills necessary to facilitate this redesign. I will be able to use the knowledge I acquired from Embedded System Design and Digital Design to produce a new, more reliable E-lock system.

This project is of particular interest to me since I am fascinated with security systems, and I feel that I have the ability to create a new system that will last the college for many years. This has much more appeal to me than a theoretical project that doesn't "do" anything.

To fully understand why this project is necessary, one has to understand the state of the current E-lock system.

Current E-lock System

The current E-lock system is set up in a serial configuration. This means that the server and all the doors are on a shared communications link. As a result, only one door at a time may be talking to the server. It is also designed in a way that the server polls all the doors individually to see if there is any activity. This takes time. Because of this, adding more doors slows down the system and creates larger wait times for users trying to open a door.

Another problem is the lack of system isolation. Since the doors use power, they are wired in to a power supply. History has shown that this unisolated wired power creates undesirable effects on the system. A new design could overcome this problem by properly isolating the power supply.

In addition to these problems, the current E-lock boards scan the keypad. This creates RF, which interferes with radio communications for people standing next to a door. This is very inconvenient and probably illegal.

Besides the bugs in the current E-lock system, there are some feature problems. In the current system, authorized individuals can put a door into "auto-open" mode for a specified period of time. This is very convenient for times when individuals may be coming and going for a while, such as labs. The problem is that authorized individuals cannot remove the door from auto-open mode. One has to wait for the specified time period to end. This could be a problem if the instructor decided to move a lab to a different area. As a result, the door would have to be left in auto-open mode. A new design should allow for an authorized individual to remove the door from auto-open mode.

Solving the Problem

I propose to redesign the E-lock system in such a way that the previously stated undesirable characteristics are removed. In the process, I hope not to introduce any new bugs. I will

probably move from a serial configuration to a star configuration for the physical layout. I also hope to look into using RJ-45 (network cable) for the physical connections, and TCP/IP for the protocol. RJ-45 would be desirable as it is cheap, and TCP/IP would allow me to simply install another network card in the server for communications. Using these entities would also allow E-lock to easily expand to other buildings as one could acquire a dedicated link from Information Services. For resources, I will need Mentor Graphics, computers, a chance to make a couple of prototype boards, a Lantronix Xport, and other various parts. I will also need a processor. I haven't decided which one. It will probably be an 8051 variant or an MSP 430 variant.

Another important thing to point out is that the design will allow the new E-lock system and the old E-lock to coexist. This is desirable because doors can be setup for new clients as needed, and we don't have to swap everything over at once.

Timeline

I hope to have the E-lock client board design finished around the end of winter quarter. Spring quarter I will start working on the code for the server. The complete system should be totally done in the 2004-05 fall quarter.

Summary

In summary, I hope to have new, more reliable e-lock hardware in place by the middle of the 2004-2005 school year. This hardware will be more stable, and it will have features that we currently lack. It will also remove some of the hardware bugs that exist in the current system.