Purdue ECE Senior Design Semester Report (Homework 14)

Course Number and Title	ECE 477 *Digital Systems Senior Design Project*
Semester / Year	Spring 2004
Advisors	Prof. Meyer and Prof. Jones
Team Number	12
Project Title	Digital Picture Frame Interface

Senior Design Students – Team Composition			
Name	**Major**	**Area(s) of Expertise Utilized in Project**	**Expected Graduation Date**
Jeff Turkstra	CmpE	C Prog., Interfacing, Schematic, Layout	May 2004
Bill Kreider	EE	IR, Web design, Schematic	May 2004
Phillip Boone	CmpE	Software/Debugging, Design Constraints	May 2004
Egomaron Jegede	CmpE	C Prog./Debugging, Network Prog.	May 2004

Project Description:

(a) Summary of the project, including customer, purpose, specifications, and a summary of the approach.

The project is a digital picture interface between a VGA display and a remote picture database. This device enables a user to access pictures stored on a remote computer via the internet and display those pictures on a monitor without any additional equipment. The device is intended for use by anyone who takes digital pictures, but is geared towards users with little computer knowledge. For instance, an elderly couple's children could setup the entire device, and send pictures to their parents. The device consists of a black box with pushbuttons, an IR sensor, VGA connector, RJ-45 connector, and an AC power adapter.

The two major phases of our approach were a top-down design followed by a bottom-up implementation. We started by drafting an initial block diagram, and determined what major functional blocks were necessary. We then examined each functional block and ultimately achieved the design at a component level. From these constraints, components were selected. We then proceeded to implement the design block by block, and then interconnected them using OrCAD schematic. A layout was generated from the schematic and the board was manufactured from the layout. The board was populated with components, tested, and software was developed to interface with the board. Finally after testing, packaging was constructed.

(b) Description of how the project built upon the knowledge and skills acquired in earlier ECE coursework.

This design built upon many prerequisite courses. EE201 knowledge was used in component selection. EE207 and EE208 knowledge was used in board testing and debugging. EE255 was used to design the current reference input to the digital to analog converter. EE270 knowledge was used to configure the PLDs

as latches, work with binary and hexadecimal numbers, and read data sheets. EE362 was used for timing analysis, microcontroller programming, operating a logic analyzer, and working with bit-wise operations.

(c) Description of what new technical knowledge and skills, if any, were acquired in doing the project.

Several new skills were learned in the span of the project. We learned to solder, select components, design a schematic, produce a layout, project management, division of responsibility, ability to work on a target deadline, techniques of debugging, and C microcontroller programming.

(d) Description of how the engineering design process was incorporated into the project. Reference must be made to the following fundamental steps of the design process: establishment of objectives and criteria, analysis, synthesis, construction, testing, and evaluation.

Weekly homeworks focused on the important aspects of the engineering design process, were completed individually, and as a team. The preliminary project proposal and final project proposal established the team objectives and project specific success criteria. We then analyzed in detail design constraints, packaging, circuit design, and layout with a design rules check that was then submitted for a production check. We developed the software, constructed the circuit board, and tested each aspect of software and hardware. We documented the final working project and gave professional presentations.

(e) Summary of how realistic design constraints were incorporated into the project (consideration of <u>most</u> of the following is required: economic, environmental, ethical, health & safety, social, political, sustainability, and manufacturability constraints).

We originally wanted to incorporate an LCD display into our project. However, due to economic constraints we could not obtain an affordable display and eliminated that aspect from our project. We performed an ethical and environmental analysis, a reliability and safety analysis of the electrical components, a patent and liability analysis to avoid infringement on existing products, and a design constraint analysis investigating power supply, packaging, computation and cost constraints involved in component selection.

(f) Description of the multidisciplinary nature of the project.

Software engineering was used in programming the microcontroller and PC client. Electrical engineering was used for powering and testing components and most board related issues. Systems engineering was used to design the circuit board. Process engineering was used to make the board more efficient, reliable, and safe.