

ECE480 Self-Assessment

Stephen Dunn – 12/1/2015

Learning Objectives

The course content and structure seemed to, quite naturally, lead me to fulfill all of the learning objectives of the course. First of all, I have learned that technical communication can be given either in written form or orally. If given orally, technical communications are either formal or informal. Formal technical communications are generally in the form of presentations and there were two opportunities in this class to develop formal technical presentation skills through both the proposal presentation and the technical lecture. Informal oral technical communication was even more commonplace in the communication between team members regarding the technical details of the project at hand. The content of both formal and informal technical communication needs to be accurate and easily understandable to those listening. For formal presentations there is usually ample time to prepare so this requirement is easier to meet. In informal conversation, there is little time to prepare so I learned to be careful to not discuss incorrect information amongst team members. Doing so would only serve to increase confusion.

Technical communications can also come in the form of written reports. In this class there were many opportunities to practice these skills including the proposal document, application note, and the final report. The proposal document was needed to effectively communicate the proposed solution to the technical problems presented to us by our sponsor. The proposal document dealt with several common constraints for any electrical or computer engineering design including cost, power, reliability, and safety. Additionally, the proposal forced our group to consider the design criteria and constraints of the design, limiting the scope of the work to come. The limited scope was vital in establishing a realistic timeline of work for the semester.

In order for the sponsor to accept the proposed solution, the writing needed to be clear, concise and well organized, but also accurate beyond a shadow of a doubt. Indeed, this need for absolute accuracy in technical communications of all sorts was a common theme. This accuracy in all communications throughout the class was achieved by obtaining the necessary information from relevant sources. This ranged from research on the internet to meetings with our sponsor to glean from his vast electrical engineering experience and knowledge. Indeed, this semester taught me to appreciate the value of experience with a particular application over and above simple research methods.

Following the acceptance of our proposed solution by our sponsor, the tasks of administering work to the various team members and establishing timetables were completed. As a part of this, a critical path was established that would allow us to complete the project by the required date.

The actual design process followed the planning phase and included the use of many tools to aid the development of the solution. These tools ranged from physical lab equipment to the use of computer programs to aid in programming the microcontroller used in the design. Indeed, the microcontroller was chosen, in part, due to the quality of the tools available for programming the chip.

Throughout the entire design process, the role of the team was vital to our success. Any one team member could not have completed the project alone and likewise, a dysfunctional team could not have succeeded either. The primary advantage of working on a team is the division of work. Myself and one other team member were more familiar with software and embedded programming and so were tasked with the programming portions of the design. The other three members were electrical engineers more familiar with the relevant hardware and were tasked with the hardware design. One negative to working on a team was effective scheduling of meetings due to the varying schedules of the team members. Additionally, arriving at a consensus on many decisions takes more time when the input of all team members is required. Because our team was able to overcome these obstacles and work together, we were able to complete the proposed design.

The Design Process

I would be hard pressed to be able to iterate every single thing I learned during the design process of this project due to the sheer volume of things fitting that description. My portion of the project was essentially related to microcontroller selection and development of the code needed to effectively run the alternator as a motor. First of all, the justification for the use of a microcontroller was simple. Microcontrollers are cheap and easy to develop in an iterative and rapid manner (essential for the short timetable for the project). The constraints on the microcontroller were based primarily around its speed of operation, but it was also a requirement that the chosen microcontroller be able to do floating point operations in hardware. The final constraint was that the microcontroller needed a suitably useful development board and development environment for rapid software development. Because of these design decisions, a significant amount of programming was able to be completed using the development board before any actual hardware for our project was completed. This allowed the project to flow in a more parallel manner and shortened the critical path to completion.

The development of the algorithm to effectively run the motor was done in an iterative and agile manner, as many aspects of the task (running the motor) were not well known to either our sponsor or any of the resources available to me. Because of this, I believe the algorithm is quite a novel creation and was revised several times when it became clear that a major revision was needed. Indeed, I learned that this is one advantage of having so much of the logic of the project in software instead of hardware. Changes can be made rapidly and with little impact on the physical hardware. The iterations of code were essentially continuous as soon as the hardware portion of the project was ready to be integrated with the software. Several versions of the code were saved for the various demonstrations but other than that, the software saw small continuous improvements almost on a daily basis.

Technical Communications

I have been a part of all of the technical communications this semester in some capacity. Our team decided to divide the work for each presentation so that everyone could contribute. For the proposal document I primarily worked on the sections regarding the software and interface with the AMS rotary position sensor. For the proposal presentation I gave a spoken presentation on the information from those sections. For the technical lecture on automotive alternators I was responsible for synthesizing the information provided by the other group members into an overall picture of how an alternator works. Before my section of the lecture, other group members introduced the history of electricity, gave a primer on field theory, and introduced the individual parts of the alternator. I then synthesized the functions of the individual parts with the field theory presented earlier to show the exact mechanism by which an alternator generates electric current. I was also responsible for writing an application note describing in detail how exactly serial communication with the AMS rotary position sensor works.

Career Impact

In the most basic sense, this course satisfies the requirements for the completion of my education which is my most immediate career goal. In a much broader sense, however, this project has given me a wealth of expertise working with embedded systems, MOSFET circuitry and electric motor systems. It is my hope that this experience can be put to good use later in my career. Even if this never happens, the presentations and teamwork aspects of the class are a wonderful preparation for the engineering workplace that I am about to enter.

Personal Strengths and Weaknesses

Though it is often difficult to accurately judge one's own strengths and weaknesses, I would divide my own strengths and weaknesses into two categories: Practical strengths and weaknesses, and interpersonal strengths and weaknesses. Practically, I found my strengths on this project to be in the areas of programming, soldering, problem solving, and in quickly obtaining a technical understanding of design problems. My practical weaknesses were in the areas of the actual operation of the hardware (for example, BJT biasing). Interpersonally, my strengths were in the areas of communication.

Professional Outlook

I am currently slated to begin working as a software developer for a local software company called IDV solutions immediately after graduation. In 5 years I hope to have risen to a senior software developer at the same company. After this it is hard to predict what my career will have in store, but it might be interesting to look at some aerospace career options. The downside of this would be that pickings are slim if I want to stay in Michigan. Given the fact that I am currently married and starting a family is also on the outer edge of the 5 year plan of my wife and me, it may be necessary to carefully plan any career changes to align well with family plans. If an opportunity arises before 5 years at IDV I will probably take it, but I'm not going to count on something like that for my 5 year plan.

Lifelong Learning

One of the things I enjoy most in life is learning, especially when I am able to learn about things that interest me. In order to be an effective and relevant software engineer for many years to come I must continue to educate myself on programming techniques and latest technologies. Additionally, I will need to stay relevant on state of the art hardware principals in order to have any chance of getting position in the aerospace industry at a later point in time. I am really quite excited to begin my career as I have a feeling that it will turn out to be even more meaningful and rewarding than anything I have experienced so far in my education.

Appendix

My resume is on the following pages.

Stephen Dunn

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EMPLOYMENT GOALS

Seeking a full time position in which I can use the very best of my technical skills in cooperation with my personal strengths to solve complex problems both in cooperation with colleagues and individually. Strive to be always learning and advancing my skillset in order to find the best solutions to problems at hand.

TECHNICAL SKILLS

- Computer Programming
 - C#, Java, C, C++ (including embedded C and C++) and small amounts of Assembly
- Electrical Engineering
 - Analog and digital circuit design
 - ARM microcontroller programming

PERSONAL STRENGTHS

- Exceptional computer skills
- High attention to detail
- Eager to learn
- Quick to grasp new concepts/skills
- Uses creative freedom to solve problems/complete tasks
- Works well in small groups

EDUCATION

Spring Arbor University
Pre-Engineering — 2010 - 2013

Accomplishments / Activities

- Cumulative 3.6 GPA
- Academic Honors for Spring of 2012
- Physics Tutoring
- Rugby Club

Michigan State University

Computer Engineering — 2013 - 2015

Accomplishments / Activities

- Cumulative 3.5 GPA in technical courses
- Certificate of Cooperative Engineering Education

EXPERIENCE

Software Developer Intern, IDV Solutions

Lansing, Michigan — Full-time/Part-time, May 2013 - Present

General software development as a member of the product team using AGILE methodologies. Experience producing and maintaining large scale software solutions through several release cycles. Worked with a tight group of developers and quality assurance analysts to bring complex business requirements to fruition within a set time-table.

Maintenance Crew, Heritage Golf Club

Hilliard, Ohio — Full-time, May 2011 - August 2011 and May 2012 - August 2012

Greens Keeping, Landscaping etc. Heavy Machinery Operation. Skilled Operator.

Two seasons experience using precision mowing equipment to maintain and stylize turf grass for a private golf club.