Benjaminjryan.com

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This is a webscrape of https://benjaminjryan.weebly.com/ containing a home, projects, senior design, education, employment, and resume tab.

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Home

About Me

Hello, my name is Benjamin Ryan. I am pursuing a Bachelors of Science in electrical engineering with an emphasis in Power at Iowa State University. Here you can find examples of projects, work experience, and reflection of my time at Iowa State University. Feel free to navigate about the pages. Comments and feedback are welcome.

Thank you for visiting my page.

Career Objective

Upon graduation in May 2015, I look forward to starting a career as an Electrical Engineer in power systems.

Projects

Course Projects

Below are some of the projects I completed during my time at Iowa State University.

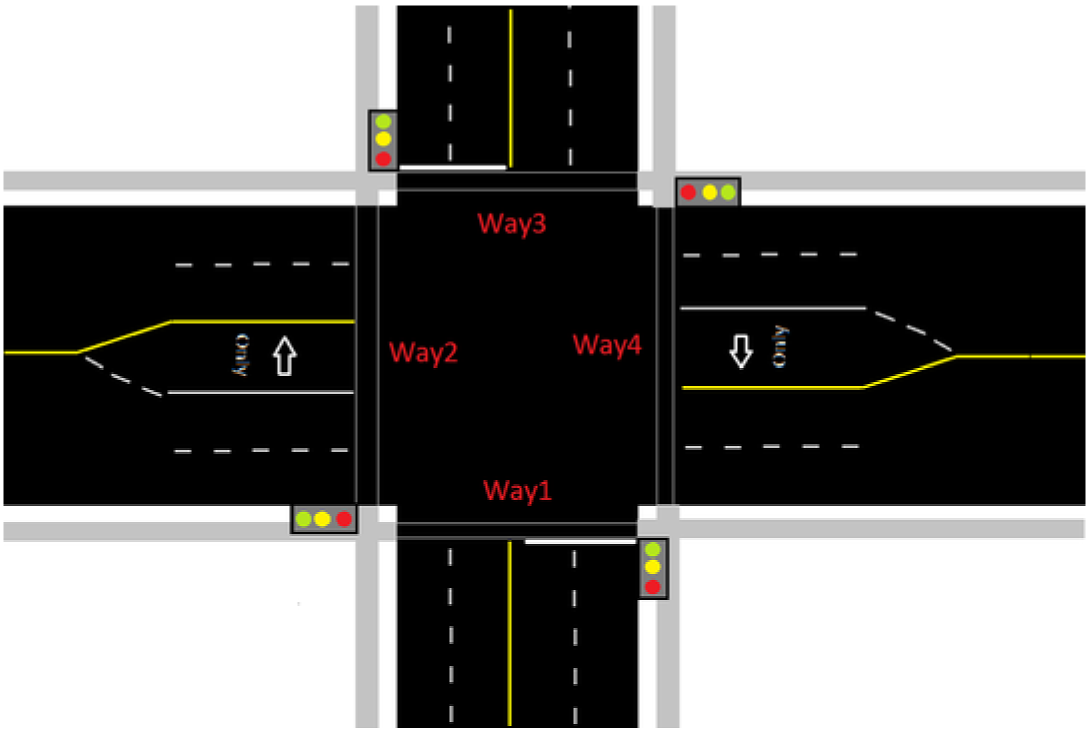
Four-Way Traffic Light Controller

Way	Light Status	Way	Light Status	Turn	Light Status	Time
1/3	Green	2/4	Red	2/4	Red	20
1/3	Yellow	2/4	Red	2/4	Red	5
1/3	Red	2/4	Red	2/4	Red	5
1/3	Red	2/4	Red	2/4	Green	15
1/3	Red	2/4	Green	2/4	Red	40
1/3	Red	2/4	Yellow	2/4	Red	5
1/3	Red	2/4	Red	2/4	Red	5
1/3	Green	2/4	Red	2/4	Red	20

Stop light sequence

Brief Description

In this project, we designed a system to control the status of a four way traffic intersection. The traffic control system has two modes of operation; automatic and manual mode in case of emergency, road work, or other events that interrupt regular traffic flow. There are a total of 6 different possible modes of operation that will either be cycled in automatic mode or manually set in manual mode. The manual mode is controlled by a 3-bit input control. In automatic mode, this 3-bit input does nothing. Pedestrians can also alter the traffic light status. Once a pedestrian presses a button to request to cross the road, the walk light (green light) will turn on within 60 seconds.



Stop light scenario

Conclusion

This project gave us a real world project to work on.

There were many tedious moments and much troubleshooting that went into this project, especially when it came to using new programs such as RTL, Encounter, and even a familiar program like Virtuoso. Much of our troubles came with exporting and importing. If something was not correctly typed when performing these tasks, everything would not work. Every now and then, we would just miss something, and we would need to redo everything because if it.

Despite our hard work we could not get our LVS to work. This was frustrating as neither our TA nor we could determine why the LVS would not work. Everything seemed to be lined up well enough that the layout and schematic should have matched. This just did not happen.

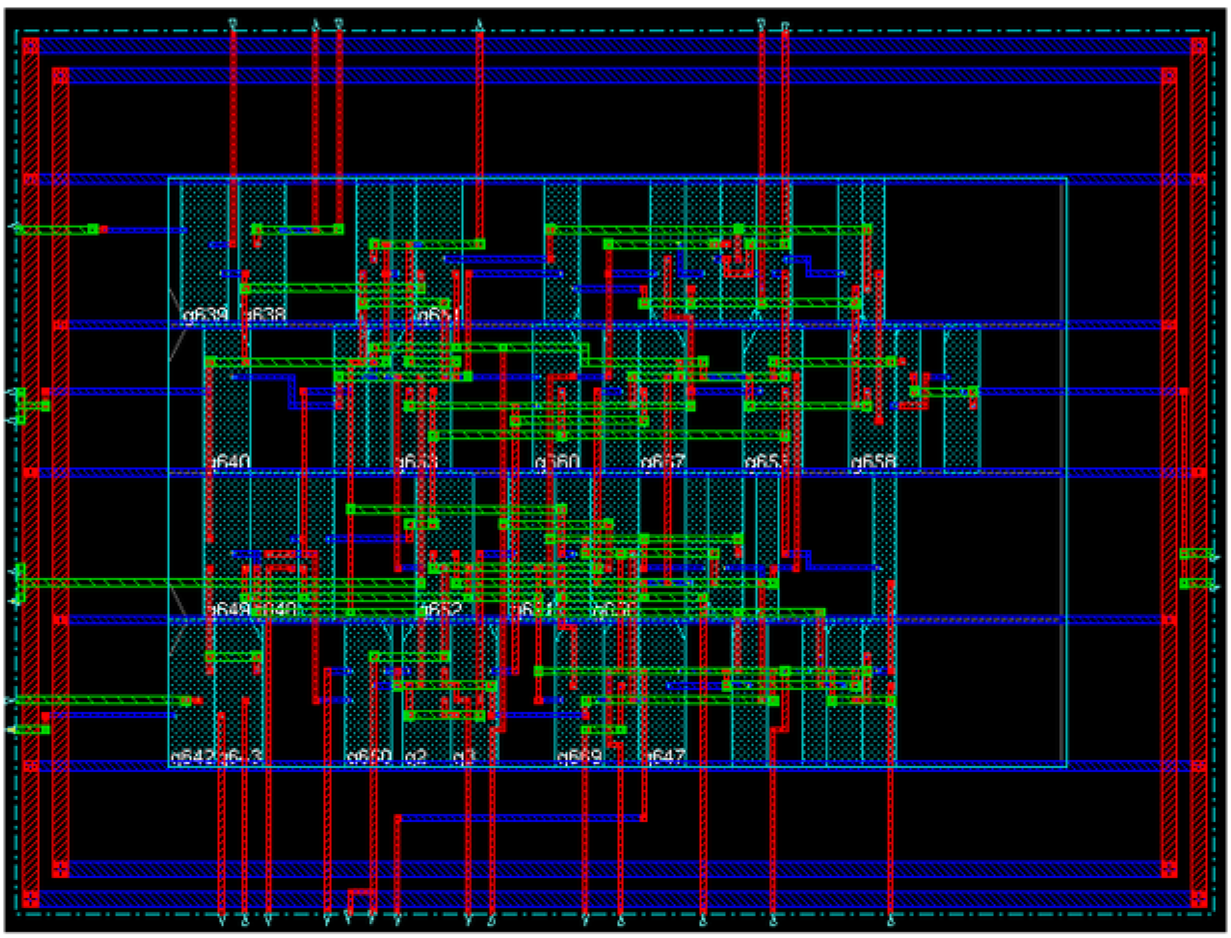
However, our simulation worked pretty well. In the end we were able to create a traffic light that:

- Could be switched from manual to automatic mode

- Took pedestrians into account
- Did not let pedestrians wait for 60 seconds or more
- Followed the timing guidelines in the description
- Utilized a 3-bit switch as a means for controlling in manual mode

We were able to become more comfortable with writing a verilog code, a successful test bench, and running multiple simulations until we emerged with the best possible results.

Despite our couple of issues, I would say that this project was a success, and the amount of experience and knowledge gained from this project, as well as our final products, highly outweigh any problems that arose throughout. The deeper understanding we both now have of digitally simulation and fabricating circuits will definitely benefit us in the future.



Final layout synthesis in Cadence Encounter

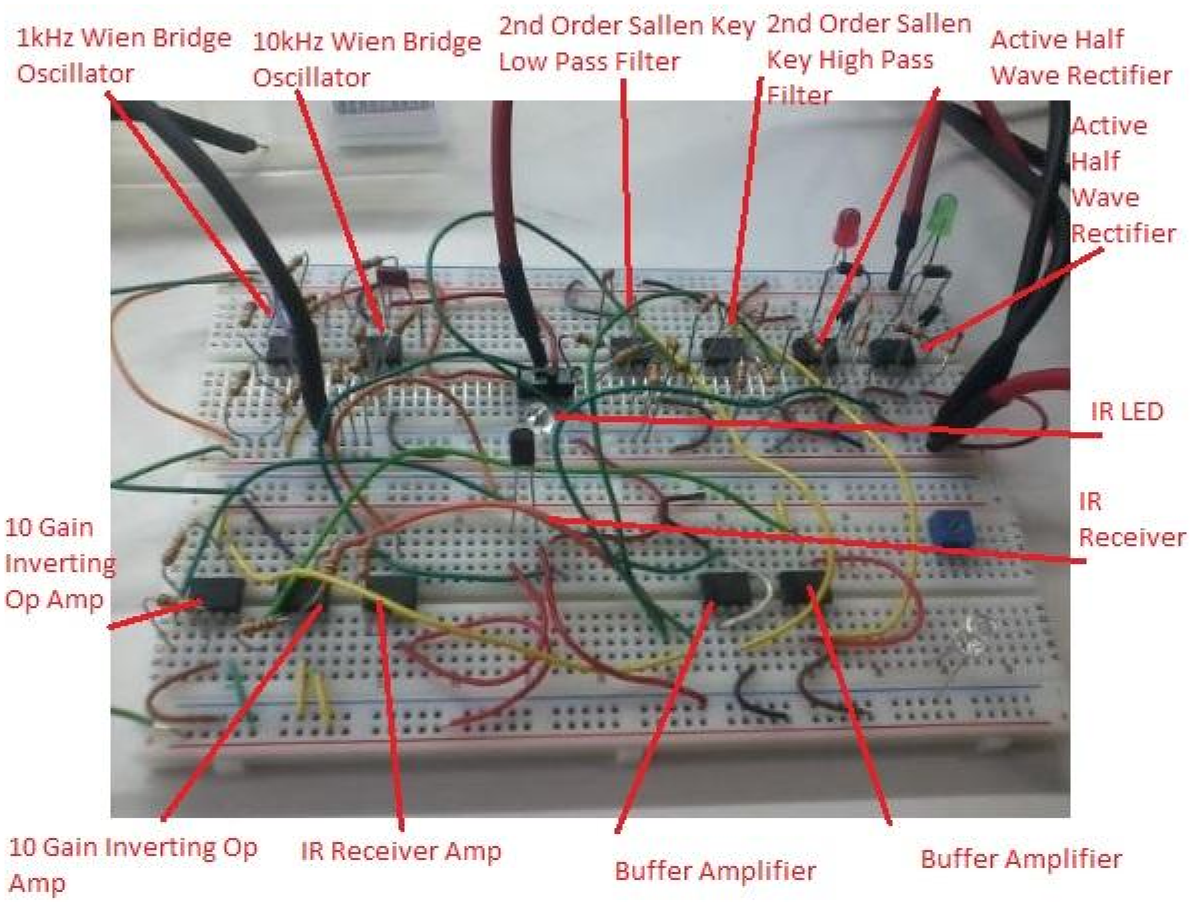
Arduino Controlled Vivarium Environment

This is a project I am working on out of pure desire to integrate what I have learned at Iowa State University with my hobbies. The goal of this project is to create a tropical environment suitable for Dendrobates Leucomelas (A frog from the Dendrobatidae family that inhabit Venezuela, northern Brazil, both Guyana's, and parts of Colombia) and accompanying plant life through data transmitted via micro-controller.

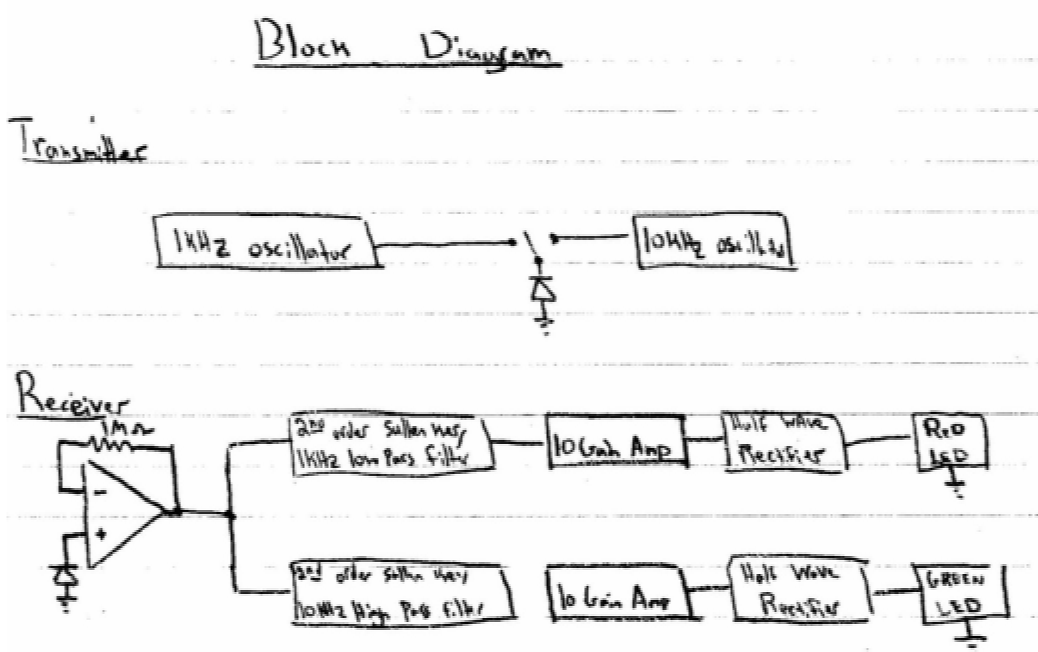
The Arduino micro-controller will be able to monitor temperature, humidity, and real time. This data will be displayed on the LCD screen. The Arduino micro-controller will also control LED arrays to provide ambient lighting for sunsets, sunrises, and lightning storms.

IR Remote and Receiver

The infrared remote and receiver was a final project for EE 230 (Electronic Circuits and Systems) at Iowa State University. The main objective of this project was to design and build a transmitter and receiver that operate much like a conventional television remote control. This project required us to apply the knowledge gained from previous labs and many sub circuits to complete the final working design.



Final working circuit



Block diagram

The design of the circuit is very simple when broken down into each individual component. The transmitter end consisted of an IR LED that would be powered by a 1kHz oscillator or a 10kHz oscillator via two way switch. The IR receiver would receive the IR signal and from there it was to be filtered. The output of the IR receiver was sent to a 2nd order Sallen key low pass and high pass filter. The low pass filter would only allow the 1kHz signal to pass through while the high pass filter would only allow the 10kHz to pass. Next the signal had to be amplified to satisfy the requirements of the rectifier portion of the signal. We decided to use a 10 gain inverting op amp. To give feedback that the circuit received a 1kHz signal versus a 10kHz signal, we placed a red and green LED at the end of each filter circuit. The red LED denoted a 1kHz signal and the green LED denoted a 10kHz signal. To properly power the LEDs, we placed a half wave rectifier between the 10 gain amp and the LED. This rectified the portion of the sine wave that had negative voltage.

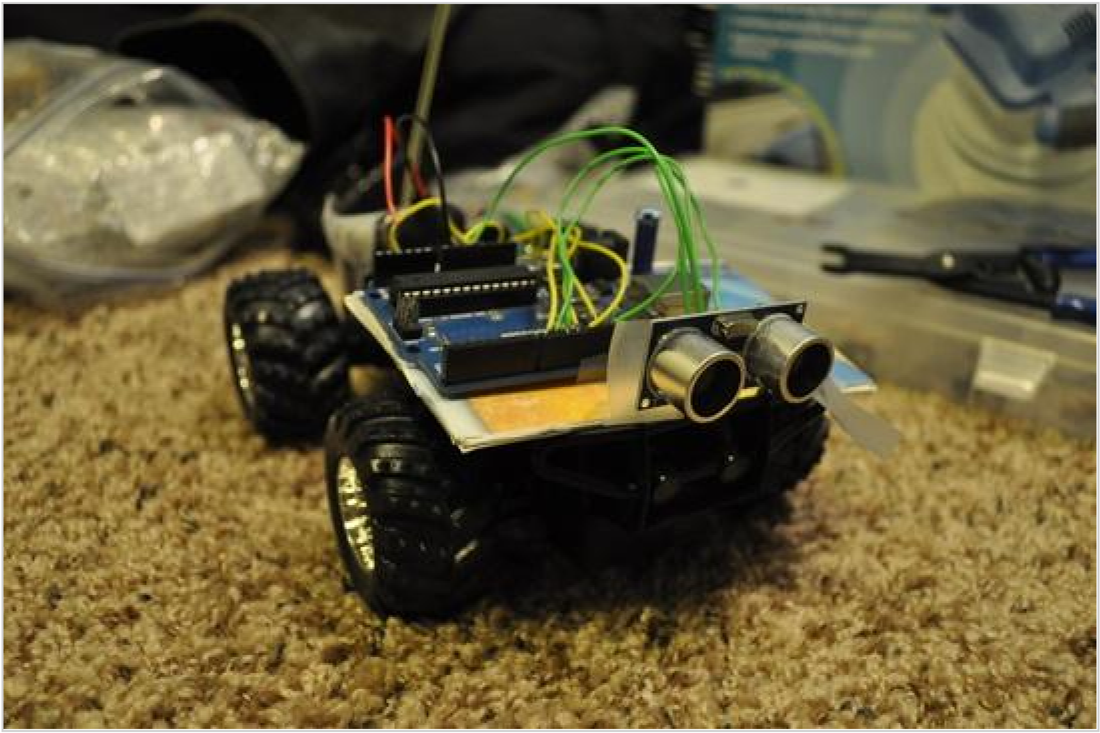
I learned a lot about the difficulties in hardware design from this lab. I found that building the physical circuit from the design on paper is certainly not as easy as it sounds. We experienced a lot of difficulty in faulty op amps that would give extraneous outputs. This made it very difficult to troubleshoot when we discovered an output that we did not expect. We learned that it was very beneficial to first build the individual component on the breadboard and test it before proceeding to connect it to the rest of the circuit. This resulted in the physical building process being a much smoother and pleasurable process.

Ultrasonic Guided Car

This project was a result of familiarizing myself with the Arduino micro-controller. After taking embedded systems at Iowa State University, I had acquired an interest in programming micro-controllers in my own time. Being completely new to the Arduino platform, I did some research to learn the basics of the Arduino and its coding language. After learning the basics I decided the best way to apply the knowledge was to start a simple project.

Goal

The project consisted of an old remote controlled car, an Arduino, and a Sonar range detector. The goal of this project was simple; create a simple program capable of maneuvering itself through an environment without external control.


Arduino car in testing phase

Project Implementation

The code for the autonomous car was very rudimentary. The default status was to drive the car straight foreward at 50% speed. The motor speed was controlled via PWM signal sent to the motor drivers from the output of the Arduino controller. I pulled range data from the sonar range detector every 1/5th of a second and converted this to a centimeter value. If the range data came back with a value less than 30cm, the car would then brake for one second, turn the front wheels to the right and drive in reverse for one second. After this sequence, the controller would begin checking range data and resume the default status.

Conclusions

Although the code for the ultrasonic guided car was very simple, it was surprisingly effective. The car was able to maneuver throughout the rooms in my house for one minute before it got stuck under the leg of a chair.

Upon completion of this project, I learned that many times, simpler can be better. With a simple solution, you have less room for error, quick turnover, lower cost, easy troubleshooting, and less stress. Spending more time understanding a simpler design gave me a strong sense of understanding of how the controller works and the concepts that need to be considered. Immediately after the successful test run, I was able to think of ways to improve the intelligence of the car code. Thus, I am grateful I took the time to learn the basics of the Arduino. This is something I will take with me whenever I am presented with a new problem or challenge.

Mars Rover

Goal

The goal of this project was to program an irobot to maneuver throughout a randomized obstacle course. The constraints of the project without a visual reference of the location of the robot to a determined retrieval zone within a set amount of time. The obstacles consisted of tall objects, short objects, holes in the floor, and IR walls.

Conclusions

I learned a great deal about embedded systems from this project. I learned teamwork, peer communication, time management and leadership skills.

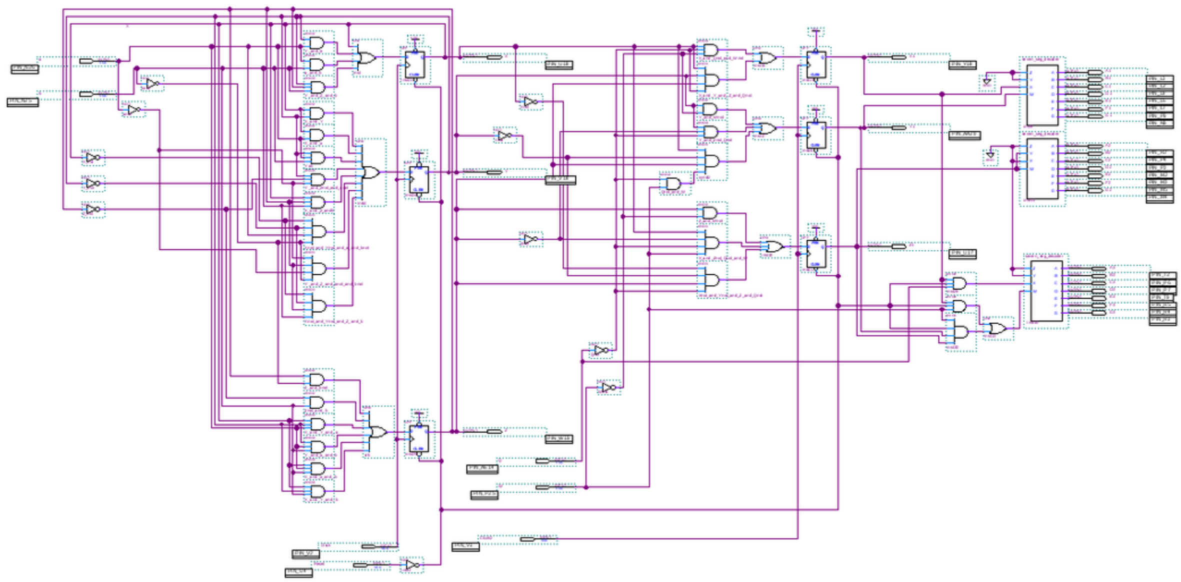
I supplied code for the musical tones that were used as feedback for particular scenarios. I supplied general help for debugging and coding help. I was the map coordinator during the actual testing session. I help provide code for about half of the embedded systems on the robot. I learned C programming, U-ART and Bluetooth communications, and the workings of step motors, Sonar range finders, LCDs, pushbuttons, and motors.

This project has great relevance in the real world. The teamwork I learned from this project will always be helpful in the workplace. Knowing the basics of C programming and embedded systems is also very important, even for electrical engineers because many devices use them on a regular basis. In the even that there is a problem with such a device that is used in the electrical engineering workplace, it is important to know the basics of how they work so the problem can be quickly and easily fixed.

Vending Machine - A Finite State Machine

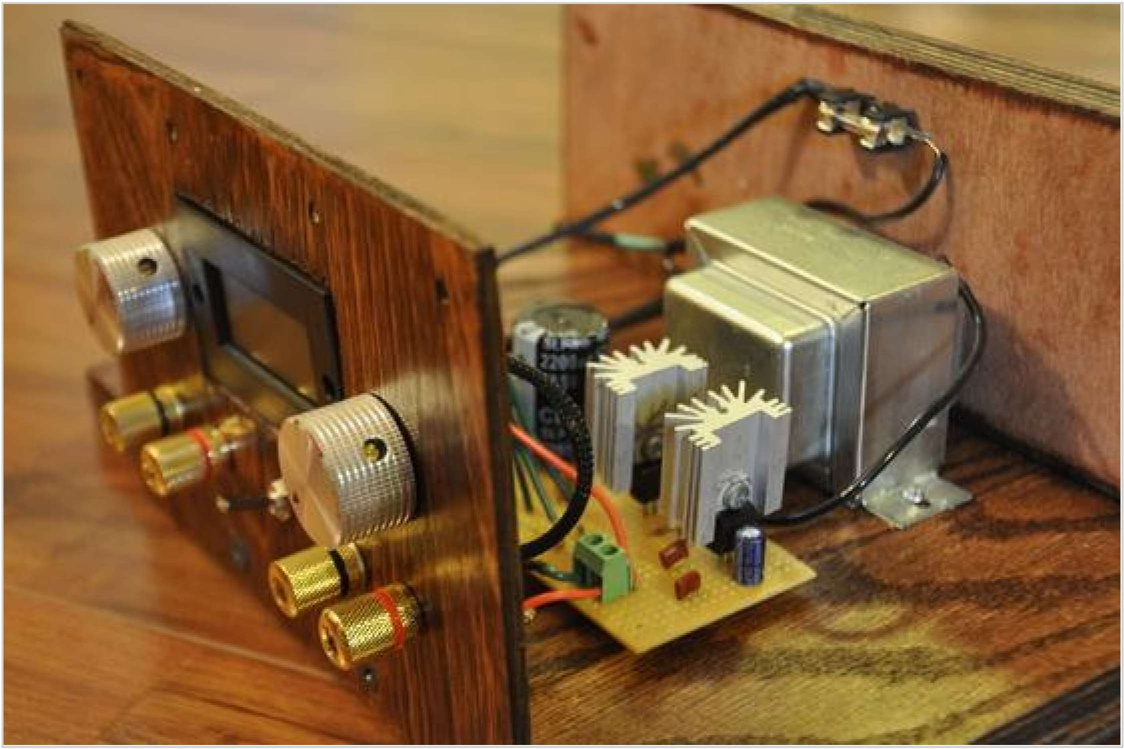
Goal

The goal of this project was to program a finite state machine in Verilog HDL using Quartus II.



Gate level implementation of vending machine

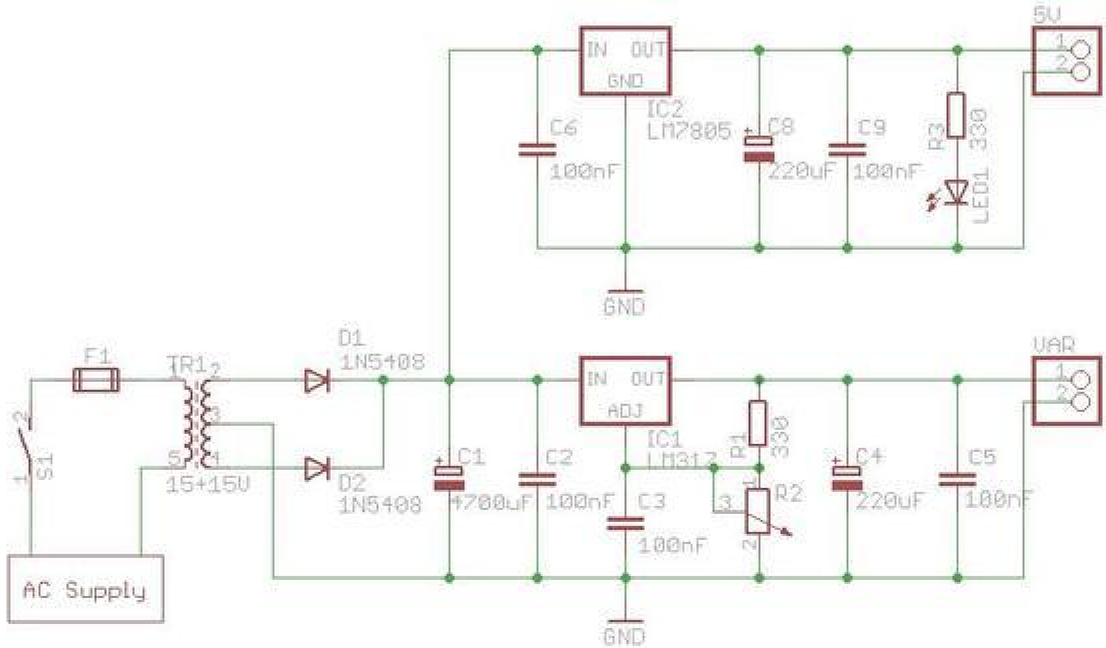
Regulated Power Supply



Power supply during chassis construction

Brief Description

This project was fueled by the need for a dependable power source for the many miscellaneous small electronic design projects I do in my free time. The idea was to have a constant 5V output along with a variable output (1.6V - 16V) that can be used simultaneously. The variable voltage output can be changed with two different knobs; the left knob for course adjustment and the right knob for fine adjustment. The basic design of the variable power supply was from a online resource and I appended the constant 5V portion along with some LED lighting.



Power supply schematic

I began the work by first acquiring all the necessary components. I tested the voltage levels at the output of each individual component as I added them to the PCB template. This testing proved to drastically reduce the amount of troubleshooting I had to do as I completed the project. It also proved to be a great learning tool as I created one of my first electrical device. I learned how the components worked, what the outputs should be, and experienced first hand the realities of component error. Surprisingly, much of the difficulty in this project was not in understanding the circuit itself, but designing a layout on the PCB that was organized and easy to follow.

Power supply with ambient lighting

Senior Design

Hybrid Solar PV and Wind Energy Generation System

The goal of this project is to design and develop a standalone hybrid renewable energy generation system which will consist of wind and solar PV energy. The first phase of the project will consist of software simulation via Simulink-MATLAB. The second phase of the project will be the hardware implementation based on the simulation results. This project will improve my knowledge of renewable electrical generation as well as power electronics.

Duties

Our group opted to not have static duties. Instead we rotated the roles for each team member on a regular basis so that each person would experience each role. The first role I was given was the concept holder. As the concept holder, I managed the group to stay on task with the long term and big picture goals. These big picture responsibilities and deadlines trickled down to short term goals. Maintaining the correct and positive direction with these goals contributed to accomplishing them thoroughly and promptly.
491 Website Link

Education

Iowa State University Education

Below are links to reflections of my time at Iowa State University. In these summaries, I discuss the classes I have taken within my electrical engineering core and general education. Use the following links to read more about my experience at Iowa State University.

Core Classes Taken at Iowa State University

Core Classes Taken at Iowa State University

Computer Engineering 281	Digital Logic
Computer Engineering 288	Embedded Systems
Electrical Engineering 201	Electrical Circuits
Electrical Engineering 230	Circuits and Systems
Electrical Engineering 224	Signals and Systems
Electrical Engineering 303	Energy Systems and Power Electronics
Electrical Engineering 311	Electromagnetic Fields and Waves
Electrical Engineering 322	Probabilistic Methods for Electrical Engineers
Electrical Engineering 330	Integrated Electronics
Electrical Engineering 332	Semiconductor Materials and Devices
Electrical Engineering 455	Introduction to Energy Distribution Systems
Electrical Engineering 456	Power System Analysis I
Electrical Engineering 457	Power System Analysis II
Electrical Engineering 491	Senior Design I
Industrial Engineering 305	Engineering Economics

Iowa State University Cumulative Reflection

Page under construction
Attending Iowa State University has proven to be the greatest opportunity of my young adult life. Iowa State University has challenged me in more ways than I could have imagined. I was always pushed out of my comfort zone to accomplish more than I thought I could have. This has led me to acquire an attitude and technical skill set that will be very beneficial in my future career and personal life.

EE 201

All of the core electrical engineering classes I took at Iowa State made a great impact on the technical aspect of my education experience. Two classes completely changed the way I approach my coursework; Integrated Electronics (EE 330) and Semiconductor Materials and Devices (EE 332). Although these classes are not directly related to my focus of power systems, they taught me important lessons that I carried with me through my remaining years at Iowa State. The depth of material along with the I learned the importance of time management

General Education Courses Taken

Econ 101	Principles of Microeconomics
Soc 134	Introduction to Sociology
Anthr 201	Introduction to Cultural Anthropology
Econ 301	Intermediate Microeconomics
Mkt 340	Principles of Marketing
Las 211	Introduction to U.S. Latino/a Studies

Iowa State University General Education Reflection

Along with the electrical engineering core classes I took at Iowa State University, I also enrolled in a variety of general education classes. The above courses listed above are the general education classes I chose These classes broadened my education experience in a way that improved the practicality of my electrical engineering degree. General education electives did not improve my electrical engineering knowledge in a technical manner, but allow me to approach, evaluate, and formulate engineering solutions with a better perspective.

As an engineer and a college student, I must consider the economics of the decisions I make. Principles of Microeconomics (Econ 101) provided me with basic knowledge of resource allocation, supply and demand, opportunity cost, production and consumption, and many other concepts. Intermediate Economics (Econ 301) taught theory of business and consumer behavior including equilibrium analysis, competitive and imperfectly competitive markets, and optimal consumption choices. I believe that having insight as to how companies and markets react to various economic situations will allow me to make decisions conscious of the economic impact behind them. On a more individual level, Principles of Marketing taught me the roles of marketing in society. This included advertising strategies, consumption behavior, and marketing decisions within a firm. The knowledge I learned in the marketing and economics fields at Iowa State University prompt me to consider the economic impact of the engineering solutions I consider.

The remaining three general education courses I took at Iowa State University were Introduction to Sociology (Soc 134), Introduction to Cultural Anthropology (Anthr 201), and Introduction to U.S. Latino/a Studies (Las 211). While I was initially reluctant to take these classes, they turned out to provide diversity to my electrical engineering core.

Ethics Essay

The purpose of having a code of ethics is to make apparent to the engineers and persons in charge that they are responsible for the safety, honesty, and overall wellbeing of a project or process at work and in everyday life. Engineers need to make decisions and designs that are for the better of the community and not selfish reasons. The decisions in engineering need to be made knowing the full extent of possible outcomes; whether they are positive or negative. For this reason, the code of ethics serves an important role in the engineering community.

When I am faced with an ethic situation, there are a number of factors that I consider before making my final decision. First, I think about all the possible outcomes whether they are positive or negative that could arise as a result of my decisions. Factors that come to mind when making an ethical decision are who it will affect, how it will affect them, and that I act as if I am the boss and my actions are seen by all my peers.

Our group discussed the space shuttle Columbia student case study. Some of the ethical considerations introduced by my group members that I did not think of myself were “how do we define an acceptable risk” and “is there a better way to keep the design and flight of the craft safe other than using safety waivers”. We all decided that someone should have said something about overlooking the design specifications for the debris prevention of the panels. We all agreed that the most ethical decision would be for one of the engineers to bring the specification to attention to his/her peers and or supervisor.

Reflecting on the “Virtue of Ethics” document provided, I chose three virtues that I feel are most related to the space shuttle case study. These virtues are honesty, responsibility, and self-discipline. I believe these virtues are most relevant to this case study for the following reasons; it takes self-discipline to recognize that you or your peers are doing something incorrectly and to bring this to attention. It takes honesty to be able to admit that you skipped over an important specification such as the debris prevention. And it takes responsibility to take action for the mistakes made. I believe the other virtues are very important to consider, but less important for this particular case study. If I were to add a virtue to the list, I would add honor. I believe that an engineer or any person whose decisions affect other should act as if everything they do is in honor or as a privilege. Sometimes people take their position or power for granted and make decisions that can have a negative impact on their peers for the better of themselves.
‘

Employment

Power Engineers

3900 South Wadsworth Boulevard Suite 700
Lakewood, CO 80235
303-716-8900

Duties and Projects

During the summer of 2014 I had the opportunity to intern at Power Engineers as an Electrical Engineer in the SCADA and Analytical Services department.

Skills Learned

While working with Power Engineers, I was exposed to some of the basic duties of a SCADA engineer. This included arc flash calculations with accompanying relay settings, CT saturation calculations, substation DC battery calculations, setup of a local lab serverand general assistance in design and troubleshooting for various HMI and SCADA projects.

Omaha Public Power District

444 South 16th Street
Omaha, NE 68102
402-636-2000

Duties and Projects

I had a co-op position at Omaha Public Power District (OPPD) from May 2013 to December 2013 as an Electrical Engineer within Production Engineering & Technical Support. I was fortunate enough to have a group of helpful engineers more than willing to involve me in their projects as my first real world experience in electrical engineering.

While I was there, I had the opportunity to work directly with plant engineers and technicians to support projects, resolve issues, and make improvements on existing systems.

Skills Learned

My co-op at OPPD was the first real world experience and application of the education Iowa State prepared me with.

I learned more than I could have imagined from everyone . Everyone was more than happy and willing to take the time to explain and demonstrate the aspects of electrical engineering within a power utility. I am very grateful to have been able to work with such a knowledgeable, friendly, and easy going group of engineers.

In particular, I provided support for the design and checking of a sluice PLC project. My responsibilities for this project included back checking of existing design drawings, creating new schematic, layout, one line, and wiring diagrams, and coordinating the project timeline.

and igniter projects. Working with Rick on the HMI and solid state regulator retrofit project gave me great experience of working a project all the way from start to finish and communicating with outside vendors. Using DBDOCs to monitor plant data was both fun and educational. Helping David with the coal soft starts taught me practical engineer-plant staff communication skills that are essential for a utility engineer. Using MicroStation to develop electronic drawings was a great hands-on tool I learned that aided in the school to real life transition. I believe the expansive list of knowledge and skills I acquired working at OPPD will prove to be a great benefit for my future career as a power engineer and with aspects of life in general. I appreciate the help, advice, and information I received from each person at OPPD.

Step 1: Determine The Internal Heat Load					
Component	Power (Heat) Dissipation	QTY	Max Temp. °F	Total Heat Dissipation:	Unit
I/O IA8I	1.81	2	140	3.62	Watts
I/O IA16	3.3	1	140	3.3	Watts
I/O IF4	2.52	2	140	5.04	Watts
I/O OA16	4.9	1	140	4.9	Watts
60W PSU	8.8	1	160	8.8	Watts
PSU 1769-PA4	18	1	140	18	Watts
PanelView Plus 6 Screen	70	0	131	0	Watts
Controller 1769-L30ER	4.5	1	140	4.5	Watts
Ethernet Switch	23	1		23	Watts
Breakers <11A	2	6		12	Watts
Breakers, 16A	3.5	1		3.5	Watts
Future I/O Modules	4	8		32	Watts
Future PLC Power Supply	18	1		18	Watts
		1		0	Watts
		1		0	Watts
		1		0	Watts
		1		0	Watts
		1		0	Watts
		1		0	Watts
		1		0	Watts
		1		0	Watts
Max Desired Internal Temp:			131		°F
Total Dissipation:				136.66	Watts
Add 10% Watt error Margin? (y or n)		y		150.326	Watts

Step 2: Determine Enclosure Surface Area		
Heat Conducting Enclosure Surface Dimensions		
Height:	72	in.
Width:	36	in.
Depth:	18	in.
Non-Heat Conducting Surface Dimensions		
Height 1:		in.
Width 1:		in.
Height 2:		in.
Width 2:		in.
Height 3:		in.
Width 3:		in.
Height 4:		in.
Width 4:		in.
Height 5:		in.
Width 5:		in.
Height 6:		in.
Width 6:		in.
Non-Conducting SA:	0	ft.^{2}
Total Surface Area:	63.00	ft.^{2}
Internal Surface Radiant Value:	2.39	Watts/ft.^{2}

Step 3: Determine Maximum Ambient And Internal Temperature		
Max Ambient Temp:	104	°F
Max Desired Internal Enclosure Temp:	131	°F
Step 4: Indoor Enclosure Maximum Termperature Rise Above Ambient (ΔT)		
Unfinished Aluminum and Stainless Steel Enclosures:	21.89	°F
Painted Metallic and Non-Metallic Enclosures:	12.22	°F
Indoor Enclosure Maximum Internal Temperature		
Unfinished Aluminum and Stainless Steel Enclosure Max Internal Temp:	125.89	°F
Painted Metallic and Non-Metallic Enclosure Max Internal Temp:	116.22	°F
If Outdoors, (Step 5:) Select Enclosure Color (x Only One Thich Applies)		
Black		
ANSI 61 Gray		x
Light Color		
Metallic		
White		
If Outdoors, (Step 6:) Maximum Outdoor Enclosure Temp Rise Above Ambient		
	40	°F
Calculated Outdoor Enclosure Temperature Rise Due Solar + Internal Radiant Heat	58.56	°F
(ΔT)	27	°F

Individual Component Heat Load (Power Dissapation) Calculation Methods		
Current Draw:	15	Amps
Voltage:	115	Volts
Effeciency:	90%	
Power Dissapation:	172.5	Watts
OR		
VFD HorsePower:	5	HP
VFD Watts:	3730	Watts
Effeciency:	95%	
Power Dissapation:	186.5	Watts
OR (May Need To Sum Individual Dissapations If Multiple Lines Exist)		
Incoming Enclosure Voltage:	230	Volts
Incoming Enclosure Current:	11	Amps
Outgoing Enclosure Voltage:	115	Volts
Outgoing Enclosure Current:	9	Amps
Power Dissapation:	1495	Watts

Color Legend			
Sequential Header Blocks			
Special Action Item			
Helpful Areas			
User Editable Fields			
User Fields Of Interest			
Conversions			
150	Watts =	511.8	BTU/HR
1	HP =	746	Watt
1	HP =	2545.35	BTU/HR
40	°C =	104	°F
18	°F =	-7.78	°C
Typical Effeciencies Of Devices Housed In Enclosures			
VFD:	95-98%		
Servo Drive:	>85%		
Power Supply:	60-85%		
Transformer:	95-99%		

If Outdoors, (Step 7:) Click On The Red Highlighted Cell. Navigate To The Data Menu. Click What-If Analysis. Click Goal Seek. Change To Value: `$J$22` (ΔT), By Changing Cell: `$J$31` (Solar Radiant Value)		
Calculated Solar Load (Black):	8.41	(ΔT)
Calculated Solar Load (Gray):	0.00	(ΔT)
Calculated Solar Load (Light Color):	-9.17	(ΔT)
Calculated Solar Load (Metallic):	-23.88	(ΔT)
Calculated Solar Load (White):	-23.38	(ΔT)
Solar Radiant Value:	14.11	Watts/ft.^{2}
Solar Load:	889.02	Watts
Solar Radiant Value + Internal Radiant Value:	16.50	Watts/ft.^{2}
Total Heat Energy Desired To Remove:	1039.35	Watts
Fan Needed?		
Fan Needed? (If Enclosure Is Indoor And Unfinished)		NO
Fan Needed? (If Enclosure Is Indoor and Painted)		NO
Fan Needed? (If Enclosure is Outdoor)		YES
Total Fan Output To Maintain Internal Enclosure Temperature At Above Ambient. Fields With RED Text Indicate Fans Not Required	27	°F
Indoor Enclosure:	17.59	ft.^{3}/minute
Outdoor Enclosure:	121.64	ft.^{3}/minute

*Calculations obtained from Pentair Hoffman Sealed Enclosure Heat Rise Articles.

Resume

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http://www.linkedin.com/profile/view?id=324313187&trk=nav_responsive_tab_profile