Project：Avista - Transactional Energy

Team Minutes

Members: Springer, Matthew(spri2717), Ropp, Joshua(ropp5425) Fan, Meng(meng2532), Liu, Liwei(liu3471), Chen, Zhiyu(chen2283)

catalogue

Lecture Day 1 (21/08)

Tuesday, August 21, 2018 3:30pm

21/08/18		**Lecture Day 1**

UI capstone Design Process

1. Planning
   - Snapshot1 - Problem definition
2. Concept Development
3. System level Design - Snapshot2 - Conceptual Design
4. Detail Design - Snapshot3 - Detailed Design
5. Testing/refinement - Snapshot4 - Project Conclusion
6. Production Ramp up

Snapshot documentation Deliverable

1. Snapshot #1 Problem Definition
   - Team contract
   - Object/Value Statement
   - Project learning Evidence
   - Customer Needs Analysis
   - Product Requirements (PRD)
2. Snapshot2 - Conceptual Design
   - Value Proposition
   - Concept Design Review
   - Design Validation Plan (DVP)
   - Initial Prototype Evidence
   - Engineering Analysis
   - Engr. Purchase Order (EPO) for long lead components
3. Snapshot3 - Detailed Design
   - Value Prop. / Business Case
   - Detailed Design Review
   - Design Validation Plan (DVP)
   - Failure Modes Anal. (dFMEA)
   - Engineering Analysis
   - CAD / Drawings / BOM
   - Software (SW) Code
   - Sustainability Evaluation
4. Snapshot4 - Project Conclusion
   - Value Prop. / Business Case
   - Functional Prototype
   - Design Valid. Results (DVP&R)
   - Assembly instructions
     - CAD/Drawings/BOM
     - SW Code and Read- Me files

- EXPO Poster
- Final Report

Project Management:

- Project Schedule (Gantt)
- Action Items & Tracking
- Project Budget
- Meeting Agendas/Notes

Lecture Day 2 (23/08)

Thursday, August 23, 2018 3:30pm

23/08/18		Lecture Day 2

Logbooks

1. INDIVIDUAL
   a. DESIGN PROCESS
      - Logbook Usage
      - Team Member Citizenship/ member coaching
      - One on one interactions/observations
   b. DESIGN PRODUCT
      - Team member Citizenship
      - individual Design/Portfolio Assignments
      - One on one interactions/observations
2. TEAM
   a. DESIGN PROCESS
      - Overall team dynamics
      - Client Relations/Communications
      - Design Review
      - Instructor/Team Meeting Impression
      - Financial Management/Budget
   b. DESIGN PRODUCT
      - Hardware/Software Created
      - Snapshot & Expo Displays/posters
      - Wiki page on Project
      - Overall Portfolio/Design Report
      - Client Acceptance/enthusiasm

Project Portfolios

What and Why?

- A team portfolio is a living record of the team's progress
- A well built portfolio will save time in creating reports, presentations and wiki.
- A high quality portfolio is useful for the client and future design teams in addition to the current design team

Contents:

1. Meeting Minutes
   - Weekly action items
   - Summary of progress
   - Meeting review: Helpful/Not
   - Attendance and participation
   - Team member contributions
2. Project learning
   - What off-the-shelf technologies you can use to solve the problem

- Why did you think the design would work
- Why the design did not work
- What needed to be changed.

3. Design Goals
   - Client need and project goal (with timeline)
   - Revision of goal. Why the revision was necessary
   - New goal
4. Specifications and constraints
   - Documentation of client interview
   - Design specifications and constrains
   - Make notes on the reasons
5. System Diagrams
   - Use standard symbols
   - Properly label and reference.
   - May use software
   - Document who drew and what software was used
6. Analysis of Alternatives
   - Safety
   - Less moving parts
   - Lower cost
   - Durability
   - Compatibility
   - Foolproof
7. Engineering Modeling
   - Physical, Chemical and Biological system modeling.
   - Modeling criteria, expected accuracy, pitfalls
   - Which modeling software was used
   - What data was needed, how the data was obtained.
   - Validation scheme for the model
8. Manufacturing/Implementation Plan
   - Fabrication need
   - Flowchart for process oriented projects.
   - Bill of materials, drawings
   - Manufacturer and delivery time
9. Experimental Design
   - Characterize the purpose of the experiment
   - Detailed documentation on instrumentation and measurements
10. Data Analysis
    - Document statistical tools used
    - Document accuracy of data, and experiment.
    - Write about the confidence in your results.
    - What conclusions can be made
11. Balance Sheet/Budget
    - Initial Budget

- Estimated cost for Materials/components
- Spending plan.

12. Appendices
    - File management/archiving
    - Unabridged documents
    - Data sheets
    - Document any issues
    - Report any accidents/near misses/precautions

Lecture Day 3 (30/08)

Thursday, August 30, 2018 3:30pm

30/08/18		Lecture Day 3

Project learning

1. Goals
   - Agreement on the scope of the project
   - What is the target
   - What knowledge and skills are required to achieve the target
2. Early in the Design Process
   - Broadly defined project
   - Idea generation
   - Problem definition
   - High level engineering analysis
3. Later in the Design Process
   - Detailed design
   - Design refinement
4. Areas
   a. People
      - User groups
      - Focus groups
      - Ride - Alongs
   b. Technology
      - Experimentation
      - Prototyping
      - Math Models
   c. Product
      - Competitive Analysis
      - Observations
      - Dissection

Client interview

1. Identify Stakeholders and Experts
   a. Stakeholders have interest in new product
      - External customers:
        • Purchaser
        • End user
      - Internal customers:
        • Manufacturing Marketing
        • Financial/Business leaders
      - What is important to each of them
   b. Experts have specific knowledge
      - Usually have years of experience

- Know the pitfalls and solutions tried before
- Can help you focus your direction

2. Interview Guidelines
   a. Observe things that unspoken
      - A simple requirement can be overlooked
   b. Confirm things that are said
      - Is it clear
      - Communicate back to customer
   c. Clarify priorities
      - Must, should, wish
      - Prioritize complete needs list
   d. Listen - let the user/client talk
      - Follow up for clarification
      - Take good notes
3. Product Attributes
   a. Functional performance
      - Speed, efficiency, flow rate, temperature range
   b. Human factors
      - Ergonomics, noise level, visibility
   c. Physical requirements
      - Size, color, mounting method
   d. Reliability
      - Quality
      - Durability
   e. Manufacturing requirements
   f. Serviceability
   g. Cost
4. Observe the product in use
   a. People often do not
      - realize opportunities,
      - realize their problems, or communicate all needs
   b. Apply anthropological techniques
      - Document activities
      - Characterize user types
      - Characterize value to user
5. Empathetic Activities

   First-hand experience is a great way to grow understanding

Use the product

- Perform the process
- Experience the hardship!
- Ride-along

6. Competitive Analysis
   - Evaluate competitor products (or prior solutions)
   - Benchmark each attribute

- Estimate cost

7. Value Proposition
   - Know how your competitor is viewed
   - Know how your customer makes decisions
   - What is important?
   - What is not important?
   - What unique value can you bring?
8. Mock-ups and Calculation models
   a. Mock-ups
      - Evaluate subjective requirements (e.g. ergonomics)
      - What happens if I change this?
   b. Calculation Models
      - Governing equations
      - Align with experiment
      - Sensitivity to changing parameters
9. Research
   - Emerging technologies (web/patent searches)
   - Alternative materials
   - Existing documentation
   - Vendor catalogs

Team Meeting 1 (04/09)

Tuesday, September 04, 2018 4:30pm

04/09/18		**Team Meeting 1**

Project- Transactional Energy

Team members: Springer, Matthew(spri2717), Ropp, Joshua(ropp5425)
Fan, Meng(meng2532), Liu, Liwei(liu3471), Chen, Zhiyu(chen2283)

Customers:Yacine Chakhchoukh (ECE), Daniel Conte de Leon (CS), and Herb Hess(ECE), Brian Johnson (ECE)

Professor: FengLi

Weekly Team Meeting: Tuesday 4:30pm

Team Name - Prosumers are the Way

Team roles:
Ropp - Team Organizer and Leader
Springer - Client Contact
Fan - Recorder
Chen - Documentation Keeper
LIU - Budget

Content: Be familiar with and understand team members, clients and professor. Talk and finish the team contract. Ask the instructor for some basic information about the project.

Lecture Day 4 (06/09)

Thursday, September 6, 2018 3:30pm

06/09/18		Lecture Day 4

Product Requirement

1. Customer Needs
   - Compile a list of needs
   - Organize by attributes (if possible)
   - Prioritize by importance
2. Engineering Requirements
   - Define metrics
   - Benchmarking
   - Set Target Values
3. Guidelines for Metrics
   - Each customer need → single metric
   - Metrics → what the product must do
   - Consider criteria for comparison in marketplace
4. Process for Target Specs
   - Create a list of customer needs.(by-product of client interview)
   - Prioritize customer needs (by importance).
   - Prepare a needs-metrics matrix.
   - Compile benchmarking information.
   - Establish ideal as well as marginally acceptable values.
   - Set appropriate target values.
5. Tips on Selecting Metrics

-Ideally each customer need would correspond to a single metric, and the value of that metric would correlate perfectly with meeting that need. In practice, several metrics may be necessary.

- Metrics should be dependent, not independent, variables. Specs indicate what the product must do, but not how the specs will be achieved.
- Show a table of metrics at first semester Snapshot event!

6. Process for Final Specs
   - Develop technical models of the product.
   - Develop a cost model of the product.
   - Refine target requirements, making well documented trade-offs as necessary.
   - Flow down requirements for overall system into sub-systems.
   - Set appropriate values for final requirements.

Developing a Budget

1. Early Estimates - before project start
   a. It's important
      - May need to be create a "quote" to a potential client
      - Early identification of what resources will be needed

- Early confirmation of feasibility of the project
- First high-level pass at a project schedule

b. Your first Draft budget is likely not very accurate
- Only estimated values for spending
- Forces you to think about what will need to be done
- Provides a baseline for future updates

2. It is a living document
a. You will continue to make frequent updates to budget throughout the project
- After every major purchase
- At a specific frequency(i.e. weekly or monthly)

b. Can use budget tracking sheet at any time to
- know if you can afford future purchases
- report to your supervisor at any time

3. Initial Approach/Set up
a. Using a simple spreadsheet(template):
- Capture all forecasted expenses for the project
  - Equipment/Tools (capital expenses)
  - Travel (direct expenses)
  - Parts/Supplies/Services(direct expense)
- Estimate the approximate timing for each expense
- Estimate the amount of shop usage required (in hours)
  - Machining
  - Material preparation
  - Consultation with Grad students and /or Bill in the shop

b. For externally sponsored capstone projects only
- Graduate student support
- Shop overhead
- University Overhead (5%)

c. The total should be less than the allocated budget

4. Ongoing Maintenance
a. Frequently update
- Past expenses (actual amounts)
- Future planned expenses (best estimates)
- Allow for unknowns or possible rework/mistakes
- continue to manage toward a target.

Escalate immediately if an update projection will exceed the target budget.

Lecture Day 5 (11/09)

Tuesday, September 11, 2018 3:30pm

11/09/18		Lecture Day 5

Project management

1. Tools
   a. Team contract
   b. Mission/vision/goal statement
   c. Timeline/Schedule
   d. Project status reports
   e. Action Item list
   f. Meetings
2. Schedule-Activity
   a. Identify all the tasks required for a person to get ready for work
   b. Estimate the duration of tasks
   c. Order task in a logical sequence
   d. What work can person do who help you.
   e. Re-sequence
   f. Design a Gantt Chart
3. Considerations
   a. Client meetings
   b. Due dates (Wikipage, logbook)
   c. Snapshot Days
   d. Design Reviews
   e. Keep some margin for error
   f. Account for holidays or busy time
4. Action ltem List
   a. All members agree and understand
   b. Allocate action items equitably
   c. Must Include: owner, Target Date, Completion Date.
   d. Review and update at team meetings

Project communication

1. Meeting guidelines
   a. All members attend
   b. Set date and time - start on time
   c. Set the agenda prior to every meeting
   d. Typical agenda
      - Review of open Action Items
      - Status toward Schedule
      - Open Issues and Risks
      - Assignment of new Action Items
      - Review of Minutes
1. Meeting Decorum

a. Be on time, start on time
b. Help everyone stay on track
c. Use direct language and be succinct
   - Eliminate “sort of”, “kinda”, etc.
   - “Yes”, “No” or “ I dont know”
d. Email/Texting
   - Never the place to have a disagreement
   - Can become public

Design Validation Plan

1. Requirement
2. Test
3. Test project
4. Target Date
5. Result
6. Recommendation

Team Meeting 2 (11/09)

Tuesday, September 11, 2018 4:30pm

11/09/18		**Team Meeting 2**

Attendees: Springer Matthew, Ropp Joshua, Fan Meng, Liu liwei, Chen Zhiyu

Content:

1. Modify something about team contract and confirm Chen to be maker of Wiki page.
2. Print the team contract and every member should signature. Submit it in the night by scan files.
3. Confirm the client meeting on Set. 12th Wednesday 6:30pm in room 218 of GLJ Lab
4. Prepare 20 basic questions about the project for client meeting

Questions:

1. What is the objective of this project?
2. What are your interests in the project?
3. What use will this project have in the future?
4. What tasks are needed to be completed by the end of the project?
5. What resources are available for use?
6. What are the first couple steps that need to be completed?
7. Do you have any preference as to what modeling software we will be using?
8. What type of communication applications do you want to be using?
9. How large of a simulation to properly analyze the stability of the power grid with reverse power flow?
10. How many sources of renewable energy do you want to be in the model?
11. What sort of budget is available for us?
12. What are you expecting the end product to look like?
13. How involved will Avista be on this project?
14. Will this project benefit later projects? If, so how?
15. Has this project already been researched in this country or others?
16. Has this project been implemented in other countries?
17. Will we have to worry about existing tariff structures and rates?
18. How often will we need to inform Avista about our progress?
19. What all tasks on the proposal do you need us to complete?
20. What deadlines do you want us to meet?

Instructor Meeting 1 (12/09)

Wednesday, September 12, 2018 6:30pm

12/09/18		**Client Meeting 1**

Attendees: Springer Matthew, Ropp Joshua, Fan Meng, Liu liwei, Chen Zhiyu

Instructors: Professor FengLi(ECE), Professor Yacine Chakhchoukh(ECE), Professor Daniel Conte de Leon(CS)

Content:

1. Basic information of project

In modern power network, the consumers like us can product own clear energy such as solar, wind and batteries to make profit by transport them to the power system and sell to local citizens. There are many good applications and examples in Japan and Europe. These company build energy price market by doing so.

2. Possible problems

Although, this kind of way can improve resource utilization ratio and extra profit, it may lead to the negative effect to the whole power network. Because of the reverse current, the stability and economy of distribution and transmission systems will be influenced. At same time, the loss of energy also need to be taken into account.

3. The aim of project

Our group need to design and make a small-scale model of power network and use it present reverse current. We can analyse and discuss this model's state in different situation to find solution. Enough control and sensing systems is may a effective direction.

4. Project main content

The whole process of this network model include "Transmission" and "Distribution" . The major of students is Electrical Engineering mainly responsible for "Distribution".

At the beginning, we need learn two kind of new software called "PowerWorld" and "OpenDSS" to understand how to build energy distribution simulation. Besides, learning how to edit the wikipedia pages.

We will need to cooperate students majoring in CS. They will design a kind of application or robot to control transmission, which can help us to finish a complete power network model.

5. Reference

IEEE Website
MIT Paper
ECE421 will have lectures talk about the distribution of energy.
The software from microsoft called "OneDrive" can be accessible for us.

Team Meeting 3 (18/09)

Tuesday, September 18, 2018 4:30pm

18/09/18		**Team Meeting 3**

Attendees: Springer Matthew, Ropp Joshua, Fan Meng, Liu liwei, Chen Zhiyu

Agenda:

1. Review our research on Transcative energy
2. Re-cap information form our instructor meeting
3. Tale about the budget draft
4. Prepare for the client interview

Content:

1. Talk about the use of software by using e-mail and upload the resource on the OneDrive.
   Research link about software and principles.
2. Confirm the meeting date and time about client - Avista
   Team interview: Every Tuesday 4.30pm LLC7
   Instructor interview: Every Wednesday 12:pm GJL 218
   Client interview: Every Wednesday, phone call 15 minutes
3. Check the form of budget draft on the website - Capstone Design and ask for some suggestions from our client
   Upload the budget form on the OneDrive.
4. Come up with some details of the 20 questions and reduce some unnecessary questions
5. Prepare simulations like PowerWorld for next research
   Check all kinds of information or research paper in the internet
6. Discuss the project's details and get deeper understanding of the project by reading the paper about designing and evaluating an energy trading system
   Figure out the product requirements and divide whole project into many different tasks. Arrange these tasks to design a schedule form.

Client Meeting 1 (19/09)

Wednesday, September 19, 2018 10:30am-12:00pm

19/09/18		**Client Meeting 2**

Presented By: Chakhchoukh, and Dr.Comnte de Leon

Co-Pls:Dr.Hess, Dr.Johnson, Dr.Lei(ECE), Ms.Daffin(Project Manager)

Attendees:Springer Matthew, Ropp Joshua, Fan Meng, Liu liwei, Chen Zhiyu

Location: IRIC 305

Agenda:

1.Greeting, Introductions&Agenda Overview
2.Program Review
3.Project Proposal Review/Updates/Changes
4.Project Goals, Deliverables and Expectations
5.Project Management - Schedule/Templates
6.Questions/Feedback/Present

Content:

1. Objective

Develop and evaluate a software application that enables prosumers and consumers to trade power on-demand or semi-automatically.

2. Possible Benefits

- Semi-automated trading of power similar to current financial high-speed trading systems
- Platform for testing new technologies and algorithms
- Data analytics that may lead to increased efficiency in the distribution system
- Profitable electric power pricing strategies and transaction fee structure for AVISTA and the prosumers.

3. Project Tasks

- Gather system requirements and understand information interchange interfaces.
- Design and model the system using modern system modeling tools.
- Develop the database architecture and schema and select a Database Management System.
- Analyse security risks and design and implement security mechanisms.
- Develop a simulated model of the power distribution network
- Design and sketch Web and/or App interfaces: User and Administration.
- Build the prototype software using a fourth-generation application development tool.
- Integrate the transaction control system prototype with the distribution model.
- Design and perform tests for : Functionality, Usability, and Security

- Produce user and administrator usage guides.

4. Project Plan

Proposed Project Schedule

01 September 2018	Project kick off. T1-T7 start
01 November 2018	T1,T2 complete. Initial prototype I
01 January 2019	T3-T6 complete. T8 starts. Prototype refinement II
01 March 2019	T7,T8 complete, T9 starts. Prototype refinement III
01 June 2019	T8 complete. Prototype refinement IV
01 August 2019	T9 complete. T10 starts. Final prototype refinement V
31 August 2019	T10 complete and final report

5. PROJECT DELIVERABLES

A. Written final report of the results of these studies in an Avista approved format

B. Interim reports and telephone conference. Midterm report in 2-page format.

C. Proof-of-concept software and user and administrative documentation.

D. Proof-of-concept evaluation within a small-scale simulated transmission and distribution system

E. Outlines of proposals for follow-on funding to further develop and refine the prototype.

Lecture Day 6 (25/09)

Tuesday, September 25, 2018 3:30pm

25/09/18		Lecture Day 6

Career Fair Prep

1. Networking Night (Oct 2nd, 5:30-7pm in Vandal ballroom @Pitman)
2. Career Fair (Oct 3nd, 2-6pm in Kibbe Dome)
   - 163 employers registered
   - Plan to take about 10-15 copies of your resume (can print on nice paper at the Copy Center - check out their linen-based paper)
3. Lots of information Sessions
   - (Boeing, Micron, FBI , Chief Architect, Plexus, NAVAR)
   - Details can all be found on Handshake
4. ALL-DAY Drop-ins for Career Fair Prep
   - Fri(Sept 28th), Mon & Tues(Oct 1st &2nd) form 8am-5pm
   - 2nd floor of commons (check-in at Vandal Success Centre)

LOGBOOK ENTRY

1. Think about how your time is allocated each day as a student, How might this be different in industry? What questions do you have about this.
2. What skills do you thinks you will need in industry that you don't have now or didn't learn in class
3. Who do you communicated with mostly as a student? Who do you think you will communicated with in industry, and how do you think you will accomplish this?
4. What constitutes professionalism with regard to all types of responsibilities?
5. Write down a few questions that you would like to ask an experienced engineer.

Value Proposition

A value proposition is a promise of value to be delivered. It's the primary reason a prospect should buy from you.

Your value proposition is a clear statement

- explains how your product solves customers' problems or improves their situation(relevancy)
- delivers specific benefits (quantified value)
- tells the ideal customer why they should buy from you and not from the competition (unique differentiation)

Prepare the MID-SEMESTER SNAPSHOT DAY (1st Semester Teams)

Instructor Meeting 2 (26/09)

Wednesday, September 26, 2018 10:30am

12/09/18		**Instructor Meeting 1**

Attendees: Springer Matthew, Ropp Joshua, Fan Meng, Liu liwei, Chen Zhiyu

Professor: Dr.Lei(ECE), Yacine Chakhchoukh (ECE)

Agenda:

1. Talk about the time of phone client interview
2. Compare the strengths and weaknesses of the two types of software
3. Look for some other software to help the project
4. Source of reference

Content:

1. We will have a conference call with the client every two wednesdays, but the specific time has not been decided yet, we need to ask for more suitable time to discuss, or the team members will gather questions, and one person will attend the meeting and raise questions. These questions can be collected and uploaded on the OneDrive, which can be visible for every group members and professor.
2. OpenDSS

   - OpenDSS is a free and available software. OpenDSS supports MATLAB preprocess or post process data and contains models of different elements in the distribution network related to delivery. It can be easily integrated with other software platforms through its COM interface, which allows users to control the simulation from their own software because of its Compatibility with other applications.

   However, OpenDSS does not support online editing, zooming, or dragging and dropping shapes and it's operation is very complicated for the inexperienced

   PowerWorld

   - PowerWorld is a convenient software which provide user-friendly interface and more visual functions. PowerWorld Simulator offers contouring visualization for users to monitor data, present data, and obtain an overview of parameters at a glance. PowerWorld Simulator also can provide various tools to model the electricity market which can help us analyse efficiency.

   However, it's a software that costs money to the masses which means we must test our result in the university laboratory. What's worse, PowerWorld simulator is designed for transmission systems, it is based on three-phase balanced AC power system model and can not simulate an unbalanced system.
3. Simulink can be tried as a simulation and modeling software. Professor Yacine will provide some basic knowledge about this aspect, but whether to choose this software to complete the project still needs to be tested by the team
4. Reference

- Two paper about how MATLAB communicate and operate between POWERWORLD and OPENDSS on the OneDrive.

- IEEE Energy and Power magazine about the application of Transactional Energy in Europe May or June 2016 issues.

- IEEE Explore

5. Supplement:

If we select PowerWorld as experimental software, we need the latest version and this version can be provided in the University Laboratory. Avista's accreditation is required. ECE 422 will provide relevant knowledge about this software.

Team Meeting 4 (02/10)

Tuesday, October 2, 2018 4:30pm

2/10/18		Team Meeting 4

Attendees: Springer Matthew, Ropp Joshua, Fan Meng, Liu liwei, Chen Zhiyu

Professor: Dr.Lei(ECE), Yacine Chakhchoukh (ECE), Professor Daniel Conte de Leon(CS)

Agenda:

1. Client interview questions for Wednesdays meeting
2. Project Requirements project
3. Go over things that need to get done before the snapshot day

Content:

1. So far, we have two choices of software: OpenDSS and PowerWorld. We need to consult Avista and the instructors to make a choice.

   We've now raised about 20 questions and uploaded them to OneDrive. Professor Yacin can solve most of unnecessary problems, and these problems that have been solved need to be cancelled

2. We need some detailed known parameters to help us complete the production requirements document, but in the initial stage we still need to learn and find information about the software, so there are too many unknown data.
3. We need to turn in logbook, portfolio, project schedule, Product Requirement Document before the snapshot day. The recorder Fan have finish the Team Logbook. However, we still have so many unknowns in the rest of the content that we still need to discuss it in detail and ask our tutor for help. If not finish on time, we will ask the instructor for an extension of the deadline
4. Due to the problem of computer system, Chinese students may not be able to use Microsoft office, so we can help each other by uploading documents and materials

Client Meeting 2 (03/10)

Wednesday, October 3, 2018 12:30pm

3/10/18		Client Meeting 2

Professor: Dr.Lei(ECE), Yacine Chakhchoukh (ECE), Professor Daniel Conte de Leon(CS)

Attendees: Springer Matthew, Ropp Joshua, Fan Meng, Liu liwei, Chen Zhiyu

Agenda:

1. The conference call to Avista
2. Main work for ECE students
3. Advice of Professor
4. Possible Problem

Content:

1. The conference call was supposed to be canceled, but it was held temporarily, so Avista was not fully prepared. In the meeting, Professor Daniel ask Avista questions about the software, and whether different software will affect the work of the entire power system. Avista argued that there was no clear provision, including data parameters for the power system. We can choose software that is more convenient for us to use.

2. We ECE students are mainly responsible for the energy sector. In order to model distribution system, OpenDss would be a better choice, because it has an advantage over PowerWorld in terms of distribution. PowerWorld is more powerful in terms of transmission, and it's a closed-source software. For Simulink, we're not going to think about the possibility of it for the time being, because if we use it we're going to have a license problem, which is going to be very troubling.

The professor suggested that we choose open source software, because it would be more convenient for them to help us debug the power system, and the open source software would be more flexible.

3. There will be two CS students in the project to help us complete the transmission aspect, one is a graduate student and one is an undergraduate student.

4. When communicating with python or MATLAB we need to keep it real time and we must figure out how to design the system to realize it. And this process also include principles of dynamics.

5. Japan has very advanced technology in this regard, and we can learn from the IEEE's information and learn from their experience, which may inspire us on our project.

Instructor Meeting 3 (10/10)

Wednesday, October, 2018 12:30am

10/10/18		**Instructor Meeting 3**

Professor: Dr.Lei(ECE), Yacine Chakhchoukh (ECE), Professor Daniel Conte de Leon(CS)

Attendees: Springer Matthew, Ropp Joshua, Fan Meng, Liu liwei, Chen Zhiyu

Agenda:

1. Feedback of 1st Snapshot Day
2. Concept of OpenDSS
3. Client Meeting

Content:

1. As it is an open source software, we can directly Google and download OpenDSS on personal computers. However, we do not have much material in hand at present, so we need to find more literature on this software to learn. Professor yacine will provide some websites to help us refer to.
2. Many professors and students took an interest in our project yesterday, thinking it was very professional. This project can not only reduce the cost of power companies, but also promote the development and use of clean energy, which is very promising in the future market and can be reasonably used in most cities.
3. While learning OpenDSS, we can take courses of ECE421, learn and try out powerworld. We can use both software to simulate and compare the final experimental results, which is very helpful for our project.
4. In Client meetings, we need to ask what software is selected to communicate and review data

Lecture Day 6 (16/10)

Tuesday, October 16, 2018 3:30pm

16/10/18		**Lecture Day 6**

Green Design Approach

Sustainability

1. Environmental
   - Resources Management
   - Environmental impact
   - Longevity of product
2. Economic
   - Economic growth
   - Market expansion
   - Supply and Demand
3. Social
   - Satisfactory products
   - Health and welfare
   - Equity and Human rights

The 12 Principles of Green Engineering

Principle 1: Designers need to strive to ensure that all material and energy inputs and outputs are as inherently nonhazardous as possible.
Principle 2: It is better to prevent waste than to treat or clean up waste after it is formed.
Principle 3: Separation and purification operations should be designed to minimize energy consumption and materials use.
Principle 4: Products, processes, and systems should be designed to maximize mass, energy, space, and time efficiency.
Principle 5: Products, processes, and systems should be "output pulled" rather than "input pushed" through the use of energy and materials.
Principle 6: Embedded entropy and complexity must be viewed as an investment when making design choices on recycle, reuse, or beneficial disposition.
Principle 7: Targeted durability, not immortality, should be a design goal.
Principle 8: Design for unnecessary capacity or capability (e.g., "one size fits all") solutions should be considered a design flaw.
Principle 9: Material diversity in multicomponent products should be minimized to promote disassembly and value retention.
Principle 10: Design of products, processes, and systems must include integration and interconnectivity with available energy and materials flows.
Principle 11: Products, processes, and systems should be designed for performance in a commercial "afterlife".
Principle 12: Material and energy inputs should be renewable rather than depleting.

Cover Sheet

Purpose:

Effective teams have members who act as responsible citizens within the team. In this exercise you will rate yourself and team members with regard to member citizenship. You will also provide feedback on what you perceive to be their greatest strengths and areas for improvement

A. Member Contributions

To stimulate your thinking, please rate members of your team(including yourself) on their contributions to an effective team. In each cell, assign the person a rating(1 to 5) for the corresponding contribution.

B. Member Coaching

Demonstrate your understanding of individual member contributions to team effectiveness by assessing two nontechnical contributions of each member(including yourself). Assess an important strength and assess an area to improve. Work will be scored by the instructor base on the quality of your assessment: their insightfulness, clarity, and helpfulness to achieving greater team effectiveness.

1. Strength: Label it; explain how it is being used to contribute to team effectiveness
2. Area to improve; Label it; suggest steps to achieve desired improvement in this area

Preliminary Design Review

Purpose

This review is where you present your "design in progress" to the customer and other interested parties for assessment. The goals of this review are:

(a) Validate your problem definition
(b) Dialogue with client about three or more viable design concepts
(c) Agree on the path forward/next steps in the design process

Who should attend?

- Faculty and mentors
- Client / Sponsor
- Fellow students (every student should attend at least <u>two</u> design reviews)

What should be covered?

- Present your needs, specifications, constraints, and deliverables.
- Summarize results from project learning.
- Present several viable designs, giving pros and cons of each.
- Provide a well-founded estimate of project costs.
- Outline a project schedule that produces needed deliverables with ample time for product validation.
- Honestly identify all potential problems or risks, and describe how you plan to deal with them.

Who should present?

- Not all team members have to speak.
- The team members chosen to speak should be competent and well-versed in the project, and able to field questions.
- For multi-disciplinary projects, a topic from a particular discipline should be presented by someone from that discipline.

How to schedule? (reserve a one-hour time block)

a) One week ahead - verify that customer, instructor, and mentors can attend and have a specific time reserved on their calendars.
b) One week ahead – secure room location and/or make travel arrangements.
c) Three days ahead – have instructor and/or mentors review your slides.
d) Three days ahead – email reminder to all participants.
e) One day ahead – email presentation or website URL to any audience members who will be connected by phone.
f) Plan to attend at least two other design reviews in addition to your own.

Presentation Tips

- Be prepared to receive assessment from design review participants.
    - Avoid being defensive about any feedback
    - Give the audience validation of their ideas
- Ask participants to forward deep and challenging questions.
- Plan to speak for 15-20 minutes, allowing up to 40 minutes for dialogue.
- Make a nice Powerpoint or web page presentation.
- Try to make the presentation flow logically.
    - Consider using the requirements as a checklist (how have you ensured each requirement is being met?)
    - Organize by attributes, schedule, budget, etc.
- Avoid long written text and long lists of bullets (like this one!). Your slides should emphasize technical aspects of the presentation; e.g.:
    - Pictures
    - Schematics / Block diagrams / Flow charts
    - Free-body diagrams / Equations / Calculations
    - Tables
- Put in just enough text to summarize important points and make each slide self-explanatory. (Detailed textual description of your project will go into your end of semester report).
- Be sure your slides are readable from all locations in the room you will use to present. Otherwise, they are useless, and create a bad impression.
- Don’t read the slides!
- Print out handouts from your slides for the audience to refer to and make notes on. Two or three per page is a good number.
- Assign numbers to your slides so people can refer to them easily, especially if some of the audience members are connected by telephone.
- Take good notes - capture the feedback received and the next steps to further improve the design.

Team Meeting 5 (16/10)

Tuesday, October 16, 2018 4:30pm

16/10/18		Team Meeting 5

Attendees: Springer Matthew, Ropp Joshua, Fan Meng, Liu liwei, Chen Zhiyu

Agenda:

1. Talk about the OpenDSS
2. The project portfolio
3. Some other small items
4. Be clear what need to be done this month

Content:

1. Supply and analyse some small models of OpenDSS. We should finish reading researches of other countries as soon as possible and figure out the principles that how the system to do and run.
2. Chen Zhiyu is responsible for Wikipage and go to workshop to learn how to do it next week.
3. Liu Liwei is incharge of the Design Validation Plan which should hand in this Thursday
4. Prepare for Project Value Proposition next Thursday
5. Portfolio

- references
- Definition
- learning
- Management
- Wikisite
- Design solution
- Implementation
- Design Validation

Client Meeting 3 (17/10)

Wednesday, October 17, 2018 12:30pm

17/10/18		**Client Meeting 3**

Professor: Professor Daniel Conte de Leon(CS)

Attendees: Springer Matthew, Ropp Joshua, Fan Meng, Liu liwei, Chen Zhiyu

Client: Avista

Agenda:

1. Read and learn OpenDSS
2. Library issues
3. Budget
4. IEEE 13 BUS

Content:

1. Our current task is to read and learn about openDSS, learn and be able to use this software to model the circuit system, and lay the foundation for the following tasks.
2. Discuss with Avista whether to hire a CS professional to help with the project, and they can take care of the software. These expenditures can be included in the budget.
3. The senior design team needs to figure out what data they need to get on the CS side, and how to communicate and use these data, which relates to how to transfer energy.
4. We need to understand how IEEE 13BUS works, keep the balance between producer and device and consumer, and make the whole power system safe and reliable.
5. Division of tasks, determine what tasks are completed by the senior design team, and what tasks are handled by CS students.

OpenDSS Learning (10/23)

Tuesday, October 23, 2018 12:30pm

23/10/18		OpenDSS Learning

Important concepts
- Power system modeling
- OpenDSS basic features

Ctrl + D - Selected lines to solved

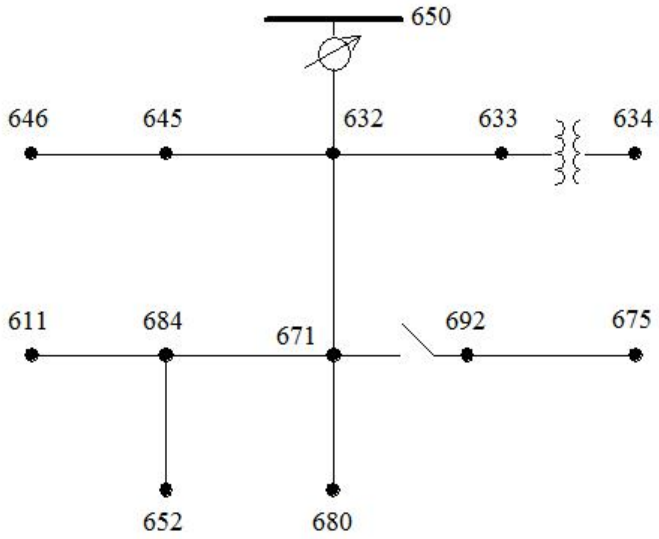
New energymeter.meter element = Transformer.SubXF terminal=1
Plot profile (Line to Node)

Set marktransformers = yes
Set transMackersize

Set mode - daily
Set stepsize - 1h
Set number - 24

Set basefrequency (change frequency)
Set maxiter (change time to calculate for complex system)

IEEE 13 Node Test Feeder



Team Meeting 6 (23/10)

Tuesday, October 23, 2018 4:30pm

23/10/18		**Team Meeting 6**

Attendees: Springer Matthew, Ropp Joshua, Fan Meng, Liu liwei, Chen Zhiyu

Agenda:

1. Talk about hte OpenDSS
2. Concept Design Review
3. Find IEEE 13BUS

Content:

1. YouTube link about OpenDSS tutorial
   https://www.youtube.com/playlist?list=PLcOap2oqW_gEMEVH9dg2HoXJ4NvydfsZM
   13 BUS feeder on IEEE website
2. Professor Daniel require us know what information about power system need to understand, which can help us make the whole system stable and work
3. Design a short report about current project schedule.

Instructor Meeting 4 (10/24)

Wednesday, October 24, 2018 12:30am

10/24/18		**Instructor Meeting 4**

Professor: Dr.Lei(ECE), Yacine Chakhchoukh (ECE), Professor Daniel Conte de Leon(CS)

Attendees: Springer Matthew, Ropp Joshua, Fan Meng, Liu liwei, Chen Zhiyu

Agenda:

1. Work on different part
2. Short Review for Project
3. Fill the form
4. Current Work

Content:

1. We need to divide the work into two parts. One part is for students majoring in CS, and the other part is for students majoring in EE.
2. We need several paragraphs to describe our current work process, including software, ideas, design, and so on. This text should not only be shown to the professor but also submitted to our client Avista. We can send these words to professor Yacine in advance and ask him to help us modify them, which can include which research materials are quoted.
3. We need to understand the principles of IEEE 13BUS and thus understand the flow of energy.
4. The ultimate goal is to simulate a reasonable and effective distribution system, so we need to focus on modification and try to design an basic distribution system
5. Complete the form for Value Position Validation as soon as possible

Lecture Day 8 (30/10)

Tuesday, October 30, 2018 3:30pm

10/30/18		Lecture Day 8

Senior Design Workshop

Printed Circuit Board Design

Outline

1. Introduction to PCB
2. Introduction to PCB design packages
3. PCB design
   - Schematic design
   - Organizing schematics
   - Board layout and routing
   - Exporting Gerber files
4. DFM
5. Fabrication
6. Assembly

What is PCB?

1. Printed Circuit Board

Mechanically supports and electrically connects electronic components using conductive tracks, pads, and other features etched from coper sheets laminated onto a non-conductive substrate.

2. Two purposes
   - A place to mount the component
   - Provides the means of electrical connections between the components
3. PCBs can be
   - Single sided (one copper layer)
   - Double sided (two copper layers)
   - Multi-layer

PCB Terminology - Component Packages

1. Through-hole technology
   - Soldered to the opposite side of the board
2. SMD/SMT (surface mount device/technology)
   - Soldered in the same side of the board
   - Can be mounted on both sides of the PCB
   - Smaller than the thru-hole type; smaller & denser PCB
   - Some common form factors

Gerber File Format

- An open ASCll vector format for 2D binary images
- de facto standard used by printed circuit board(PCB) industry software to

describe the printed circuit board images: copper layers, soldermask, legend.
- The standard file extension is GBR or gbr

PCB Design Packages
- Altium Designer(Protel)
- AutoDesk EAGLE
- The Cadence Allegro PCB Designer/orCAD PCB editor
- Mentor Graphics Xpedition
- PCBWeb Designer, Express PCB, Pulsonix, DesignSpark PCB, TinyCAD, easyEDA

Which PCB Design Package to Use?
- Price/cost
- User interface, default keyboard shortcuts
- Learning curves
- Organizing components, component libraries
- 3D viewer
- Gerber file generation

Assembly(Soldering)
1. Through-hole components
   - DIY at ECE Senior Design Lab(BEL 216)
2. Surface-mount devices
   - GJL 001 ECE lab (free)
     - < 30 components
     - Case size > 0402
     - Label pin numbers

Team Meeting 7 (30/10)

Tuesday, October 30, 2018 4:30pm

30/10/18		**Team Meeting 7**

Attendees: Springer Matthew, Ropp Joshua, Fan Meng, Liu liwei, Chen Zhiyu

Agenda:

1. What needs to be in the Wikipage
2. Talk about OpenDss and the 13BUS system
3. Talk about the group portfolio that is due next week
4. Start to talk about the concept design review

Content:

1. Add more pictures or diagrams about the project to Wikipage
2. Show fundamental information about OPENDSS and IEEE 13 BUS to professor in tomorrow client meeting
3. Prepare a binder for portfolio before the next week
4. Book a conference room Wednesday and ensure every professor to attend
5. Leader Ropp will host this Concept Design Review and require the Client Avista to confirm it.

Client Meeting 4 (31/10)

Wednesday, October 31, 2018 12:30pm

31/10/18		**Client Meeting 4**

Professor: Yacine chaknchoukn, Dr. Johnson, Herb Hess

Attendees:Springer, Ropp, Fan, Zhiyu, Liwei

Agenda:

1. Concept design review
2. Update information of 13BUS
3. Think about the price
4. Deadline

Content:

1. The senior design team has downloaded and successfully opened IEEE 13BUS, which may be the basis of the distributed system. Accelerate the learning of software and 13BUS and update the understanding of it.
2. More details are analyzed between consumers and producers, and price factors are taken into account. Currently, the two factors affecting price are location distance and system parameters.
3. Think about how to turn solar energy into electricity, try to design the structure of the whole system, distribute the energy to people who need it, and lay the foundation for future work. Control of the time factor that the system needs to consider.
4. A short presentation before the meeting 11:30pm on November 14th.

Instructor Meeting 5 (11/7)

Wednesday, November 7, 2018, 2018 12:30am

11/7/18		Instructor Meeting 5

Professor: Yacine Chakhchoukh (ECE), and Herb Hess(ECE)

Attendees: Springer Matthew, Ropp Joshua, Fan Meng, Liu liwei, Chen Zhiyu

Agenda:

1. Concept design review
2. OpenDSS
3. Wiki page
4. Content of schedule
5. Two week report for Avista

Content:

1. Concept Design Review will start next Wednesday before the 11:30am in GJL218. (like the final exam of senior design)

   After the suggestion of Dr.Herb, we canceled the case that the leader spoke alone, but everyone talk in turn. The content should include engineering examples, software testing, success stories, and everyone needs to show their contribution and work to the team. (13BUS and OpenDSS)
2. Demonstrate OpenDSS operation and execution commands through CSV file(a file like an excel spreadsheet that holds data points)
3. Zhiyu Chen is responsible for Wiki page. The title of wiki page is Transactional Energy and it contains basic information. The wiki pages will be updated as the project progresses
4. The logbook and protfolio are delayed until next Wednesday
5. The report was sent to professor Yacine last Friday to help us revise it and to professor Daniel to have a look

Team Meeting 8 (8/11)

Tuesday, November 8, 2018 4:30pm

8/11/18		**Team Meeting 8**

Attendees:Springer Matthew, Ropp Joshua, Fan Meng, Liu liwei, Chen Zhiyu

Agenda:

1. Concept Design Review and what needs to get done before next Wednesday
2. Talk about anything new with the 13BUS system

Content:

1. Portfolio and logbook due next Wednesday
2. Dr. Yacine will review the draft of presentation and give senior design team some suggestions.
3. Concept Design Review Process
   - Brief introduction everyone about name and work - Springer
   - explain the meaning and object of the project - Springer
   - explain why we choose OpenDSS as our software - Zhiyu
   - how program work - Ropp
   - OpenDSS demonstrate - Fan
   - Budget and Future plan - Liwei
4. Concept Design Review will hold in GJL 218 11:am in next Wednesday

Client Meeting 5 (14/11)

Wednesday, November 14 2018 12:30pm

14/11/18		**Client Meeting 5**

Professor: Yacine Chakhchoukh (ECE), Daniel Conte de Leon (CS), and Herb Hess(ECE), Brian Johnson (ECE)

Attendees: Springer Matthew, Ropp Joshua, Fan Meng, Liu liwei, Chen Zhiyu

Agenda:

1. Advice for design review
2. Date of next client meeting
3. Future plan

Content:

1. Change the color of the Budget table to make it clearer, and the font size of the presentation document needs to be improved.
2. The next client meeting will depend on everyone's schedule, compare everyone’s schedule in next semester.
3. Send work plan to Professor Yacine and Report the work progress to Avista
4. Design dynamic system to model PV and check how to renewable and add storage. Collect useful data to apply for CS,
5. Real time running CSV file, Matlab may have an advantage over CSV files and other software.

Team Meeting 9 (25/11)

Tuesday, November 25, 2018 4:30pm

8/25/18		Team Meeting 9

Attendees:Springer Matthew, Ropp Joshua, Fan Meng, Liu liwei, Chen Zhiyu

Agenda:

1. SnapshotDay#2
2. Future plan
3. Confirm next semester meeting time

Content:

1. Snapshot Day will hold in same room at 8:30am on Friday.
2. Update relevant information about Concept Design Review.
3. Talk way to build communication between Matlab and OpenDss, sending codes to everyone or put it in OneDrive folder.
4. Keep it open source and confirm what kind of load we need.

Client Meeting 6 (26/11)

Wednesday, November 26 2018 12:30pm

26/11/18		**Client Meeting 6**

Professor: Yacine Chakhchoukh (ECE), Daniel Conte de Leon (CS), and Herb Hess(ECE), Brian Johnson (ECE), Dr. Johonson

Attendees: Springer Matthew, Ropp Joshua, Fan Meng, Liu liwei, Chen Zhiyu

Agenda:

1. Talk about Snapshot Day
2. Set the time of the meeting for next semester
3. OpenDSS with Matlab
4. Some other small items

Content:

1. Get the report before December 7th to Dr. Yacine
2. Senior Design Team will have the meeting with Avista on December 12th
3. Set the meeting time with Client in next semester at 3:30 every Wednesday
4. Mission
   - Working on Matlab and 13BUS system next spring
   - Integration by January and two pager report by February include demonstration
   - Finish Distribution System by January (13BUS model)
   - OpenDss: storage for renewable PV
   - Figure out what data we need for Matlab
5. Professor Daniel create a website to communicate with OpenDss include two parts
   - Website
   - Data
6. Prepare the Snapshot Day #2