

## 9/15/15 8:00 AM Senior Design Suite Meeting Minutes

Agenda for team meeting on Tuesday morning (9/15 at 8:00 am):

1. Finish and review the roommate contract (This has to be done before the client meeting later in the afternoon)
2. Come up with questions that we would like to ask the client during the meeting. (Possibly questions for Dr. Wolbrecht as well)
3. Do an "inventory" of what we have in the Senior design suite (other than the Twister)

8:07 - Austin, Sally, Jacquelin here. Waiting for Robert.

8:10 - Robert arrived. Proceeding with meeting.

- Finish Team contract, three questions to answer.
- Other team goals; none so far, will add as we go.
- Robert is Primary client contact.
- Process to address conflict
  - bring it to the attention of everybody in person
  - address in meeting
- Team dynamics communicated to instructors
  - At each instructor meeting, reported as needed.

8:15 - Team contract finished. Will print off and sign to bring to afternoon meeting.

- Conference room should be set
- **For future, reply to all texts and emails to ensure communication**

8:20 - Come up with a final list of questions to ask this afternoon

- Sally will type up, a copy will be placed here later.

8:45 - 19 questions!

- Ask if we can record, and send her a recap after to make sure we've got her answers right
- Questions on next page.

Next Time:

- Meet thursday at 8 just to recap
- In meeting, write up a preliminary schedule based on answers to questions
- consider individual strengths and end goals
- Today, 4:45, Senior Design Suite meet with Dr. Cohen, bring signed contract

8:55 - Meeting adjourned, inventory done later

### Client Questions

1. Equipment: what is available to us in the machine shop and from Dr. Cohen?
  - a. Is everything that we need in the Senior Design Suite already?
  - b. Are there any additional sensors etc. that we don't have here
2. Budget
3. How often do we need to touch bases with Dr. Cohen?
4. What is the motivation of this project?
5. What is the range of participants that will be participating in experiments?
6. Can we make cosmetic adjustments?
7. What are the specifications of the project?

- a. Like what are we measuring?
- 8. What is the end goal of this project?
- 9. How current equipment works?
  - a. Do we (ME) have to get the electrical side working as well? (Sensors)
- 10. What software is going to be used for this project?
  - a. How much of the software do we need to know?
- 11. For the new device came we copy what we already have or come up with something new?
- 12. What do you want at minimum to happen for this project, what is the big goal of this project?
- 13. How much outside help do we get? From her (Dr. Cohen) or research students?
- 14. To what extent can the existing device (hardware and software) be modified?
- 15. What is your time line for various parts of the project?
- 16. Can we have some data to compare to?
- 17. Once the existing device has been assembled, can you come in and show us how this works?
- 18. Is the equipment going to be used while we are improving it?
- 19. What the primary location of this device?

## 9/17/15 8:00 AM Senior Design Suite Meeting Minutes

### Notes from Sally for today

1. Be sure to have read the article that I forwarded from Dr. Cohen. I know it is long, but I think we should read that.
2. Dr. Cohen has sent me the assembly list (in two emails), I haven't gotten a chance to look at them yet, but I will. So I will be sending the assembly list shortly. Based on what you see on the assembly list, come up with a timeline that you think we will/should/possibly follow for the assembly of the Twister and design that we need to add.
3. Be sure to have a design idea or two (regarding the device that we need to design for Dr. Cohen) to share with the group tomorrow, during the morning meeting.

8:03 - Everybody here. Recapping the first client meeting.

8:07 - Ideas for a pulley system that would use rotary encoders or potentiometers.

8:09 - Do we have additional questions for Dr Wolbrect this afternoon?

- What is his role? More like a client?
- Is the dynamic model accurate?
- Do you know how to assemble the twister?

8:11 - Setting a time of 4 weeks to get it put together and working.

- Tuesday meetings, ~20 minutes meeting and rest of time working on twister.
- As we're working, add notes and create a how-to guide to put it together.

8:14 - Where is her lab?

- Thursday 10/1 plan on meeting with Dr. Cohen to take measurements and tour the lab.
- Sally and Robert will scout out Forney hall today to get a good feeling for space.

8:24 - For next time:

- Sally and Robert scout out the building
- Austin and Jacquelin start CAD model of the thing
- Background research on Spike, how much a research licence costs
- Robert email Dr. Cohen to ask for password for computer

**9/22/15 8:00 AM Senior Design Suite  
Meeting Minutes**

8:04 - Robert and Jacquelin present. Sally informed the team she will be about 10 minutes late.

8:05 - Austin here.

From an email sent last week:

Assembly instructions

<https://www.dropbox.com/s/mdsl8sdiz5if5ym/TwisterAssembly.docx?dl=0>

Computer password and username

u: ced

p: CED

8:22 - Sally here.

- Report on Forney hall:
  - hallways outside elevator are smaller than the twister, doors aren't wide enough.
  - Dr. Cohen wants to put it in a corner of her lab that is taller than all the others.

8:26 - begin tinkering with twister and software.

For thursday:

- Ask Dr. Perry what we need to do for the Client Interview that's due monday
- Update of where we are
- Does he want to go on the Lab tour?
- Can we grab plastic sheets from Dr. Odom?

Possible Missing Components

-37 pin RST 32 connector

## **9/24/15 4:00 PM ME Conference Room Meeting Minutes**

- 4:01 - Sally, Jacquelin, Dr. Perry here. Austin is in the spending meeting, Robert is gone for the weekend.

Last meeting's agenda for today:

- Ask Dr. Perry what we need to do for the Client Interview that's due monday
- Update of where we are
- Does he want to go on the Lab tour?
- Can we grab plastic sheets from Dr. Odom?

4:02 - Discussion on Cohen's lab

- Hallways in the building are very small.
- Come in through the front, down the stairs, through the doors. Wider by maybe 6".
- Lab ceiling is 9', but sprinklers are in the way. Twister can fit in a corner, but Cohen wants it in the center of the room where all the cameras are.

4:04 - Current assembly status

- missing a 37 pin connector
- might have one sitting around in a storeroom.
- surplus, rooms in GJ, electronics storeroom. Probably allowed to just grab something?
- know what it looks like, it's available online.
- Female to male.
- Need a converter, computer doesn't have a 37 pin connector. Maybe a cord with both?

4:07 - Sally and Robert talk to Cohen

- want to go on a lab tour at thursday 3:30. Does Dr. Perry want to come? Maybe.

4:09 - For client meeting next monday

- Type up a summary of the important points from the meeting.
- 1-2 page report on what we think she needs. no tech specs, just guidelines and easy for her to follow. Functional specs, later convert that into something technical.
- How can those tech specs be assessed? Checkboxes, numbers, etc.
- Include a small point about budget, don't need a timeline. Communicate that at some point, but not critical for specs.
- What are we developing? What should it do? Ideal vs baseline. Prioritize.

4:15 - Leaving to find a 37 pin connector. Meeting done.

## 9/29/15 8:00 AM Senior Design Suite Meeting Minutes

Agenda for today:

1. Someone needs to type up the summary of the transcript for Dr. Cohen and for Dr. Perry (we need to turn this in by Friday (10/2))
2. Lab Tour
3. Shop Orientation
4. Communication with the team

8:05 - Everyone here.

- Sally bought the 37 pin connector, should be here tomorrow.
- Our month is almost over, two weeks from today.
- Someone needs to type a summary of the transcript to email to Dr. Cohen and Dr. Perry by Friday, so Cohen can ok it.
- Mid-October-ish, another client meeting to update

8:07 - Meeting with Dr. Cohen on Thursday.

- 3:30 at Forney Hall.
- No meeting with Dr. Wolbrecht this week!
- Any additional questions?
  - Take dimensions
  - Updates that were mentioned
  - Can we take pictures?
- Austin put the solid model up on the drive
- Shop Orientation? Jacquelin is already done, it's best if all of us do it. Set up with Dillon Savage for some time in the next two weeks.

8:11 - Communication

- Austin's number is just for texting.
- Perry sent an email explaining the group email set up for us.
- Be sure that we can all make it to meetings, especially client meetings. Find available times, pick one the whole team can make.
- Everything needs to be done through email and Google Drive.
- Start keeping track of assembly status
- Also due Friday, Budget!

8:15 - Budget

- Molly needs figures from Dr. Cohen for us to buy things.
- Anything we order should be shipped to the ME dept
- Molly needs to approve it
- Easier to fill out the credit card ordering form than to get reimbursed.
- Austin will put form and info sheet on drive
- Fill out sheet, Austin checks out card, buys thing, returns card.

For Next time:

- Thursday
  - Meet with Dr. Cohen
  - Questions
    - Take dimensions
    - Updates that were mentioned
    - Can we take pictures?
- Friday
  - Budget - Ask Dr. Cohen on Thursday
  - Transcript summary - Sally Mei
- Eventually

- Shop orientation

## 10/1/15 3:30 PM Mind and Movement Lab Meeting Minutes

For today:

- Meet with Dr. Cohen
- Questions
  - Take dimensions
  - Updates that were mentioned
  - Can we take pictures?

3:34 - All present.

- went into lab, Dr. Cohen not here.
- Robert is getting fit for a motion test with the cameras
- Room is rectangular, with 8 cameras mounted on a rail on the ceiling. Adjacent is another smaller room with computers and desks.
- To the pipes is just under 8 feet. Camera bars look to be about 4-5 inches below that.
- Doorway joining two rooms is 95" tall, 2 or 3 doors wide.

3:43 - Sally back from checking for Dr. Cohen.

- Cable is here, in the senior design suite.
- Lowest thing in the lab is the pipe, at 8 feet.

3:47 - Still not here.

- Sally will finish the transcript summary tonight
- Robert and Sally will work on assembling tonight
- Budget is \$1800, directly from Molly. Can't spend all of it, some needs to be allocated to other things.

For next time:

- Finish the summary, due tomorrow.
- Attach the cable
- Turn in budget? Have a pseudo-line-up of things we're going to buy. Say we have 1800, plan on spending 1500.
- Start preparing for snapshot. Talk about what we need.
- Start thinking about a wiki page
- Ask Dr. Perry about snapshot time, budget (what do we need to turn in)
- Concept ideas for our device

Next two tuesdays after meeting, two people will work on twister and two will brainstorm ideas, then switch.

Dr. Perry oked meeting at 4:30 next week to accommodate for shop orientation.



## 10/6/15 8:00 AM Senior Design Suite Meeting Minutes

Agenda for Tuesday Meeting (10/6)

1. Snapshot day
2. Wiki page
3. Talk about a budget for the project (a rough budget?)
4. Brainstorming needs to start for Phase 2 of this project
  - a. The way we are going to do this is by having two people start brainstorming and coming up with concept ideas while the remainder of the team assembles the Twister. We will then swap roles for next week.
5. Organization of information
  - a. I think we are pretty organized, but the drive folder can be "cleaned up" a little bit we are getting to the point where we need to stay organized.
6. We need to look at the links that Dr. Cohen had on her presentation

8:13 - All Austin, Robert, Jacquelin here. Sally informed us at 8 she would be late.

8:19 - All here. Snapshot

- What do we want on the board?
- Things to show off
- Print off a few images from the video
- Project description and goals
- Design concepts
- NEXT TUESDAY.

8:25 - Wiki page

- Robert is in charge, Jacquelin is backup.
- Page due by 10/30.

8:27 - Not talking about the budget, not due.

8:28 - Logbooks and Team Binders due today!

- Logbooks are person by person, Sally can turn in the Binder.

8:31 - Due date for assembling the twister is thursday.

- Maybe we should postpone that date to this weekend.
- People come in this weekend to work on it and get it running.

8:35 - Twister assembly

- Crossbar that is against the wall right now is in the wrong place
- Twister code is in C++, shouldn't be a challenge to integrate it later if we need to.
- Sally will email Joe about the missing pieces and fix the portfolio before we turn it in.

8:45 - Working on design idea (note taking stops here)

**10/6/15 8:00 AM Senior Design Suite  
Meeting Minutes (continued)**

Thursday:

- Meeting with Dr. Perry only
- Update on twister
- 4:30, not 4.
- Have a design idea by thursday

**10/8/15 4:30 PM ME Conference Room  
Meeting Minutes**

4:32 - All here.

4:34 - Handed over the team portfolio, Dr. Perry is inspecting.

- We should have a team photo to put in the binder for next time
- Strengthen meeting minutes by including a list of tasks for each person in a table
- Conclusions, review to-dos from last meeting, assess completion
- Good job on content, maybe more detail than is useful in meeting minutes?

4:44 - Update on Twister

- Technically working. it moves like it should, but Spike is missing a driver to communicate with the data acquisition box. Maybe have to use a USB drive to transfer it
- Control for bottom works.
- We want to get it up and running to make sure the old system works, then improve it.
- Movement works how it should
  - Can control start orientation, amount it moves, speed
  - three sequences, sweep, stairs, staircase

4:51 - Possible concept for design of new device

- Ask Dr. Wolbrect about electromagnets for the dropping device
- Force control, motor force is proportional to the current supplied
- The attachment between the head and the upper sensors is missing
- need new pieces of spring steel
- Ask Dr. Cohen about necessity of purple piece for head

Robert send email about updates and the purple piece

## 10/10/15 11:00 AM Senior Design Suite

### Meeting Minutes

Schedule:

- October
  - Week 1: Snapshot preparation
    - Dress nice
  - Week 2: 1st idea, present to Dr. Wolbrecht
  - Week 3: 2nd idea/addon to first idea
  - Week 4: 3rd/final idea, have finalized decision
    - Have schedules for next semester done for future reference
- November
  - Week 1/2: Iron out details, material use, time to manufacture, budget, work
    - Keep in mind making twister shorter
    - Get data from Dr. Cohen
  - Week 2/3: Continue details and data acquisition, begin ordering
  - Week 3: Finish ordering everything
    - begin execution of design plan
    - Prepare for Snapshot
  - Week 4: THANKSGIVING BREAK
- December
  - End of Semester Snapshot
    - Need Project portfolio
    - proof of concept prototypes
    - updated problem statement
    - table of specifications
  - Begin manufacturing

### TO DO BY TUESDAY

- We need to take more accurate dimensions now that we know the Twister is a little taller. Ask Dr. Cohen how centered the subject needs to be in her lab.
- Purple headpiece: replace or locate
- Austin - Cut the spring steel on monday (10:30ish)
- Jacquelin - Print 10/8 and 10/10 meeting notes
  - Print article, powerpoint, word document
  - print pictures of lab and twister
  - Start doing Summaries of meeting minutes and to-do lists
- Sally - Email Joe about the admin password, necessity of other accounts
  - Write a document on what we were given, what we learned, how the Twister works
  - Table of Contents (vague)
  - eventually print off team photo
- Robert - Print off Screenshots of video for binder

This tuesday's snapshot (during class time)

- Table of requirement, not necessarily filled out, but a general plan
  - Data is in acceptable range
  - Our device needs to perform within acceptable parameters
    - length of use, weight dropped, target values
- Write up project learning
  - figuring out how the thing works
  - documentation, literature review
  - We learned how it's assembled, how it works mechanically, how the software is supposed to work

Tentative time of 9:20 am Monday to meet and take team photo. Sally will print off. No need to dress up.

- Whole Binder:
  - Table of contents/abstract or introduction
  - Meeting minutes tab
  - Project Learning Tab
    - Summary
    - Article that inspired project
    - Word document and powerpoint
    - Screenshots of the video
    - Parts list (what we were sent)
    - What we currently have (picture of current twister)
  - Design Goals tab
    - Timeline
    - Client needs
  - Design Specifications
    - Client interview summary
    - Pictures and measurements
  - System Diagrams
    - Drawing and solid model of concept ideas
  - Other tabs are basically empty right now.
  - Misc tab
    - Snapshot day progress
    - team contract
    - Teammates' schedules
    - Shop Orientation
    - Print correspondence emails

Summary of today's Group Adventures:

Austin downloaded the driver installation package for 1410 driver, but we can't install it. Waiting on Joe to answer Sally's email about the admin password. We also came up with a tentative list of things to do for team and individuals (See above for list).

**10/13/15 8:00 AM Senior Design Suite  
Meeting Minutes**

SHOULD BE DONE BY TODAY

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IS IT DONE?

- |                                                    |                         |
|----------------------------------------------------|-------------------------|
| - Accurate dimensions, how centered they should be | X                       |
| - replace or locate purple headpiece               | X                       |
| - Austin cut spring steel                          | O                       |
| - Jacquelin Print                                  | x/o (will finish today) |
| - Sally email, print team photo                    | O                       |
| - Robert print                                     | O                       |

8:12 - everybody here. get ready for snapshot

- organizing photos.
- Problem statement, design goals, table of requirements

8:33 - begin working on posterboard

For Thursday

- Sally will send an email assigning tasks for first design
- We will meet thursday morning to discuss options before meeting with Dr. Perry.

## 10/15/15 8:00 AM Senior Design Suite Meeting Minutes

8:05 - Everybody here

8:08 - Robert's research on encoders

- Absolute: multi-line communication, can go back and forth
  - SPN communication
  - Multiple encoders on the same line
  - How to hook it up to the DAQ?
- Incremental
  -
- Contacting: can be either incremental or absolute
  - cheap, but break easily
- Bourns EMS 22A50 Encoder looks the best, \$35. Exact instantaneous position, reliable

8:13 - Austin's research on weight mechanism

- Electromagnet? How will the weight still being attached to the person affect it
  - most expensive option
- We only need an impulse, maybe a linear actuator motor
- Electric motor on the pulley or down farther
  - Line could be on a spool
- Line needs to go slack on either side

8:17 - Jacquelin's research

- Wire placement is important
- A few ideas, mostly to do with rearranging the

8:20 - Sally

- Solid Aluminum is much cheaper than the hollow tube. Can also use steel
- Need an 8 ft bar
- Current pieces are 1.5"
- We would need to weld the pieces together
- 12 ft of steel was \$55.

8:32 - How are we presenting?

- Maybe have some kind of drawing to show what we want to have
  - Draw frame Sally made, add a circle for the pulley, rotary encoder, weights?
- DAQ - ask about what to do

8:37 - Drawing up idea

## 10/15/15 4:00 PM ME Conference Room Meeting Minutes

4:03 - Everybody here, Update

- Assembly done, everything but Spike is running
- Still need DAQ that connects
- We've been recommended to use a different program, because Spike only likes the DAQ we're missing.
- Twister runs on C++, might be easier to move everything onto a more modern computer
- Depending on sample rate, cost might be less than \$1000

4:11 - New DAQ possibilities/transferring old program to new computer

- Might be able to find a new computer around the department
- We need to look into what Dr. Cohen expects as far as file types and data type
- How necessary is Spike? Why did they choose that and the DAQ they used?
- Quadrature channel is required by rotary encoders, how far you've turned and what direction

4:16 - Design Concept

- Could use an encoder, could use potentiometer

4:24 - Encoders

- Absolute magnetic encoder
- would need special code to read SSI
- Potential magnetic interference?

4:26 - Force Application

- Push-pull solenoid, electromagnet, direct drive motor
- Subject can't hear the weight dropping
- Do we want the weight to continue to be attached?
- Need to ask Dr. Cohen.

4:46 - Harness

- Need to ask where exactly we can pull

4:57 - Look into testing for harness and where arms go.

Done!

Jacquelin - Can Simulink send data elsewhere?

Robert - Email Cohen questions, can code be moved, wiki page

Austin - Headpiece working

Other assignments by Sally



## 10/20/15 8:00 AM Senior Design Suite Meeting Minutes

8:07 - Jacquelin here, Sally here. Austin can't make it, Robert said he'd be late.

For Tuesday: will be going over the emails that Dr. Cohen and Robert has sent, because there are things in there that we need to discuss as a team. So in preparation for tomorrow, please read the emails.

8:22 - Emails

- Looks like Dr. Cohen is open to buying a new computer, as long as it's not too expensive. Could find a used desktop at Best Buy, VGH, Staples, Amazon, storage?
- Find a new computer for ourselves to use, and see if we can transfer the program later.

8:28 - Robert here

8:30 - Moving program over?

- Need Visual Studio, can move from windows 2000 to windows 2010
- <http://www.microsoft.com/en-us/download/details.aspx?id=23507> (link to visual studio 2010 download)
- **Send Robert photos for bios on wiki page**

8:36 - Weight system

- Loops of ropes like rock climbers use to create tension when we want it?

8:38 - Data acquisition?

- Motion Monitor is willing to help us and code for an A/D converter, which would avoid us having to spend hundreds on a new system.

8:39 - Harness

- for now, going with the y-split idea
- **Find a replacement for the purple headpiece missing**

### Jobs list

- (A) Headpiece needs to be made
- (J) Harness needs to be modified or recreated
- (S&R) Look at Dr. Cohen's system (get access to her lab?) and start learning how to use it
- (all) Send photos
- (all) Ask around for advice on moving twister program
- (?) Build a proof-of-concept twister?
- (?) Electromagnets for dropping weights and system holding them, rotary encoder?
  - think of designs, should be easy
- (S) Max height for person once Twister is in her lab, how to mount head piece?
- (R) Twister Code
- By thursday, have tentative assignments
- By next tuesday, have definite assignment of jobs and get started

**10/22/15 4:00 PM ME Conference Room  
Meeting Minutes**

4:10 - Conference room is free, waiting on Dr. Perry.

4:25 - Perry not here, we're going to go over what we have so far.

- Austin and Sally will be doing the attachment portion
  - Austin, electromagnet
  - Sally, weights and ways to catch
- Austin will do the headpiece design
- Jacquelin will do the harness design, Sally may help with integrating rope
  - Also rotary encoders. Pick one out, meet with Sally and figure out how they will fit together.
- Robert will work on the twister program itself
  - by tuesday, he'll have an idea of how feasible it is

4:31 - Decision on computer

- Sooner or later, we'll need another computer.
- Should we get a laptop now or later?
- Getting a cheap laptop looks to be the best option.
  - Does Dr. Cohen want our stuff on her system or can we use a separate system?
  - Ask Seth about extra computers to borrow to test new code on

4:35 - **Ask John Canning about motor control and the systems talking to each other.**

4:37 - DAQ

- Probably save integrating it till last. Keep in mind which components we get though, so they all work.

4:44 - Questions for Dr. Perry

- Go through plan, break it down
- Do we get a new laptop and scrap the current box?
- How complete does the wiki page needs to be?
- Does the current meeting time still work?

**BY TUESDAY:**

- Work on assignments
- have a good idea of what actually needs to be done
- ask Seth if we see him, also the white boxes

## 10/27/15 8:00 AM Senior Design Suite Meeting Minutes

### From Sally:

First we will be reviewing what everyone has done so far, meaning your assigned assignments. So be sure to have those done (it will be reflected on your citizenship, if you don't get your assigned tasks done on time, just warning you ☐ ).

Then we have some major decisions to make. I will share with everyone what I learned about the magic silver box (which I don't really like at the moment) and everything else that I may/may not have made progress on. After the meeting is over, we need to have a few things done and decided. So this is what you need and what you will get out of the meeting:

1. Your assigned tasks that is due (10/27) should be done. Check the Project Learning spread sheet if you don't know your assigned tasks (I really hope you know your tasks ☐). Check often, because they do get updated.
2. We will make a decision of whether or not to get a new computer for our project.
3. How we are going to tackle the problem of the DB37 and Twister Program. Whether we Frankenstein a thing for it or we straight up replace the whole thing, or we just sit there and stare at it while eating gummy bears.
4. Know what your next assigned tasks are and have it ready by the due date.
5. Review individual and general goals, and team dynamic

8:09 - Everybody here.

8:11 - Sally's things

- picked out a bunch of ropes, found a covered cable that looks good
- weights, probably easiest to take a chunk of steel and machine it
- Pulley picked out. Has no hole, but we can figure that out. Nice because it has a base.

8:13 - Austin, headpiece

- going to be like the rest of the twister's attachment
- make the attachment curved?
- redesign the spring thing, maybe find a ball joint
- Austin will look into redesigning.

8:17 - Robert, wiki page and code

- all sections are there
- will go to the meeting and see exactly what they need
- code is working, buttons and interface work! All the connections are there.
- Have code, going to try it on Sally's computer using an install package
- Sally's friend got the code working by building it in Visual Studio 2015

8:25 - Jacquelin, harness

- Bill of materials by thursday
- Cable placement, need to push each other around more

8:31 - Magic silver box

- red tape/black tape, red tapes go to position sensor

- smaller box splices 37 pin connector into different pins
- Microcontroller goes through ethernet and to 37 pin
- board with duct tape is probably for torque sensors
- Giant thing is a power supply
- So a couple options:
  - locate or create a 37 pin connector converter, or convert it to DB9?
  - Replace the system. everything would go except the motor, replaced by a modern microcontroller board.
- Cohen's system is compatible with up to Windows 8, so if we replace the system we need an older OS

8:47 - Thursday

- talk to Wolbrecht, make sure our plan is ok to get a new computer and scrap the system
- Are there any microcontrollers he recommends?
- everybody's jobs done

For thursday:

- Pick out a rotary encoder
- Jacquelin have a BOM
- Sally have weights figured out
- Austin finish headpiece
- Robert have wiki page done, help Jacquelin with rotary encoders
  - email project learning and photos

9:05 - adjourned.

## 10/29/15 8:00 AM Senior Design Suite Meeting Minutes

8:09 - Everyone here. Robert update

- Wiki page is done, pics and everything is up.
- At meeting, they said just post what you have.
- We'll add to it as we go.
- Cohen wants physical data, maybe an encoder isn't the right thing?
- A person's physical reaction back and forth might create slack

8:13 - Austin update

- Ball joint thing for the headpiece exists, but difficult to find an exact one that we need.
- \$20-\$30 average price
- Working on current headpiece after class today.
- Electromagnets rated for 22, 55, and 80 pounds, around 1 Amp each

8:22 - Jacquelin update

- Harness materials are easy and cheap,
- found another option, <http://www.rei.com/product/879434/mountain-hardwear-lani-shoulder-straps-womens-2014-closeout>
- if the REI option will ship within a week, get it, if not go with the old materials

8:24 - Sally update

- Project learning is done
- Arduino is capable of programming a bunch of stuff
- Recommended to use the Arduino because we all have experience coding in those
- There is a usb connector for the computer

8:38 - Meeting today

- Need two plans
  - Either scrap and replace with arduino, or keep it and work around
- Come up with a good list of reasons to replace the computer, but be prepared to keep it
  - Greater possibility of it working with a new computer
  - Advantages vs Disadvantages of scrapping the system
  - How the torque sensors will be hooked up

## 10/29/15 4:00 PM Senior Design Suite Meeting Minutes

4:03 - Dr Wolbrecht and Dr. Perry are here. They're examining the Twister and the head spring.

4:06 - Load that can be taken by the motor/foot plate

- How much can the bearings take?
- Statically and dynamically, so we know how much a person can weigh and how heavy the weights can be.

4:09 - DB37 (or actually the DB25)

- Sally found a USB converter cable, but the twister program is missing a .dll file when run on Sally's computer, and when she ran the new code, it's missing a different one.
- Probably a framework issue, might need to re-write libraries?
- Or find what the new libraries are called and switch them out
- Wherever it says "include x.dll" comment it out, and try and compile it
- Ask a CS friend for debugging help

4:13 - Circuit board in silver boxes

- It is possible to do it on a smaller package
- Could totally skip the box, since we're just collecting data.
- What goes into the digital/analog connections that used to connect to the DAQ?
- How do you send the signal to the motion monitor?

4:29 - Replace computer?

- Dr. Cohen thinks it's fine
- basically all we're doing is driving the motor and taking in some sensor data
- Can control the Twister using the computer
- We think we're good to get a new computer.

4:54 - Dr. Wolbrecht has some extra hardware

- A couple motors and a motor driver
- PCI cards have D/A converter (can sample at 1000 Hz) and can send signals to the motor driver which can also take in signals
- Thinks we could connect his existing hardware to matlab or simulink
- Arduino will be a little slower for DAQ

5:14 - Motor and tension

- Replace the cable with a timing belt, include a gear in the middle for tension on the belt

## 11/3/15 8:00 AM Senior Design Suite Meeting Minutes

8:13 - Jacquelin, Austin, Sally here. Today, divide up assignments

- Lookup PCI cards, see what they do
- Motor controller box
- Rotary encoders/hall sensors

8:29 - Meeting thursday?

- Probably need to.
- Everybody do as much of their jobs as possible.
- Figure out all the electronics we need.
- Will we need an EE/CS? When do we need to tell Beyerlein if we want help?

8:32 - Client Presentation

- Thursday, 12th
- Need a budget, flow chart of how components work
- Where we are right now, where we're going
- 20 minutes for talking, 40 for questions
- Evenly divide topics to talk about
- **Meet this weekend to put together a rough outline**

For Thursday:

- Pick out a rotary encoder, replace existing ones and for new ones (Jacquelin and Robert)
- Research PCI boards (Jacquelin)
- Arduino (Robert)
- Computer (Sally)
- Find motor, belt, and gear (Austin)

## 11/5/15 8:00 AM Senior Design Suite Meeting Minutes

8:07 - Sally, Robert, Jacquelin here.

8:09 - Everyone here. Logbooks & portfolios

- Due next tuesday, need to ask if we can turn it in next thursday after the client meeting
- Get project learning done so we can put it into the portfolio

8:10 - Harness was signed for and ordered.

- should be here monday.
- From now on, whoever needs a signature on something needs to be the one working on it, then give the paper to Austin
- Easy to meet outside Molly's office, get card, order, and return the card.

8:12 - EE student

- proposal for help from EE or CS due by dead week
- should probably know if we need one by then
- Robert and Jacquelin will probably be the ones to write it

8:13 - Meeting this weekend

- 10 AM Saturday, senior design suite

8:14 - Assignments. Sally and computers

- Looked up computers, talked to Wolbrecht
- doesn't need to have crazy processor
- HP desktop is refurbished, windows 7 4GB RAM 250GB mem <\$220
- Dell 8GB ram and 1TB hard drive, intel2 processor \$265

8:16 - Jacquelin PCI card research and harness

- research not done yet, will be done by meeting this afternoon.
- Harness is ordered, should get here by monday, do best to have it together by thursday

8:16 - Robert and serial encoders

- called the motion monitor company, didn't have any data sheets, claim that they just plug in
- gave 4 options, didn't really give any concrete answers
- maybe we should get connectors for motion monitor just to have on the side, to make working on circuits easier

8:21 - Austin head spring replacement, electromagnets, motor

- universal joint with a slider is best option so far. will keep working
- electromagnets picked out
  - 55 lb .6A ~\$20 each or 80 lb .7A ~\$28
- motor control box figured out
  - will run off anything from 12-50 V
  - existing power supply will work
  - speed and current input are set by a potentiometer
  - 5-12V .2A output on control board

8:27 - Sally how to catch weights

- probably don't need something unless the weights are really tall

8:33 - We need a more scheduled plan for the rest of this and next semester



- will come up with a list later

8:57 - Cutting off the Twister's height next week to get it taken care of.

- Need to remove about a foot of steel

8:59 - Project learning

- there's a tab on the excel sheet

-

## 11/5/15 4:00 PM ME Conference Room Meeting Minutes

4:05 - Sally, Jacquelin, Austin, Dr. Perry here. Intro

- Project is turning into Jacquelin and Robert on electrical, Sally and Austin on mechanical

4:07 - Wiki page review

- Specifications table, target values need to be more specific. need to be able to say "Yes we did that"
  - Look at usability scales, score above a certain value
  - <http://www.usability.gov/how-to-and-tools/methods/system-usability-scale.html>
- Maybe an "acceptable value" column
- How do we simplify circuitry/coding?

4:16 - Client presentation

- Client meeting, thursday 11/12 from 4 to 5 in the ME conference room
- Other presentation, Rabbit burrows Thursday 19th at 1:30 ME conference room
- Send our time to Dan, ask where we can find the times to the other ones

4:20 - Logbooks and portfolios

- It's ok if we can turn them in after our client meeting on thursday, hopefully get them back the next day?

4:23 - Updates

- Harness is ordered, hopefully get it done early next week. No elastic
- Goals for next week:
  - Austin and Sally will try to get all the mechanical portions designed/ordered
  - Harness will be made
  - Robert will try to see what kind of connectors we need for the motion monitor
  - Have a plan for the rest of the semester/next

## 11/7/15 10:00 AM Senior Design Suite Meeting Minutes

10:18 - Everybody here. Encoder vs potentiometer?

- Encoders seem too complicated, but accurate
- potentiometers are not sensitive enough and may break under high acceleration, but cheap and easy to use
- The motor runs at half the speed and twice the power of the current motor, so we can keep the existing gear reduction and have it be more efficient
  - need 12 mm to 4 mm shaft adapter
  - remake the motor mount plate
  - new gear to attach to timing belt

10:35 - What do we need

- Austin will make a new head spring
  - Solidworks for accuracy of the model
- Motor
  - Adapter coupler
  - motor plate
- Harness
  - Fill out purchasing form to go to Joann's and get straps and buckles
- Rotary Encoder
  - Pulley it will attach to should probably just be machined, easier
- Attachment
  - Clamps will be used to attach bar to Twister

**11/10/15 8:00 AM Senior Design Suite  
Meeting Minutes**

8:14 - Everybody was running a little late today. All here now.

8:18 - Powerpoint is on drive

- Most slides are filled out, just need to add electrical stuff.

8:20 - Bar for Twister attachment

- Clamps on sides to hold the bar in place
- steel piece that wraps around bar to hold it in on the sides
- maybe add a ruler on the bar itself, to aid in measuring properly
- calculations give a safety factor of 2 for 3/16" thick steel, 5 for 1/4" steel.
- should be finished today

8:32 - Austin and Sally will order everything this afternoon after Elger's class

8:40 - Tentative meeting time next semester will be at 5:00 on tuesdays, after senior design

\*rest of meeting was spent working on the powerpoint

**11/12/15 8:00 AM Senior Design Suite  
Meeting Minutes**

8:10 - Austin, Sally, Jacquelin here. Working on putting binder contents together.

8:16 - Robert here, going over powerpoint

- Slides look fine, maybe add a harness slide now that's done
- Adding a goals/project objectives slide
  - shorter, needs to roll, modernize current system, create attachment, replace headpiece and chest harness

**For tuesday:**

- Austin: fixing the headpiece track
- Sally: Have idea for the mobility of the Twister
- Austin/Sally: Go look at facilities to see what materials are available
- Robert/Jacquelin: attempt to connect Arduino to matlab and simulink, look at packages for arduino
- Jacquelin: Pick an electromagnet and order it

**11/17/15 8:00 AM Senior Design Suite  
Meeting Minutes**

8:14 – Electromagnets will be ordered by end of meeting

- Austin and Sally will go to facilities later
- Austin still working on head spring, should be done Thursday
- Sally has short wheel picked out
- Harness design needs to be done by Thursday
  - o Make it adjustable, but also can't get in the way of arms

8:51 – Electrical side

- Ideally will have a code package to install, Dr. Cohen won't need to install anything
- Potentiometer will need to be powered somehow, probably with Arduino or power source
- Motor, potentiometer, torque sensor: figure out ratings for all of them
- Figure out if we're using Visual Studio or Matlab.
  - o Ask Dr. Wolbrecht
- Exact plan will be determined tomorrow.
  - o Work on motor first (coding), then Potentiometer, photoresistor, electromagnets

9:06 – Instructors meeting

- Electrical plan – schematic, timeline/plan mostly done (Jacquelin, Robert)
- Harness design, BOM for testing (Jacquelin)
- Mobility of Twister (Austin and Sally)
- Will meet Tuesday after break, put together snapshot stuff.

## 11/19/15 3:30 PM Mechanical Engineering Library Meeting Minutes

3:36 – all here. Portfolio

- Thoroughly label tabs in binder, include page numbers on actual pages
- Add a specification sheet
- Grade and comments are in the front.
- Look at email summary of comments on presentation
- Grade doesn't reflect actual grade in the class.

3:40 – sensors

- Photoresistor will be driven by Arduino
- Potentiometer has one data line out, probably won't have to use an op amp
- Torque sensors, waiting on data sheet. Need to know which op amp to use, we're trying to research which ones are actually used on the board
- Don't need to drop current, as long as the supplied amperage is higher we're good to go.
- Use voltage and resistance on torque sensor data sheet to calculate current, see if digi-key voltage regulator will work <http://www.digikey.com/product-detail/en/LM7812ACT/LM7812ACT-ND/1923050>
- Motor controller should have a common ground with the Arduino
  - o Has +5V and Ground output, we can use that for the sensors
- Visio, LTSpice, EagleCad could work for schematic
  - o Organize things by device
  - o Map, submaps/subsets. Show components within their subsystem, like showing the op amp in the motor driver subsystem
  - o All signals and components and where they go
  - o Project overview and map. Put together a plan of attack
- Split things up into tasks

4:05 – Mechanical design

- Mostly done. Going to start fabrication after break
- Should also have order form for rollers done
- Solidworks drawn up for motor mount plate
- Motor belt needs to be between 6 and 8 mm. at 6 mm can hold 20 N before slipping

4:16 – Schedule

- Maybe find Gantt chart.
- Can be split up by people, or by area of task

Tasks over break

- Sally - create a gantt chart for mechanical and organize binder
- Austin – fabricating as much as possible, maybe be available for electrical questions
  - o Motor drive pulley and max torque it can withstand

- Robert – Test matlab executable, get a rough visual studio executable
- Jacquelin – New schematic, electrical gantt chart
- Everybody stay in contact over break so we can prepare for snapshot
  - o Layout what will go on snapshot poster
  - o Project learning



## 12/1/15 8:00 AM Senior Design Suite Meeting Minutes

8:10 – All here. Snapshot things

- Poster will be 1/3 mechanical, 1/3 electrical hardware, 1/3 coding
- Email schematic to Dr. Perry before Thursday
- Electrical:
  - o Rough component list
  - o Executable files for visual studio and matlab
- Hardware:
  - o Electrical schematic
  - o Headpiece
- Gantt chart, future plans

8:20 – GUI

- Code will work on its own in Matlab, but having trouble running the exe on its own.
  - o Capable of real-time graphs
- Visual studio, have an example we can show but haven't connected Arduino yet
  - o Tonight, code (hopefully exe) will be on drive
- Put exe online
- If connecting to Dr. Cohen's software doesn't work, we have to use Matlab.

8:31 – Sally's wheels

- Wheels are centered in the corner, but feet are offset.
- Feet are placed so twister is still stable, have rubber pieces on the bottom

8:34 – Harness

- Fall protection harness is pretty expensive, cheapest is ~\$50
  - o Can cut off legs

8:38 – portfolio, wiki page, logbooks

- Will be finished by snapshot
- Due by end of dead week
- Change table format on wiki page so it scales properly across platforms
  - o Add a usability scale to charts
  - o Take off silver box stuff
  - o Pics of each major component
  - o Archive dates, change documents (meeting minutes, PowerPoints) over to word

For Thursday:

- Meet to put together poster board
- Get GUI working
- Send schematic

- Put code on drive

**12/3/15 8:00 AM Senior Design Suite  
Meeting Minutes**

8:10 – All here. Working on finishing binder

- Sally will be sending us things we need to make but don't have for the binder yet

8:15 – Matlab gui

- Options are similar
- Need to talk to Dr. Perry to ask his opinion
- We can ask Dr. Cohen tomorrow at snapshot what times work for her to go to the lab and try to connect to motion monitor
  - o TA isn't available easily this semester, maybe wait till next? Then we can think of options over break
  - o Lab is open all finals week

8:25 – Instructor's meeting

- Snapshot
- Update

8:29 – Rest of semester

- Stuff to print off for portfolio
  - o Due next Friday
- Usability – maybe just put pass/fail?
  - o Complexity of the system (# of components)
  - o GUI interface usability
  - o Ease of replacing parts in case of failure
- Wiki page
  - o Need to create a list of things to remove/add, Robert and Jacquelin work on it
  - o Table of Specs
  - o Electrical components section
- Project learning
  - o Headpiece, harness, mobility, general twister
  - o Electrical coding and .exe file
  - o Due Wednesday on drive
  - o Electrical schematic details?

To Do:

- Everybody post their finals schedule before the meeting this afternoon
- Everybody do their project learning, due wed

## 12/3/15 4:00 PM ME Conference Room Meeting Minutes

4:02 – Everyone here. Snapshot poster

- Our list of things to put on the board is in a PowerPoint on the drive.
  - o Problem statement needs to be simpler; maybe one sentence. Start with something simple to draw people in, then elaborate with more sentences.
  - o Modernizing the control system (hardware and software), refurbishing headpiece/other hardware, adding portability, adding lateral perturbation
- Electrical components should probably be split into little chunks, and assumed they all work.
  - o Stretch the definitions
- Mechanical will have some SolidWorks images to show progress
- Electrical schematic
  - o Maybe have a laptop with an exam of a GUI or snip pics and print them off
- Gantt Chart

4:29 – Motion Monitor

- For Matlab, you need the DAQ toolbox, we can't find a data sheet or information anywhere.
  - o Syntax over last year changed a lot, executable worked but we need a separate compiler to make the .exe
  - o Hopefully know by the next week.
- We either need Visual Studio to talk to motion monitor, or use Matlab and its DAQ system
- Ask Russ about keyway for motor

4:38 – Things that are due

- Logbooks next Thursday, portfolio and wiki page next Friday,
  - o Wiki page needs edits

4:42 – Shared Drive

- By end of semester, have updated version of all files on shared drive

To Do:

- (Jac) read through motion monitor pdf, write summary
- (Jac) look into coding and hardware for electromagnets
- (Sally) Files need to be moved to Shared drive by next Friday
- (All) Project learning and print things

## 12/8/15 8:00 AM Senior Design Suite Meeting Minutes

8:10 – All here. BNC?

- Robert needs to research some more.

8:15 – GUI

- New GUI is very similar to old, has same buttons and options.
- Has staircase, ramp, and step options
- Last GUI had coordinates as feedback for system
- Buttons exist but aren't connected

8:18 – Electromagnets

- Preliminary code is done, needs testing.
- Need to purchase mosfets
- Could also use a solid state relay
  - o Has a mosfet and optical isolators, so it's already basically done. Just apply a brief signal
  - o Need ~20-30 mA trigger current, maybe one specific to Arduino
  - o Must be DC/DC
- <http://www.amazon.com/SainSmart-Channel-DC-DC-5V-220V-Arduino/dp/B00IZ35OYQ>

8:22 – Wiki page

- Robert and Jacquelin will meet tomorrow and go over what needs to be done.

8:25 – Harness

- Tried to purchase yesterday, Molly wasn't there. Trying again today.
- Will probably be done when we get back from break
- For mechanical, all that needs doing is ordering the feet, details about motor mounts
  - o Cutting will wait until the very end, going to remove about 8"

8:26 – Meeting Thursday?

- If we meet then, we would go over solid state relays and BNC connectors.
- Also show wiki page to instructors
  - o Change project background
  - o Update table of specs to what we used for snapshot
  - o Scrap silver box table, maybe just have one pic
  - o Probably organize Mechanical vs Electrical
  - o Meeting minutes need to be in one document
  - o Remove safety thing
- Project learning due Wednesday at 5 PM.
  - o Format according to Sally's email
- Logbooks will be due Thursday at the meeting
- Binder and wiki page due that Friday

- Not meeting Thursday morning, **meeting Monday of finals at 3:30-5**

Tasks Over break:

- Jacquelin – Fine tune electromagnet things
- Sally – Harness work
- Austin – Work on coding motor
- Robert - GUI
- Someone? – What we're doing with the old pelvic piece