

1/14/16 3:30 PM Meeting Minutes

ME Conference Room

3:38 – Conference room free, all here.

- Robert update
  - o Using CMD Messenger, transport serial for Arduino
  - o Tested and working with LEDs
  - o C# compatible, communicate between visual studio and Arduino
  - o Austin and Sally worked on a basic GUI for the motor control

3:50 – Do we need two-way communication?

- Serial comm might work, we need to tie into their start button
- Need to look into it.

3:52 – Jacquelin update

- Very close to finishing with LED/visual studio integration.

3:56 – Sally/Austin update

- Harness “finished”, probably too big. Use as a prototype
- Also worked with Arduino, has a circuit that turns an LED on/off and switches between two LEDs
- Met with Austin to play around with motor
- Austin has motor and potentiometer hooked up and working, basic code works

4:08 – What’s next?

- If we don’t need two-way communication, we can just use serial and get it working very soon.
  - o With just serial, we can’t see the current position
- Command messenger will be more complicated, probably should be put on the back burner so we can all work with visual studio for now.
- Ask Dr. Cohen what data she wants to see in real time
  - o Make a list of questions we can ask at next client meeting or in next email
- Order electromagnet relay
- Hook up LEDs to GUI on drive
  - o Need to compare notes on code so we find the most efficient way to code things
  - o Pay attention to comments in each other’s code
- Headpiece swivel is less smooth at extreme angles
  - o Shouldn’t ever reach that extreme
- Feet arrived
- Crossbar is mostly done, just need to bolt it together
  - o Think about cross-bracing for extra support to replace the diagonals we removed
- Find pulleys and order
- Austin has a list of mechanical things that need doing.

4:30 – To do for next time

- Sally: housing for potentiometer/pulley

- Austin: build a prototype of torque arm, finish crossbars, start writing Arduino code for step functions, order relay
- Robert: fix wiki page paragraph to first person (pulley system) and electromagnet section, think about worm gear drive for the motor
- Jacquelin: add a random button to EM code, integrate code into GUI (maybe send to Robert), update schematic with data/signal type, remove photoresistor, add motor potentiometer

1/19/16 4:00 PM ME Conference Room  
Meeting Minutes

4:00 – Sally + harness

- Has an old hiking backpack, in the process of taking it apart
  - o Using the backpack part without the pack, includes weight strap and aluminum supports
- Cables and string potentiometer will be out of the way
- Found a plastic frame for making backpacks on amazon, could be handy if we need it

4:05 – Design review

- Have we made our designs? Analyzed alternatives and made decisions?
- Have specs for what we're building detailed out
- Show we have plans to address each spec defined by client – no roadblocks
- Timeline for purchases
- Gantt chart should include those details
- Dr. Wolbrect will be around, so we can have him sit in on the meeting

4:15 – Code

- With case statements, they create a jump system so it's faster to go with ordered cases. We should have 13
- Write different functions for each case that executes different things
- Call out variables in beginning for later use in case statements
- Currently, functions are called out and case statements are written
- Look into Arduino random instead of visual studio

4:20 – Schematic

- Fix voltages
- Motor and potentiometer should be one

4:25 – Torque sensor

- Need to figure out how to hook that up, order connectors
- Robert will research
- Should test to get a linear calibration

4:30 – Wiki page

- Robert fixed it. Combined pulley system and electromagnets
- Also researching worm gears, Robert will meet with Austin to go over current ideas
- Picture of silver box caption needs to be changed, maybe use another word than "mesial"

4:35 – Coupler

- Russ says there's no way to make a coupler for the adapter, easiest way is to get 12mm keyed coupler and make a bushing that goes to 4 mm on the other side, hold with a set screw
-

1/21/16 3:30 PM Senior Design Suite

## Meeting Minutes

### 3:40 – Short announcements

- Dylan emailed asking when meetings are, need to ask if he's coming to future meetings.
- Rough outline for the presentation on the drive, couple slides
  - o How detailed do we need to be with background info? Is the attendance expected to be the same as last time?
- Start thinking about questions to ask Dr. Cohen.
  - o Do we need a random button?
  - o Twister present at EXPO?
  - o \*remind Sally, email Wolbrecht to see if he'll be at the client meeting?
- Austin and Robert talked about motor
- Maybe make a test stand for demonstration and debugging purposes

### By Tuesday:

- Sally: will have design for case done
  - o Talk to Molly/Beyerlein about using the other printer
  - o Harness is still being worked on, having issues with fabric thickness
  - o Look into torque sensors?
- Jacquelin: continue electromagnet code, try and work out bugs.
  - o Add code to master Arduino code (formerly motor code)
  - o Actual electrical schematic
- Austin: working in the shop. One crossbar will be done today
- Robert: Come up with idea for worm gear attachment
- All: brainstorm a "test stand" idea, some kind of panel
  - o Make sure we're all writing project learning, update on drive

1/26/16 4:00 PM ME Conference Room

## Meeting Minutes

### 4:05 – Sally update

- String potentiometer solidmodel on the drive
  - o Will have 3D PDF to show next time
- Harness should be done next time

### 4:20 – Robert + worm drive

- Thinking of putting it off-center of the table, then the potentiometer could go in the center
- Modeling it right now, should have a full model by next Thursday
- Want to put it inside the bearing ring

### 4:30 – Code

- Motor code and electromagnet combined
- For next time check if visual studio stuff still works

### For Thursday:

- Austin
  - o Code
  - o Machining
- Sally
  - o Harness
  - o Details of potentiometer case
  - o Torque sensors + circuit
- Robert
  - o Worm Gear
- Jacquelin
  - o Schematic
  - o Link electromagnet portion of master code to VS
  - o Test Relay
- All: Think of a list of things to order (shaft adapter, pulleys, etc)

2/2/2016 4:00 ME Conference Room

## Meeting Minutes

### 4:05 – Electromagnets

- There's a lot of residual magnetism in the magnets when the power is disconnected, weights are holding on for a long time.
- Options for weight dropping? 3D printed case, wrapping in fabric, other metals?
  - o Test with brass weights and scale
  - o Add a spring underneath that counters the magnetic force, pulls on when magnet is turned off.

### 4:15 – electromagnet mounting

- Basic two-hook design, screw in electromagnet is M5
- Have a drawing by next time.

### 4:18 – harness, housing

- Harness is almost done, need industrial needles to finish
- Case for string potentiometer is almost done, need to check size of BNC connector and thread sizes. Just pick out a BNC connector so we have a consistent design.

### 4:20 – Austin

- Clamps and coupler are ordered, need to machine a bushing
  - o Look at Lovejoy for coupler?
- Started modeling motor plate, should be done sometime this week.

### 4:22 – Robert + worm gear design

- New cable will be inside the old disc
  - o Plate needs to be either aluminum or steel, need to figure out stresses given certain weights of subjects
- Circuit – designed for the torque sensor, has a LEMO connector to a BNC
  - o Would probably do a quick one, then order an official one
  - o Sunstone(?) could do them, can do surface mount or thru holes

### 4:36 – Design review

- Recommended dates are 2<sup>nd</sup> – 12<sup>th</sup>
- Key people: Dan, Beyerlein, Russ, Cohen, an EE professor (Santora?), Wolbrecht
- Don't have to attend others this time around.

- Look into fuses for system

2/9/16 4:00 PM ME Conference Room  
Meeting Minutes

4:00 – Design Review

- Next week, Tuesday, 4 PM
- Robert will email out to everyone on last meeting minutes
- Presentation is mostly done, has placeholder pics and empty slides
- Changed format to include existing Twister and repairs, and additions
- Do we need a background slide? Need specifications, brief background.
- Budget/timeline slide? Should have some sort of update on what we can deliver by when, and budget sheet including pending purchases
  - o Prototype done by ??

4:10 – Housing for amplifier circuit

- Want circuit inside the case?
- Everything will rest inside a new metal box
- Can mount everything on a simple piece of plywood for display purposes

4:13 – Motor coupler

- Halfway done, need to add the bushing to inside of coupler
- Still need solidworks, but labs were full today.
- Need to buy aluminum tubing

4:17 – Motor code

- Two of them are up on the drive

4:30 – Op Amp

- Basically done, need to test
- Need a gain of ~1000, apply appropriate resistors
- Testing during Thursday meeting
  - o Contact Jason so he can come
- Austin and Robert will meet at 4:30 tomorrow

4:40 – By next week:

- PowerPoint done by Friday so we can email it out
  - o Add in pictures and small text boxes
  - o Will all of us need to talk? See how many slides we have by Thursday, see who'll talk.
  - o Dress business casual-ish
- As much of GUI working as possible so we can demonstrate it.
- Harness mostly done, as much as possible
  - o Jacquelin bring needles
- Test Jacquelin's harness
-

### Questions for Dr. Cohen

- What weights should we get?
- Is the interface looking good?
- Maximum weight of subjects

### Things left to buy

- Weights
- Wires
- Piece of sheet metal for box
  - o Angle iron
- Tubing
- Steel for base plate
- Timing belt and gears
- Voltage regulator
- LEMO connectors
- Circuit boards (voltage regulator and torque sensor)
- One more potentiometer



2/23/16 4:20 PM ME Conference Room

## Meeting Minutes

### 4:20 – Design review

- Motor control
  - o Total customization is a little much, make it a secondary option. Ask Dr. Wolbrecht about it to see what we actually need to do.
- First and foremost get the whole system working.
  - o Keep in mind possible future development of the code, i.e. code now so it's easily changed later

\*Dr Perry left

### 4:24 – Robert

- Talked with Dillon, have a gear system for motor pulley planned out

### 4:27 – Start outlining where we are and where we need to go.

- Twister (mechanical)
  - o Support braces/sidebars (A)
  - o Headpiece/torque arm (A)
    - Telescoping tubes x1 of each
    - Head gear – plate (A)
  - o ~~Twister harness (Jacquelin)~~
  - o Base (motor, etc)
    - Plate (R)
    - ~~Worm gear~~
    - Timing belt
    - Potentiometer x1
    - Spring x1
    - Tensioner pulley
  - o Feet
  - o Rollers (A/S)
- Twister (electrical/circuitry)
  - o Torque sensor circuit (R)
    - PCB (R)
    - LEMO connector x2
    - Op amp x4
    - BNC x3
  - o Voltage regulator (R)
  - o ~~Relay~~
  - o ~~Power mapping/wiring~~
  - o Twister GUI (J/Team)

- Arduino
      - Settings for motor: staircase, ~~ramp~~, sweep (A)
    - Visual Studio
      - Layout
      - Linking (J/Team)
      - Graph preview (J)
    - Start needs to start Motion Monitor
  - E-stop (S)
- Others
  - Wires
  - Fuses
  - Cable
  - Wire management
  - Magic silver box 2.0 (MSB2.0) (A/S)
- Attachment
  - Attachment bar
    - Clamps
    - Bracket
    - Potentiometer bracket
    - Pulley
    - Rubber stop
    - Pot. Case (R will print)
  - Harness (S)
  - ~~Potentiometer case~~
  - EM case (J)
  - Weight system (J/Team)
- Electrical components of attachment
  - ~~Potentiometer~~
  - Electromagnets (J)

Also need to do:

- User manual
- DFMEA

## 3/1/16 Expo Registration Notes

**Deadline: 3/18**

### Good Title

- Descriptive, catchy

### Good Abstract (only 50 words)

- Blunt
- Concise
- Simple
- Exciting
- Goal
- Outcome
- Opposite of a good book (short, no mystery, etc.)

**Online form (uidaho.edu/expo)**

1. Project Title: \*This question is required.

2. Project summary/abstract (50 word maximum): \*This question is required.

3. Project Type: \*This question is required.

Booth

Oversized

Technical Presentation

4. Will your project require electricity? (Standard 120v outlets will be available, but extension cords will not be provided.)

Yes

No

5. Are there additional considerations we need to know about regarding your project? (i.e. size, weight, proximity to other projects, etc.) Please Specify.

6. Team Members, Departments & Emails

6. Team Members, Departments & Emails	Name (First & Last)	Department	Email
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1.

2.

3.

4.

5.

6.

7.

8.

9.

10.

7. Client or Funding Sponsor:

7. Client or Funding Sponsor: Name (First & Last) Organization

1.

8. Faculty Advisor(s), Departments & Emails

8. Faculty Advisor(s), Departments & Emails Name (First, Last) Department Email

1. \*This question is required

2.

3.

9. Mentor(s), Departments & Emails

9. Mentor(s), Departments & Emails Name (First & Last) Department Email

1.

2.

3.

10. If any additional members are required, please use the below field and include student's first and last name and major department.

11. Team project leader contact phone number (no spaces or dashes): \*This question is required.

12. Team project leader contact email address: \*This question is required.

Brainstorming things:

Title

- Posture
- Perturbation
- Psychology
- Evaluation
- Modernizing
-

3/10/16 Brief meeting in Senior Design Suite

Expo – 4/29

Finish Project – 4/25

Dr. Cohen's Request – 4/21

Spring Break – 3/12-3/20

- March – 10 days
- April – 21 days
- = 31 days (weekend, test day, admin work included)

Sally

- Harness
- Pulley on attachment bar
- User Manual Intro

Austin

- Head piece
- Torque arm
- Cross bars (Sally)
- Height (Sally)
- Wheels (Sally)

Jacquelin

- Electromagnets
- Arduino -> GUI (Robert?)
- Arduino Motor Code (Austin)

Robert

- Torque Sensor circuit
- Pulley assembly
- Voltage regulator

Shop

- Pulley attachment
- Headpiece
- Torque arm
- Cross bars
- Wheels
- Top Plate

- U-Block
- Shafts for pulley attachment

#### Buy

- Material for top plate
- Wiring
- Fuses
- Housing
- PCB for torque sensor, voltage regulator
- Idle roller
- Needle Bearings
- Spring force
- Pulley belt
- Turntable belt

#### Make

- Harness
- Torque sensor circuit
- Voltage regulator

#### Unknown

- Electromagnet housing
- Magnet weight system

#### **Over Spring Break**

- Sally
  - o Harness, user manual intro
- Austin
  - o Finish Motor code
- Jacquelin
  - o Electromagnet housing design
  - o Rearrange buttons, add preview on GUI
- Robert
  - o Wiki Page
  - o Finalize design for voltage regulator circuit
  - o Make rough voltage regulator (tonight)



## 3/22/16 Meeting Minutes

### 4:11 – Email update

- Dr. Cohen spoke with Tim/twister builder, have three things that are requirements of the system
  - o Delay on when motor changes direction
  - o Headpiece needs to be able to move up and down as well as laterally
    - Spring supported
    - Must have zero resistance
    - Any resistance at extreme movement?
  - o Long list (22 items)
- Look into whether we addressed all these items
- Compile a list of ideas on Thursday to email to Tim

### 4:30 – Manufacturing

- Wazzu's waterjet cutter is probably 2 weeks out, so if we have a design for the plate we should get it started
- Slots for attachment bar are done
- Brackets still need to be made
  
- Dr. Cohen wants it done by the 21<sup>st</sup> of April, so 4 weeks left
-

## 4/7/16 3:30 Meeting Minutes

### Senior Design Suite

3:30 – Everyone here. Where is everybody at?

- Sally
  - o Will finish bracket tomorrow
  - o Harness will be done by instructor's meeting
- Weight system
  - o Large single tube encasing weights clamped on a rod by washers. Outer tube to rest on ground and act as guide for weight tube.
- Robert
  - o Hopefully have the motor things done by next week so we can start assembling everything
  - o Circuit design is done, will be ordered today
- Austin
  - o Headpiece parts picked out
    - Ball bearing or nylon slide bearing
  - o Getting a second u-joint for better shaft misalignment
  - o Wiring for whole system planned out ~\$120
    - 20 gauge control wire, not shielded
    - 18 gauge 2 wire conduits for power supply
    - 22 gauge wire for potentiometer wiring
  - o Need to attach feet and rollers, cut it down to height
  - o Rest of motor code should be done this afternoon
  - o Plate and wood are mounted on twister
- Jacquelin
  - o GUI code 99% done, just need to double check some things
  - o Will look into poster and manual things this weekend
  
- Everything due in two weeks
- By 4/19, everything tested at least once

Next Tuesday:

- Rough snapshot poster layout (Jac)
- Plan for weight container (Rob + Jac)
- Update binder (everyone)
- Drive needs to be organized + copied to shared drive (Jac)
- Wiki page (Rob + Jac)
- Machining (Austin + Sally)
- Last order form by tomorrow/Monday (Austin)
- Harness (Sally)

4/12/16 4:00 PM ME Conference Room

4:15 – All here. Updates

4:17 – Deadline

- This is probably the last instructor's meeting, since the twister needs to be done by the 21<sup>st</sup>.
- Can everybody be done by then?
  - o PCBs are on order, should be here in a week
  - o Looks like we'll be good to go.
  - o Harness is almost done

4:20 – EXPO poster

- Statement of project outcome
- What we did to get to the end
- More detailed images are preferred over text
  - o Replace certain images with more current
- Headings linked to images on the right
  - o Objectives followed by pieces followed by images/details
  - o Bullet list to outline main components
- System diagram
  - o Make sure labels are the same as the labeled image on the right
- SolidWorks calculations
  - o For crossbars, stresses?
  - o Deformation of structure given the maximum load being dropped
  - o How do you determine the weight for every person? 7% of body mass

4:40 – Electromagnet holder

- Robert has a solidmodel of the current setup.
- Weights are discs inside 4" PVC tubing with caps on either end
- Cap in current design is metal, but it's a curved surface. Will that fall off easily enough?
- Need to decide between a round metal cap or a plastic cap with magnet embedded inside it

4:55 – GUI

- Motor code is finished
- GUI is done mostly
  - o Maybe add a variable delay button
- Delay needs to be enough so the user doesn't know when you're dropping the weight
- Modify the text boxes so they don't look like buttons

5:00 – Shared drive

- Is there an organizational style?
- Needs to be organized to any outsider.

## Capstone class notes

### Poster

- PowerPoint template for photos, text, etc.
- Logos must be best quality possible
- Save the ppt as a PDF, make sure dimensions are correct (roughly 30x40)
- Inserting photos information on pamphlet at copy center
- Print online, submit the job [www.printonline.uidaho.edu](http://www.printonline.uidaho.edu)
- About 24 hr turnaround time for print, 24 hrs for lamination etc.
  - o Tuesday April 26 4:30 is the cutoff date, after that rush fees applied
  - o 8-6:30 M-Th, 8-6 F
- Template on capstone website
  - o Poster should work as a standalone, but act as a supplement to explanation
  - o Example has font size 29, shouldn't be smaller than that

### What's happening expo day

- 2 day event, starts on Thursday
- Thursday:
  - o 3:30-5, setup projects in the ballroom
  - o Must be set up by 8:45 Friday
  - o Dean's reception Th @ 5:30 in ballroom, free food
  - o Can invite sponsors/mentors/advisors
- Friday:
  - o 7 AM: expo hall open, setup for outdoor projects
  - o Registration on 2<sup>nd</sup> floor, receive lanyard with all necessary information + lunch ticket
  - o Tech presentations
    - Ballroom, gold room, silver room
    - Projectors, ppt, laptops available, bring presentation on thumb drive
  - o 8:45 opening
  - o 9:00 Expo hall is opened
  - o 500-700 visiting students, judges begin at 9
    - Judging rubrics submitted at 12
    - Example forms will be online
  - o Expo hall continues to stay open until keynote
  - o 2:30 keynote address (not required, but suggested) in ballroom, projected in international ballroom
  - o 3:30 awards
  - o Ends at 4
  - o Out of ballroom by 5
- Dress code: business casual

## Tech Presentations

- ~ 20 minutes
- Present design as a finalized design to the audience
- Audience has technically inclined individuals who have limited exposure to the project
  - o Why is what we're doing important?
- Who should present?
  - o Not all team members have to present
- 12-13 minutes long, 5 minutes for questions, arrive 10 minutes early
- Pre-load presentation on laptop in the room
- Videos of project performance are good
- Show lead instructor the presentation before expo for input/advice

## 9:20 Gold room (Bruce)

## After Expo

- All course deliverables
  - o Final hardware/software
  - o Design report/project portfolio
    - Check with instructor
    - Decision by team's instructor whether or not you need a design report
  - o Wikipage
    - Approved by Beyerlein and instructor
  - o Poster
    - Approved by instructor, delivered to expo
  - o Work area check-out
    - Approval from Russ, instructor
  - o Electronic archive/file management
    - Approved by instructor
    - Materials for future teams' use
    - Put on shared drive
- **Due 5/6**
- Keep in mind feedback after EXPO
- Option to put files on a thumb drive attached to portfolio
- Design suite will be open after graduation

## EXPO checklist

- Twister Body
  - 4 corners
  - Top
  - Bottom
  - Torque Arm
  - Rear torso fixture
  - Wooden/steel baseplate + lower leg fixture
- Twister Add-on
  - 2 side bars
  - 2 pulley attachments
    - String potentiometers
  - 2 electromagnets + housing
  - 2 weight canisters
    - 10, 5, 4x1 steel weights in each
  - Cables
- Harnesses
  - Head
  - Twister Chest
  - Axial Chest
  - Hip
- Misc
  - Old circuit boards
  - Programming laptop (in case)
  - Computer monitor + cable
  - EXPO poster
  - Tools
  - Extra wire/tape/screws