

Fall 2016 Agendas/Minutes

1. Agenda—Team Meeting—Thursday, August 25, 2016
 - a. What to complete:
 - i. Resistance testing on our circuits
 - ii. Reattach new u-joints for the heat torque sensor
 - iii. Working on bender bar tracking system
 - iv. Design/build stability for the apparatus
 - b. We need to ask Dr. Cohen if she needs a back up power supply.
2. Minutes—Team Meeting—Thursday, August 25, 2016
 - a. We picked up the circuits/power box from Brandon Morford
 - b. Tristan and Hussain are going to work on the track system, reattach the u-joints, and flat springs.
 - c. Hai is going to create a way to attach the electromagnets for the bender bars.
 - d. Jennifer is going to work on the 2nd torque attachment.
 - i. She e-mailed Dr. Cohen and Dr. Wolbrecht about updates.
 - e. Brian Hanson's office moved and we need to find him for machine shop time because we do not have a machine shop instructor yet.
 - f. Do we need a mechanical stop since we already have an electrical stop?
3. Minutes—Instructor Meeting—Thursday, August 25, 2016
 - a. We need to plan our detailed design review and e-mail Dr. Cohen and Dr. Wolbrecht
 - b. Do we have a new budget?
 - i. We need to talk to Dr. Beyerlein and Dr. Cohen if we need more funding
4. Agenda—Team Meeting—Monday, August, 29, 2016
 - a. We need measurements for the 2nd Torque sensor attachment so we can cut the bar.
 - b. We need information about the machine shop so we can estimate how long machining will take.
 - c. We will work on our individual assignments.
5. Minutes—Team Meeting—Monday, August, 29, 2016
 - a. We will work on our individual assignments.
 - i. Hai brainstormed ideas for the electromagnet attachment.
 - ii. Tristan and Hussain worked on the track system
 1. Jake Gilles suggested water jet cutting will be used to attach the 2nd end cap and the connecting bar.
 - iii. Jennifer worked on the torque sensor attachment and brainstormed ideas for stabilizing the apparatus.
 1. Hussain helped Jennifer take measurements to see how much bar to cut off to meet our height requirements.
6. Agenda—Team Meeting—Tuesday, August 30, 2016
 - a. Everyone will continue their assignments.
 - b. We need to move our apparatus to a new location in the Design Suite so another group can expand their project.
 - c. We need to shorten the length of the neck bar to meet our height requirements.

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7. Minutes—Team Meeting—Tuesday, August 30, 2016
 - a. For stabilizing the apparatus, Tristan suggested using turnbuckles. Jennifer did further research on the best way to use them.
 - b. Tristan and Hussain measured and brainstormed the best way to shorten the neck bar because currently, only a 5 ft tall person can use neck bar.
 - c. Jennifer and Hussain moved the apparatus to the new location in the Design Suite. The other capstone team helped us move.
 - d. Hai brainstormed, took measurements, and made a SolidWorks drawing of the electromagnet plate so it can be machined.

8. Minutes—Instructor Meeting—Wednesday, September 1, 2016
 - a. We gave Dr. Maughan updates about our current projects and he gave suggestions.
 - b. Hussain talked about shortening the neck bar.
 - i. Dr. Maughan suggested grinding the plate connected to the torque sensor to make it thinner to remove some length.
 - c. Hai talked about the electromagnet plate.
 - i. Dr. Maughan said we need to center the electromagnet to prevent the weights from swinging.
 - d. Tristan said the ME department will cover the cost for jet cutting and the materials which will be roughly \$150.
 - e. Jennifer explained her ideas for using corner stabilization. She thinks it will require a lot of accuracy.
 - i. Dr. Maughan suggested using the turnbuckles in an “X” design with cables.
 - f. Jennifer has not been able to reach Brandon Morford about the code. Dr. Maughan told us to inform him if Brandon does not communicate with us by 9/7.

9. Agenda—Team Meeting—Wednesday, September 1, 2016
 - a. We all need to continue working on our projects and include Dr. Maughan’s suggestions.

10. Minutes—Team Meeting—Wednesday, September 1, 2016
 - a. Jennifer designed an idea using turnbuckles and cables and decided on the needed materials.
 - b. Jennifer needs to try contacting Brandon Morford again.
 - c. Hussain and Tristan shortened the neck bar by cutting the steel extensions that attach to the u-joints. They also removed a cross bar that was attached to the top supporting frame.
 - d. Tristan realized we need to measure the length of the neck bar from the head harness attachment not the top of the head harness which gives back 5.5 inches.
 - e. Tristan needs to talk to Dr. Beyerlein and Molly Steiner about our budget and the machine shop. He also needs to contact WSU about jet cutting tie.
 - f. Hai reworked his electromagnet design. Hai needs to calculate how much cable we need for the bender harness.

11. Agenda—Team Meeting—Tuesday, September 6, 2016

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- a. Everyone needs to find specific pricing so their parts can be requested and bought
 - b. Everyone needs to continue working on their individual projects.
12. Minutes—Team Meeting—Tuesday, September, 6, 2016
- a. Jennifer talked to Dr. Cohen and she wants the mechanical stop. It is a top priority.
 - b. Jennifer will go to Moscow Building Supply this week to price parts for stabilizing the apparatus.
 - c. Jennifer worked on the torque sensor attachment drawing in SolidWorks.
 - d. Tristan and Hussain
 - i. Found u-joint adapter pricing at the facilities
 - 1. They need a 1" diameter and 4.25" long rod--\$7
 - ii. Talked to Dr. Wolbrecht about the mechanical stop effecting our motor. Dr. Wolbrecht said the maxon motor had a heat protector/sensor that shuts off the motor when the motor heats up; thus, the motor won't break if we add the mechanical stop. Dr. Wolbrecht said we should add a degree limiter in the code as an additional precaution.
 - iii. They also met with Rick to ask their advice about machining the u-joints adapters.
 - iv. Brainstormed ideas for the mechanical stop.
 - e. We need to order a timing-belt for the motor.
 - f. Hai needs 48" of cable and 4 cable clamps for the bender harness.
 - g.
13. Minutes—Instructor Meeting—Thursday, September, 8, 2016
- a. Jennifer went to Moscow Building Supply yesterday to price the stability apparatus. She also needs angle iron for the torque sensor attachment. She will talk to facilities. She will also finish the parts order.
 - b. Tristan shares his conversation with Dr. Wolbrecht.
 - c. Hussain shared about the extra length they found for the neck bar attachment.
 - d. Hai wants to use I-bolts to attach the weights to the cables.
 - e. Our next meeting will be for design review preparation on Wednesday, September 14, 2016 at 4:00 PM in the Design Suite. Dr. Maughan will review our PowerPoint and the information we want to cover.
14. Agenda—Team Meeting—Thursday, September 8, 2016
- a. Hussain and Tristan need to find out the location for the mechanical stop. They will reattach the motor and remove the parts that need machined.
 - b. Tristan will provide Dr. Beyerlein with a list of parts and costs to be approved.
 - i. We also need to build a base cover out of plywood that Tristan has available.
 - c. Hai also has parts to remove for machining. He will update the Gantt Chart for the design review. He will update portfolio.
 - d. Jennifer will finish pricing for the 2nd torque attachment and update the SolidWorks drawings. She also needs to remove parts for machining.
15. Minutes—Team Meeting—Thursday, September 8, 2016
- a. All of the above tasks in the agenda will be worked on during this meeting.

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- b. Jennifer also needs to e-mail Brian again and work on the Design Review PowerPoint.
 - c. Jennifer reworked the turnbuckle design with Ryan and Tristan. We were able to lessen the number of needed materials.
 - i. The facilities shop did not have the correct size of angle iron, but Pacific Steel in Lewiston does. Jennifer will pick it up.
16. Agenda—Team Meeting—Monday, September 12, 2016
- a. We need to machine parts for the 2nd torque sensor attachment, track system for the bender bars, and the u-joint attachment.
17. Minutes—Team Meeting—Monday, September 12, 2016
- a. Tristan and Hussain worked on the track system. They cut the bars to the required length.
 - b. Jennifer started on the 2nd torque sensor attachment. She worked with Jake Gilles on the CNC mill. The rod was 0.05” too long and didn’t fit in our hollow rod. Hussain helped check tolerances. Then we spent a lot of time cleaning. The part will need to be finished.
 - c. Tristan and Hussain verified their u-joint adapter with James Mader, but James suggested adding a fillet or chamfer to the part. He also suggested making the drilled hole a through hole if the drill was not long enough.
 - d. We will machine with Rick on Wednesday, September 14 from 8:30-12:30.
18. Agenda—Team Meeting—Wednesday, September 14, 2016
- a. We are machining with Rick.
 - i. Hussain and Tristan from 8:30-10:30
 - ii. Hussain and Jennifer from 10:30-12:30
 - b. We will meet with Dr. Maughan today so he can give suggestions for our design review tomorrow.
 - c. Jennifer needs to finish the design review PowerPoint.
19. Minutes—Team Meeting—Wednesday, September 14, 2016
- a. Hussain and Tristan continued working on the track system with Rick.
 - b. Hussain and Jennifer created a hole pattern with the bigger angle iron. Dr. Odom said we would not be able to weld the angle iron to the steel rod so he lathed a hole into the rod and tapped it. This allowed us to bolt the angle iron to the steel rod.
 - c. In the afternoon, Jennifer worked on the design review PowerPoint. Everyone sent her photos over the weekend.
 - d. Dr. Maughan reviewed our presentation and PowerPoint at 4:00 PM.
20. Minutes—Design Review—Thursday, September 15, 2016
- a. Dr. Maughan, Dr. Beyerlein, Dr. Cohen
 - b. Overall, the design review went well. Dr. Cohen seemed happy with our progress.
 - c. The weights should not “drop” when they are attached to the person. The weight system will go back to the original design.
21. Agenda—Team Meeting-Monday, September 19, 2016

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- a. Jennifer will work in the Machine Shop on the 2nd Torque Sensor attachment.
 - b. Hussain and Tristan are machining for the track system.
 - c. Hai will continue working on the weight system.
22. Minutes—Team Meeting—Monday, September 19, 2016
- a. Jennifer thought the holes on the angle iron were miscalculated, but Dillon Savage suggested cleaning out the holes and place each screw in equally. This worked!
 - b. The graduate students did not think Jennifer needed to add an additional plate to attach the torque sensor.
 - c. Tristan and Hussain machined four slots at each end of the track bars. Then bars were cut.
 - d. Hai worked on updating the hold design for the weight system.
23. Minutes—Instructor Meeting—Thursday, September 22, 2016
- a. Updates:
 - i. We bought all the parts for the stability design and drilled the holes.
 - ii. Hai placed the electromagnets into the original design.
 - iii. Tristan ordered parts and is making an appointment for jet cutting. It should be completed by 9/30.
 - b. Needs completed:
 - i. We need to splice a wire that was cut. Should be completed today.
 - ii. We need to weld the bender bars which cannot be completed until the jet cutting is completed.
 - iii. We may need to push back the day we move the apparatus to Dr. Cohen's lab.
 - iv. Hussain and Tristan need to cut some steel rods for the bender bars.
 - c. Suggestions from Dr. Maughan:
 - i. Use a lock nut to keep bolts tight on the stiffening design.
24. Agenda—Team Meeting—Thursday, September 22, 2016
- a. We will work on our individual projects.
 - i. Hai and Jennifer on the stability apparatus.
 - ii. Hussain and Tristan on the bender bars.
25. Minutes—Team Meeting—Thursday, September 22, 2016
- a. Hai and Jennifer decided to move the side bar connections to the front and back of the apparatus to make room for the bender bars.
 - b. Hussain and Tristan created subassemblies using SolidWorks to should the final weld pattern for the track system.
26. Agenda—Team Meeting—Monday, September 26, 2016
- a. Tristan and Hussain need to send files to WSU.
 - b. Tristan and Hussain need dremel tools out of the Machine Shop.
27. Minutes—Team Meeting—Monday, September 26, 2016
- a. Tristan and Hussain made DXF files and emailed them to WSU so the jet cutters could examine the designs before cutting.

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- b. Tristan and Hussain tried checking out the dremel tool but no one showed up in the Machine Shop.

- 28. Agenda—Team Meeting—Tuesday, September 27, 2016
 - a. The turntable has some friction and needs some work.
 - b. The pulley and timing-belt need tested.
- 29. Minutes—Team Meeting—Tuesday, September 27, 2016
 - a. Tristan, Hai, and Hussain worked on the turntable to make the pulley a fit and rotate the table without friction from the inner surface.
 - b. Hai and Hussain ground down the surface of the turntable using a dremel tool.
 - c. Tristan tapped a hole in the plate of the drive system.
 - d. Tristan, Hai, and Hussain installed the pulley and timing-belt and tested the belt tensioner. It worked well.
 - i. Now we need to test the drive system with the belt rotating.

- 30. Agenda—Team Meeting—Wednesday, September 28, 2016
 - a. The bender bars need to go to WSU for jet cutting.
 - b. The u-joint adapters need machined. Jake Gilles is going to help.
- 31. Minutes—Team Meeting—Wednesday, September 28, 2016
 - a. Tristan brought the parts to WSU and they will be picked up on Friday.
 - b. Hussain started making the adapter parts with Jake Gilles. He used the CNC lathe.
 - i. Hussain will meet with Jake tomorrow at 9:00 to continue machining.

- 32. Minutes—Instructor Meeting—Thursday, September 28, 2016
 - a. Updates
 - i. Hussain and Tristan cut all the steel rods for the bender bars
 - ii. Tristan added the belts to the motor
 - iii. The parts were taken to taken to WSU for jet cutting. They should be completed on 9/30 or 10/3.
 - b. Needs completed:
 - i. Base cover
 - ii. Need to attach bender bars
 - iii. We need to test string potentiometers, torque sensors, and electromagnets
 - iv. Final testing of the code
 - v. Need to disassemble and inventory parts for moving
 - c. Dr. Maughan Suggestions:
 - i. Spray paint the I-bolts on the front of the frame a brighter color to lessen a tripping hazard.
 - ii. Push back the moving date.

- 33. Agenda—Team Meeting—Monday, September 3, 2016
 - a. Pick up parts at WSU
 - b. Need to machine holes in a rod for 2nd torque attachment.
 - c. The head harness needs shortened.
- 34. Minutes—Team Meeting—Monday, September 3, 2016
 - a. Tristan picked up the parts at WSU.

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- b. Hussain, Hai, and I created the holes in a steel rod for head harness attachment.
 - c. Hussain and Hai cut the head harness attachment. Six inches were removed to fit the height requirements.
 - d. Tristan will weld in the shop tomorrow.
 - e. Jennifer talked to Dr. Cohen and the moving date is moved back to Monday, October 10, 2016.
35. Agenda—Team Meeting—Tuesday, October 4, 2016
- a. The slots in the neck bar need machined.
 - b. The base cover needs completed. Tristan needs to bring the OSB.
36. Minutes—Team Meeting—Tuesday, October 4, 2016
- a. Jennifer, Tristan, and Hai, with help from Ryan Simler, made the base cover.
 - b. Hussain machined the neck bar slots and tested them.
37. Minutes—Instructor Meeting—Thursday, September 6, 2016
- a. Updates:
 - i. We cut the base cover.
 - ii. We picked up the bender bars from WSU.
 - iii. Hai and Hussain shortened the head harness attachment by 6 inches.
 - iv. We pushed the moving date back to Monday, October 10, 2016.
 - b. Action Items:
 - i. We need to place holes in the base cover to bolt it to the frame. It is mostly for aesthetic appeal.
 - ii. We need to place the apparatus in its completed stage position so we can double check that everything works.
 - iii. We need to update our poster for Snapshot Day 10/11.
 - c. Goals:
 - i. Move to Dr. Cohen's lab on Monday (10/10)
 - ii. Fully complete the bender bars
 - iii. Finish testing the code and circuits
38. Agenda—Team Meeting—Monday, October 10, 2016
- a. Move the apparatus to Dr. Cohen's lab.
 - b. Work on the bender bars in the Machine Shop.
39. Minutes—Team Meeting—Monday, October 10, 2016
- a. Jennifer and Hai disassembled the apparatus. We timed how long it took us to disassemble the apparatus and took inventory. It took 50 minutes.
 - b. Ryan Simler let up borrow his pick up to move the parts to Dr. Cohen's lab.
 - c. The potentiometer was broken in movement. Jennifer replaced and soldered the potentiometer and brought it to Dr. Cohen's lab.
 - d. Hai and Hussain, with help from Ryan, set up the apparatus. Setting up the motor took more time than expected.
 - e. We grabbed the wrong timing belt. We will grab the correct one in the Design Suite tomorrow.
 - f. Dr. Cohen wanted to close the lab so we will test the code tomorrow.
 - g. Tristan worked on the bender bars in the machine shop.

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40. Minutes—Snapshot Day—Tuesday, October 11, 2016
 - a. Jennifer updated the Snapshot Poster with current work. She used her laptop to show the apparatus since we moved it to Dr. Cohen's lab.
 - b. Snapshot Day was a success.

41. Agenda—Team Meeting—Wednesday, October 12, 2016
 - a. Test the code and circuits
42. Minutes—Team Meeting—Wednesday, October 12, 2016
 - a. We tested the code and it worked! It only worked three times.
 - b. We forgot the multimeter in the lab to test circuits.
 - c. The power supply smelt like “burning dust” which Tristan says is a bad sign.
 - d. We will test circuits on Friday.
 - e. Tomorrow, after our instructor meeting, we will drill holes and cut material for the bender bars.
 - f. Goals:
 - i. Test the power supply and circuit connections
 - ii. Finish bender bars
 - g. Action Items:
 - i. Drop off the bender bar parts to facilities because we do not have the welding expertise (10/13)
 - ii. Bring multimeter to Dr. Cohen's lab for circuit testing
 - iii. Pick up completed bender bars at facilities on Monday (10/17)

43. Minutes—Instructor Meeting—Thursday, October 13, 2016
 - a. We think the power supply is broken and needs fixed
 - i. Suggestion: check this idea with the multimeter
 - b. Bender bars are making progress and our experience is limited and so is the shop availability.

44. Agenda—Team Meeting—Friday, October 14, 2016
 - a. Test circuits with the multimeter
45. Minutes—Team Meeting—Friday, October 14, 2016
 - a. Hussain, Hai, and Jennifer tested the AC to DC power supply converted. It is supposed to output 24 Volt, but it was outputting 48 Volts. This seems highly unlikely and we believe we are reading the multimeter incorrectly.
 - b. We also tested the connections for all the motor controls
 - c. We shocked Hussain. He is okay.

46. Agenda—Team Meeting—Tuesday, October 18, 2016
 - a. Have Tristan double check our circuit values and see if he has testing suggestions.
47. Minutes—Team Meeting—Tuesday, October 18, 2016
 - a. Tristan tested all of our circuit connections and double checked our results from Friday. He got the same results.
 - b. Hussain was holding the wire instead of the alligator clip which is why he got shocked.

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- c. Tristan did not have a suggestion for testing the other connections. He thinks it might be the ribbon cable connector.
 - d. Jennifer will e-mail Brian Hanson for circuit help.
 - e. Tristan will contact his electrical engineering friend for electrical testing help.
48. Agenda—Team Meeting—Wednesday, October 19, 2016
- a. Cut some metal for the bender bars.
 - i. They also need welded.
49. Minutes—Team Meeting—Wednesday, October 19, 2016
- a. Jennifer and Hussain cut the metal for the bender bars.
 - b. Tristan welded the bars.
50. Agenda—Team Meeting—Thursday, October 20, 2016
- a. Test circuits with Tristan’s electrical friend (Zack)
 - b. Drop off bender bars at facilities in the morning
51. Minutes—Team Meeting—Thursday, October, 20, 2016
- a. Jennifer dropped off the bender bars
 - b. Tristan’s electrical engineering friend (Zack) confirmed our findings. He also helped us test connections between the motor and pin connector. There is currently flow through every wire.
 - c. The EE (Zack) suggested temporarily converting power out of the 24 Volt power supply into a breadboard so we could test better.
 - d. We will replace the power supply for longevity purposes.
 - e. Jennifer emailed Brian Hanson again so we can get further circuits help.
52. Agenda—Team Meeting—Tuesday, October 25, 2016
- a. Test power supply and ribbon connector
53. Minutes—Team Meeting—Tuesday, October 25, 2016
- a. Jennifer and Tristan signed all the forms and put down the deposit for Dr. Cohen’s lab so the team can have a key to her lab.
 - b. We continued testing and troubleshooting the power supply and ribbon connector.
 - c. Tristan explained our issue to his dad who is an EE. His dad thought it might be a grounding issue because we could be reading the signal wrong since it isn’t grounded.
 - d. Jennifer e-mailed Dr. Maughan about the best way to proceed with our circuit problem and suggested we contact Ankit.
 - e. Jennifer scheduled a meeting with Ankit and we will meet with him at 3:00 in Gaus Johnson tomorrow.
 - f. Jennifer also contacted maxon motor to see if they could help or provide more data sheets.
 - g. Action Item:
 - i. Move circuits from Dr. Cohen’s lab to GJ building so Ankit Gupta can help us.
54. Agenda—Team Meeting—Wednesday, October 26, 2016
- a. Move the circuits to GJ to meet with Ankit Gupta.

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55. Minutes—Team Meeting—Wednesday, October 26, 2016
- a. Ankit lent us a DC power supply so we could isolate our problem from our power supply.
 - b. Ankit also triple checked all our circuits with our help.
 - c. We did not find a solution.
 - d. Jennifer talked to Hunter Fillmore and he suggested a 24 Volt power supply from www.powersupplydepot.com because they are drastically cheaper.
56. Minutes—Instructor Meeting—Thursday, October 27, 2016
- a. We updated Dr. Maughan about our attempts, but lack of success.
 - b. We also need to shorten the bender bars.
 - c. Goals
 - i. E-Mail Brian Hanson again—Jennifer
 - ii. Cut Bender Bars—Hussain and Hai
57. Agenda—Team Meeting—Thursday, October 27, 2016
- a. Test circuits with code
58. Minutes—Team Meeting—Thursday, October 27, 2016
- a. We did a connectivity test to check if there was a dead wire in the circuits.
 - b. We organized the wires and bagged the loose ends.
 - c. Jennifer realized she had save the new code incorrectly and so we tested the new code. There were a couple errors.
 - d. Jennifer emailed Brandon to meet with him this Saturday.
 - e. Jennifer also e-mailed Brian after our instructor meeting. Brian emailed back and we will meet on Monday morning (10/31) at 10:30.
59. Agenda—Team Meeting—Monday, October 31, 2016
- a. We will meet with Brian Hanson at 10:30 to test circuits.
 - b. Jennifer will give an update about meeting with Brandon Morford over the weekend.
60. Minutes—Team Meeting—Monday, October 31, 2016
- a. Our meeting with Brian was moved to 2:30.
 - b. Brian double checked some of our basic connections. Then, he picked up the motor and the connector. He squeezed the connector and the motor worked. We know we need to replace the connector.
 - c. Jennifer checked the price for a new connector online and they are about \$20.
61. Agenda—Team Meeting—Tuesday, November 1, 2016
- a. Test the code with the improved motor connector.
62. Minutes—Team Meeting—Tuesday, November 1, 2016
- a. We moved the motor back to Dr. Cohen's lab. This was too soon. The code wouldn't work no matter how tight we clamped the connector.
 - b. Tristan contacted Michael McMenemy in ECE Workshop for help. Michael will meet with us in the ECE workshop at 2:30 tomorrow.
63. Agenda—Team Meeting—Wednesday, November 2, 2016

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- a. We will meet with Michael McMenemy to test our circuits and ribbon connector.
64. Minutes—Team Meeting—Wednesday, November 2, 2016
- a. We retested all the circuits and retinned the ribbon cable connectors. Again, we were able to get the motor to randomly work when the connector was very tightly clamped. Michael agree with us and Brian.
65. Agenda—Team Meeting—Thursday, November 3, 2016
- a. We will meet with Michael McMenemy.
 - b. We will pick replacement parts.
66. Minutes—Team Meeting—Thursday, November 3, 2016
- a. Jennifer’s been emailing Maxon motor for about a week. They provided more data sheet. The data sheet were very helpful when troubleshooting circuits.
 - b. We will order a new ribbon connector from Maxon. If shipped from California, it will take a week to get here.
 - c. We will order a new power supply from power supply depot.
 - d. Goals
 - i. Tristan—Order 24 V power supply and maxon motor ribbon connector
 - ii. Hai and Hussain—Cut bender bars
 - iii. Jennifer—send parts links to Tristan and email Dr. Beyerlein for budget approval
67. Agenda—Team Meeting—Monday, November 7, 2016
- a. Buy parts—Tristan
 - b. Machine parts—Hai and Hussain
 - c. Set up time with Dr. Cohen to access the Motion Monitor software so we can test sensors. –Jennifer
68. Minutes—Team Meeting—Monday, November 7, 2016
- a. Hai and Hussain set up a time with Jake to machine on Wednesday.
 - b. Jennifer emailed Dr. Cohen and her graduate student will meet with us tomorrow at 2:30 to provide us access to Motion Monitor.
 - c. Tristan will buy the parts today. On Friday, Tristan was going to buy the parts, but he saw that the maxon motor ribbon connector was going to take 2-4 weeks to get here and cost \$60 in shipping (the part is tiny!)
 - d. Goals and Action Items
 - i. Finish bender bars
 - ii. Test string potentiometers and torque sensors
 - iii. Update portfolio and wikipage
 - iv. Update poster for Snapshot Day
 - v. Get extension cord to plug into power supply
 - vi. Attach and test new power supply and ribbon connector
69. Agenda—Team Meeting—Tuesday, November 8 ,2016
- a. Test the sensors in Dr. Cohen’s lab with the graduate students
70. Minutes—Team Meeting—Tuesday, November 8, 2016
- a. Dan, Dr. Cohen’s graduate student, helped us with testing the torque sensor using Motion Monitor.

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- b. The torque sensor had so much noise and the signal could not be read clearly.
 - i. We checked the connections and wiring. They were fine. We also tried changing settings on the Motion Monitor interface but it didn't help eliminate noise.
71. Agenda—Team Meeting—Wednesday, November 9, 2016
- a. We will meet with Michael McMenemy about the torque sensor.
72. Minutes—Team Meeting—Wednesday, November 9, 2016
- a. He suggested average out the voltage signal to remove noise. This solution could be permanent. If this does not work, we could add a resistor and a capacitor to remove the noise.
73. Minutes—Instructor Meeting—Thursday, November 10, 2016
- a. We met with Dr. Maughan and explained our issues with the torque sensors. He was happy with our use of our resources, but he realizes we have a lot of work to do.
74. Agenda—Team Meeting—Thursday, November 10, 2016
- a. We will test the torque sensors update and string potentiometers with the Motion Monitor. Dan will help us.
75. Minutes—Team Meeting—Thursday, November 10, 2016
- a. In Motion Monitor, we got a signal when the torque sensor was twisted, but the signal started at 0.55 Volts.
 - b. We thought recalibration might be needed since the torque sensors have not been calibrated in 10 years.
 - c. We also tested the connection of the BNC cable to the power supply. One of the torque sensors had a poor connection. We continued to test with the other torque sensor.
 - d. Even after we changed torque sensors, the data still did not make sense.
 - e. Dr. Cohen suggested we call Motion Monitor and explain the situation to them for a solution.
 - f. Next, we tested the string potentiometers. The results made sense, but the data kept returning to zero ever half second. This was odd because we tested the string potentiometers with Michael McMenemy. Tristan thought it might be a sampling rate issue.
 - g. We decided to talk to Dr. Wolbrecht since he is familiar with data collection and worked with this project in the past.
76. Agenda—Team Meeting—Friday, November 11, 2016
- a. Bring the torque sensor back to Michael McMenemy to find another solution
 - b. Shorten bender bars
77. Minutes—Team Meeting—Friday, November 22, 2016
- a. When we tested the torque sensors before with Michael, we got some really consistently good data. We could not repeat that data today. We tried different oscilloscopes and tested all the connections. Nothing worked. Michael said he will call Futek to find a solution.

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- b. We will meet with him tomorrow.
 - c. Hussain and Hai shortened the bender bars with Jake. They did not finish drilling the angle irons. Jake will help them on Monday at 9:30 AM.
78. Agenda—Team Meeting—Monday, November 14, 2016
- a. Bender bars need shortened.
 - b. Meet with Michael McMenemy to find a solution for our torque sensor.
79. Minutes—Team Meeting—Monday, November 14, 2016
- a. Hai and Hussain finished the bender bar shortening in the morning.
 - b. At 2:30, we met with Michael McMenemy. He talked to Futek who suggested a \$400 amplifier. We cannot afford this and it would take too long to ship. Michael said he might be able to build us an amplifier.
 - c. Jennifer went to find solutions with Dr. Maughan and Dr. Wolbrecht. Dr. Maughan thought building the amplifier was a good solution. He wasn't sure about the settings for the Motion Monitor.
 - i. Jennifer then talked to Dr. Wolbrecht. He gave us a tested amplifier. He suggested a couple settings for the Motion Monitor. He also believed we need to replace our 5 Volt power supply.
 - d. Hussain, Hai, and Tristan went to Dr. Cohen's lab to test the bender bars. The bars were the correct length. There are still a few changes to be made.
 - e. We will ask Michael McMenemy to build an amplifier.
80. Minutes—Instructor Meeting—Thursday, November 17, 2016
- a. We explained the amplifier decision and we shortened the bender bars.
 - b. Bender bars still need completed
81. Agenda—Team Meeting—Thursday, November 17, 2016
- a. Work with Michael McMenemy to build the amplifier for the torque sensor.
 - b. Install clamps on the bender bars.
82. Minutes—Team Meeting—Thursday, November 17, 2016
- a. Tristan worked with Michael on the amplifier. They plan to make a copper board to install the AO622 amplifier provided by Dr. Wolbrecht. This should remove the noise. This will be finished, hopefully, over Thanksgiving Break.
 - b. Hai and Hussain installed the clamps on the bender bars. They wouldn't clamp to the frame when tested. Thus, they added rubber pads to the clamp design.
83. Agenda—Team Meeting—Monday, November 28, 2016
- a. Check to see if parts arrived
 - b. Check with Michael McMenemy
 - c. Work on the Expo poster
84. Minutes—Team Meeting—Monday, November 28, 2016
- a. The new power supply arrived. Jennifer and Tristan picked it up.
 - b. Jennifer, Hai, and I hooked up the power supply and made space on the circuits box. The new power supply is a different shape.
 - c. Tristan checked for updates with Michael McMenemy. Hai, Jennifer, and Hussain followed after the power supply was installed. The amplifier is complete!

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- d. We tested the amplifier with the torque sensor and it worked.
 - e. Jennifer worked on the Expo poster. She will turn in the poster to the Copy Center tomorrow night.
 - f. Action Items:
 - i. Test the bender bars with the frame.
 - ii. Get the code from Brandon and test it with him
 - iii. Test the new power supply
 - iv. Get the poster ready for Expo which is on Friday.
 - v. Fix the second torque sensor wiring
 - vi. We still need the ribbon connector
85. Agenda—Team Meeting—Tuesday, November 29, 2016
- a. Finish/Edit Expo poster
 - b. Set the Bender Bars
 - c. Completely set up the apparatus for pictures
 - d. Bolt circuits to circuits box
86. Minutes—Team Meeting—Tuesday, November 29, 2016
- a. Jennifer continued editing the Expo poster. Dr. Beyerlein offered for the ME Department to pay for the poster. He also spent a couple minutes editing the poster. He suggested more photos and less words.
 - b. Hai, Hussain, and Tristan moved the circuits box back to Dr. Cohen's lab. They finished bolting down the circuits and organized the wires for pictures.
 - i. They also organized the apparatus and sent Jennifer photos to add to the poster.
 - c. Hai, Hussain, and Tristan tested the torque sensor with the amplifier. The amplifier was easy to attach. At first, the torque sensor did not produce the same results as when we tested with Michael McMenemy. The guys insulated the bottom of the amplifier and we changed the sampling rate and data acquisition settings. This led to reasonable results. There was still room for improvement. It was not consistent. We need to add another capacitor to the amplifier.
87. Agenda—Team Meeting—Wednesday, November 30, 2016
- a. Troubleshoot the torque sensor.
 - b. Test the torque sensor with Dan and Dr. Cohen.
88. Minutes—Team Meeting—Wednesday, November 30, 2016
- a. Tristan and Hussain went to Michael's office to troubleshoot the sensor problem. Michael showed that the torque sensor fluctuates around 2.3 volts.
 - b. Michael suggested changing the Motion Monitor settings to $1\text{m}\Omega$ to $50\ \Omega$ which is the default setting. He also suggested that there are two inputs at 2.5 Volts each
 - c. We tested the torque sensor with Dr. Cohen and Dan. The signal fluctuated and didn't care about applied torque.
 - d. Dr. Cohen took some snapshots and sent them to Motion Monitor for help.
89. Minutes—Team Meeting and Instructor Meeting—Thursday, December 1, 2016
- a. The bender bars will not work. They will need to be rebuilt.

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- i. Jennifer and Hai will design and build. Dr. Maughan spent time with us planning a new design. Hai finalized the design. Hai will cut needed materials tomorrow and Ryan Simler will weld them on Saturday.
- ii. Hussain and Tristan continued working on the sensors and met with Dan to test the torque sensors and string potentiometers. They also attached the ribbon connector.

90. Agenda—Team Meeting—Saturday, December 3, 2016

- a. Test the motor with the code.

91. Minutes—Team Meeting—Saturday, December 3, 2016

- a. We tested the motor. The motor spins in one direction and stops after an undetermined amount of time. It did not respond to the potentiometer. It should get to a certain location on the potentiometer, switch directions, then go a certain distance on the potentiometer, and stop.
- b. Jennifer talked to Brandon Morford and he said he will meet with us, but we do not think this meeting will happen.

92. Agenda—Team Meeting—Sunday, December 4, 2016

- a. Attach the new bender bar design—we need holes in the frame
 - i. Ryan Simler will help us

93. Minutes—Team Meeting—Sunday, December 4, 2016

- a. Jennifer made the measurements for the frame holes.
- b. Hai and Ryan spent the afternoon drilling holes. We broke multiple drill bits. We improved the design by making the holes the same distance apart as holes drilled in the bars.
- c. Jennifer went to Spence Hardware and picked up two types of bolts and nuts. We double checked all the connections and drilled them out as necessary.
- d. Hai and Jennifer also attached the plates and attached the electromagnets and pulley to the plates.
- e. We also double checked the weight system idea. We added more carabiners so the harness and cables detach easier. This also protects the string potentiometer.
- f. Jennifer cleaned the lab and took unnecessary parts to GJ Building.
- g. Tristan and Hussain checked the code since it wasn't working the day before. Zack, Tristan's EE friend, came and analyzed the code with our circuits.

94. Agenda—Team Meeting—Monday, December 5, 2016

- a. E-mail updates to Dr. Cohen and Dr. Maughan
- b. Continue checking code.
- c. Add capacitor to torque sensor to reduce noise

95. Minutes—Team Meeting—Monday, December 5, 2016

- a. Jennifer sent update emails to Dr. Maughan and Dr. Cohen
- b. Tristan and Jennifer continued checking the code
- c. The capacitor was completed. Hussain and Hai will meet with Dan tomorrow to test with Motion Monitor.
- d. Jennifer and Tristan are meeting with Anki Gupta tomorrow to have more help with the code and circuits. We loaded all the circuits into Hai's car.

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- e. Action Item:
 - i. Replace bender portions on the hip harness. It was dropped and tripped over and now the bender portions need replaced.
96. Agenda—Team Meeting—Tuesday, December 6, 2016
- a. Tristan and Jennifer will meet with Ankit Gupta to get help with code and circuits.
 - b. Jennifer will attend a general class to get information about Snapshot Day.
 - c. Hai and Hussain will work with Dan Kral to test the updated torque sensor.
97. Minutes—Team Meeting—Tuesday, December 6, 2016
- a. Jennifer and Tristan met with Ankit who helped with coding. The potentiometer now outputs correct values. Now we can work on pairing it properly with the motor code on C#. We will meet with him tomorrow afternoon (1-3) to continue working.
 - b. Hai and Hussain met with Dan Kral. There was still a lot of noise on the torque sensor. They met with Michael McMenemy to add another resistor. They will test again tomorrow.
98. Agenda—Team Meeting—Wednesday, December 7, 2016
- a. Hussain and Hai will meet with Dan Kral to test the torque sensor update.
 - b. Jennifer and Hussain will meet with Ankit for more coding.
99. Minutes—Team Meeting—Wednesday, December 7, 2016
- a. Hussain and Hai worked with Dan Kral. There is far less noise. It is at an acceptable level.
 - b. Jennifer and Tristan met with Ankit. Ankit said he found a lot of errors in the original code and the code Brandon Morford created. We decided to focus on bringing the original code into a functioning program.
 - c. Jennifer started working on redesigning the hip harness for the vertical natural movement. She talked to Bill Magnie and he suggested a hinge. Jennifer will pick one up tonight.
 - d. Tristan created cables to attach the weights. He also sanded the weight holders so they would stick less when trying to open.
100. Agenda—Team/Client/Instructor Meeting—Thursday, December 8, 2016
- a. Tristan and Jennifer will meet with Ankit to test the error-free code that Ankit created. Our meeting is at 1 o'clock.
 - b. Jennifer will create the holes for the hip harness with the hinge.
 - c. Hai will help us move the motor back to the lab at 2:30
 - d. Tristan, Jennifer, and Hai will meet with Dr. Maughan, Dr. Cohen, and Dan to have a final review of the apparatus.
101. Minutes—Team/Client/Instructor Meeting—Thursday, December 8, 2016
- a. Tristan and Jennifer met with Ankit to test the error-free code. The code worked with all parts of the twister system. We need to test the motor with the base. We will probably have to modify the angles.
 - b. Jennifer standardized the bolts for the hip harness. The holes still need to be drilled.

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- c. Hai and Jennifer moved the circuits to the lab and set up all the components for the meeting.
 - d. During our client/instructor meeting, Dr. Maughan made a list of what we need to complete:
 - i. Finish code
 - ii. Round over ALL sharp edges
 - iii. Clean up/Protect all wiring
 - iv. Strain relief on motor connector
 - v. Connect emergency stop wiring—FRIDAY
 - vi. Hip harness—FRIDAY
 - vii. Make cables symmetrical—FRIDAY
 - viii. Bigger red carabiners—FRIDAY
 - ix. Set excess cable lengths based on 95th percentile girth--FRIDAY
 - x. Move data from engr shared drive to psychology shared drive
 - xi. Tristin to give training
 - ~~xii. Install software on Dr. Cohen's computer~~
 - xiii. Get spring pins for bars
 - ~~xiv. Identify correct nut drivers, send to Dr. Cohen~~
 - ~~xv. Square up the twister so that it isn't leaning to the right~~
 - xvi. Check for extra material for extending the base attachment
 - xvii. Finish documentation/user manual—FRIDAY
 - xviii. Clean out design suite
 - e. Jennifer finished xii after the meeting
 - f. Xiv was completed during the meeting
 - g. We also tried to square up the base by tightening the left side of the apparatus and loosening the right side. It didn't help a lot. We think the whole frame is slightly slanted.
 - h. We need to finish our logbooks.
102. Agenda—Team Meeting—Friday, December 9, 2016
- a. Tomorrow, Tristan is meeting with Ankit at 3:15. Jennifer is leaving her laptop.
 - b. Jennifer is finishing the hip harness.
 - c. Tristan is extending and connecting the emergency stop button at 9:30 AM.
 - d. Jennifer will bring bigger carabiners.
 - e. Hussain will work on the 95th percentile to cut the cable lengths. They will also make cables symmetrical.
 - f. Hussain, Hai, and Jennifer will turn in our documentation to Hai so he can finish the portfolio to turn in tomorrow.