|  |
| --- |
| [Link to QEs 29-52] [Link to QEs 80] |
| QE #53 (0.00 hrs) 21Feb19 **[D]**  Topic: New battery order form (after re-sizing from ME testing).    **Outcome(s):** Have new order for batteries. |
| QE #54 (0.50 hrs) 21Feb19  Topic: Component placement.   1. On Device:    1. Arduino    2. Buttons    3. Display    4. SD breakout    5. Load cell amplifier    6. Motor controller 2. On Battery Pack:    1. Batteries    2. Fuses    3. Power button  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | |  |  |  |  |  | | --- | --- | --- | --- | --- | | On Device | | | | | | Item | Height | Width | Depth | Weight | | Arduino |  |  |  |  | | Buttons (each) |  |  |  |  | | Display |  |  |  |  | | SD breakout |  |  |  |  | | Amplifier |  |  |  |  | | Motor controller |  |  |  |  | | |  |  |  |  |  | | --- | --- | --- | --- | --- | | On Battery Pack | | | | | | Item | Height | Width | Depth | Weight | | Batteries (each) |  |  |  |  | | Array |  |  |  |  | | Fuses (each) |  |  |  |  | | Array |  |  |  |  | | Power button |  |  |  |  | |   **Outcome(s):** Have the competents list to tell MEs where each component should go. |
| QE #55 (1.00 hrs) 21Feb19 **[GP&A]** (Whole team)  Topic: Midterm testing presentation peer reviews.    **Outcome(s):** Have documentation for watching, analyzing, and critiquing other teams’ presentations. |
| QE #56 (1.50 hrs) 21Feb19 **[A]**  Topic: Reading the forum that Ian Alexander found that has (what he called) a motor controller code (with PID) that can do everything we need.   1. ([Arduino Forum](http://forum.arduino.cc/index.php?topic=8652.0)) Topic: DC motor control with PID [from “kas”]    1. kas’s project was with a balancing robot using 2 350 RPM Pololu motors with integrated encoders (with a 14A dual motor driver). From August 2010.    2. Codes (2 parts):       1. First Code          1. motorForward()…functions that are defined in main          2. motorBackward()          3. motorStop()          4. Pass a PWM value [0, 255]       2. PID has control over the motor speeds          1. It’s a lot, but maybe it could be made into a library or just piecemeal-ed into the code.          2. There are a lot of functions, but they look workable and customizable. 2. Conclusion/Prescription    1. I think that this code seems very likely to provide what this project needs and could be cleaned and serviced.    2. Ian should figure out the pinout to suit our project and should make all appropriate changes in the code.    3. The code comments need to be check for clarity, but seem good quality as is.    4. Proper citation needs to be created and inserted.    5. Citation:     **Outcome(s):** This code will get the motor control (with PID) that is required. |
| QE #57 (2.00 hrs) 23Feb19 **[M]**  Topic: Outlining code and fleshing out individual functions.    **Outcome(s):** The code is close to being ready for initial testing. Need to add: error handling and motor/PID control. |
| QE #58 (1.00 hrs) 24Feb19 **[A]**  Topic: Analyzing the code Ian found for compatibility with the present code and for how to integrate.  I had to go back and look at my control notes before I mis-identified the error.  **Outcome(s):** Switching back to the PID [library](https://playground.arduino.cc/Code/PIDLibrary) (etc.) I found [earlier](http://brettbeauregard.com/blog/2011/04/improving-the-beginner%E2%80%99s-pid-reset-windup/). |
| QE #59 (1.00 hrs) Feb19**[A]**  Topic: Analyzing the PID code I found for compatibility with the present code and for how to integrate.    **Outcome(s):** I will be attempting to use the proportional on measure PID type control in order to help prevent overshoot. |
| QE #60 (1.00 hrs) 26Feb19 **[GP&A]** (Emily, Dylan, and Me)  Topic: Team meeting (just the MEs and myself) and working on next report due.   1. MEs doing analysis on the newest frame design. 2. MEs need to put their tests into the required document form. 3. Need foam sample from NASA, but they are ignoring us. 4. Encoder:    1. Moved to motor…    2. Because the LA casing can’t handle the load weight; therefore, the previous encoder placement plan wouldn’t work.    3. The gear ratios, etc., are unknown. 5. The new casing design might require to be cut to specs if can’t bend the metal. 6. Dylan will count the gears for the ratio 7. I might need to change the buttons. 8. Making sure items to go in the device are going to fit and how the design needs to be changed. 9. Now we have to make our own attachment piece… 10. Dylan asked if the load cell would “make the load go up even though the sample piece isn’t getting pulled.” I explained how a load cell works, and Emily   **Outcome(s):** Got the teammates that showed up caught up and discussed issues with device to be solved. |
| QE #61 (1.50 hrs) 28Feb19 **[GP&A]** (Whole team)  Topic: Team meeting with Dr. Guo   1. Encoder    1. DrG asked TC if he’d worked on it…TC: need to test if it works    2. EZ: told about how shop gut suggested to move the encoder in order to support case 2. Talking about the case to hold the motor…how to create it    1. DrG concerned about how manufacturing will affect the structural integrity    2. IA: asking how COG will be affected…EZ: haven’t chosen material, but shouldn’t be an issue 3. DrG expressed some concern about the total length of the device (~15”)    1. DrG: do we need all 2” of stroke 4. Buttons:    1. EZ: explained function…DrG: can it just stay once done? **YEP** 5. Talked about how ours will be compared. It’s required…DrG: don’t worry about that…just talk about advantages.    1. DrG: don’t compare the devices…**WTF they said we need to compares them**    2. DrG: can’t say new tests are better than old test…you tell them we can meet the specs.. 6. EZ: We (DB and/or TC) will go talk to the shop guy to see how/if what is designed can be done 7. EZ is going to work on resizing the battery case and getting models fixed up. 8. We need to re-measure all the components in order to get accurate measurements   **Outcome(s):** Have tasks for week(s) ahead and cleared up some component functionality. |
| QE #62 (1.50 hrs) 28Feb19 **[A]**  Topic: Outlining the library Thommy wants to use for the [motor driver](https://www.pololu.com/product/2503).   1. [Arduino Library](https://github.com/pololu/dual-mc33926-motor-shield)    1. Function Definitions       1. Setup()          1. Baud is 115200…need to check if it will work at 9600       2. “void setM1Speed(int speed)”          1. Sets Motor 1 so a speed where speed is [-400, 400]          2. 400 corresponds to motor current flowing from M1A to M1B.          3. -400 corresponds to motor current flowing from M1B to M1A.       3. “unsigned getFault()”          1. Returns “1” if there is a motor driver fault, “0” if no fault.       4. “DualMC33926MotorShield(…)”          1. Allows for custom mapping of pins       5. “void init()”          1. “Initialize pinModes and maybe timer1.” 2. [User’s Guide](https://www.pololu.com/docs/0J55/all)    1. Dual motor driver    2. FET for battery protection    3. Stackable on the Arduino    4. Logic inputs are 5 | 3.3 V  |  |  |  | | --- | --- | --- | | **Arduino Pin** | **Shield Pin Name** | **Basic Function** | | Digital 4 | D2 (or nD2) | Tri-state disables both outputs of both motor channels when LOW; toggling resets latched driver fault condition | | Digital 7 | M1DIR | Motor 1 direction input | | Digital 8 | M2DIR | Motor 2 direction input | | Digital 9 | M1PWM | Motor 1 speed input | | Digital 10 | M2PWM | Motor 2 speed input | | Digital 12 | SF (or nSF) | Status flag indicator (LOW indicates fault) | | Analog 0 | M1FB | Motor 1 current sense output (approx. 525 mV/A) | | Analog 1 | M2FB | Motor 2 current sense output (approx. 525 mV/A) |  * 1. Between 5-8V degrades motor controller performance and max current output   2. Max continuous current rating of 5A      1. Will reduce current automatically if over or if temp reaches limit      2. They tested at room temp (no forced air + 100 =d): max, lasted 10 s; 4A, 37 s; 3A, 10 min.      3. They suggest to add cap(s) in order to reduce noise.   3. Simplified Motor Control Truth Table  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **Inputs** | | | **Outputs** | | | | **D2** | **MxPWM** | **MxDIR** | **MxA** | **MxB** | **SF** | **Mode** | | H | H | L | H | L | H | forward | | H | H | H | L | H | H | reverse | | H | L | X | L | L | H | brake | | L | X | X | Z | Z | L | coast |   L = LOW, H = HIGH, X = HIGH or LOW, Z = high impedance   * 1. Customizing the Shield        3. The yellow boxes would need their trace cut if any custom mapping is to occur.   **Outcome(s):** Have clear idea of how to work the library and how the board operates. |
| QE #63 (2.00 hrs) 28Feb19 **[M]**  Topic: Adding code for motor controller and integrating PID controls.   |  |  | | --- | --- | |  | 1. I did my best to setup the PID, but I need Thommy to confirm how the encoder will output to determine how the input to the encoder will work. 2. Need to go throw and count the added delay() functions because otherwise the code will take too long. |   **Outcome(s):** Have the PID integrated (or started to) and I now have a method of capturing an input for the PID from the encoder. |
| QE #64 (1.00 hrs) 28Feb19 **[A]**  Topic: Calculating the gear ration and figuring the rotational motion of motor to equivalent linear motion of the hook assembly.   |  |  | | --- | --- | | Gears separated | Gears assembled in housing |      1. Counting the number of teeth on each gear yielded:    1. A: 12    2. B: 12 and 30    3. C: 11 and 36    4. D: 45 2. [Total Gear Ratio](https://woodgears.ca/gear/ratio.html) with compound gears: 3. Conversion to linear motion    1. 1 rotation of lead screw is 1/16th of inch linear 4. For code:    1. Inputs linear set point in inches    2. Outputs rotational speed in rotations    3. Need to check if the speed of motor is 2356.55 (3 )    4. Using a delay():   **Outcome(s):** Have the gear ratio and a conversion from rotational motion of the motor to linear motion of the hook assembly. |
| QE #65 (0.50 hrs) 28Feb19 **[T]**  Topic: Creating test plans and documentation for the battery charger test.    **Outcome(s):** Have required documentation format for the battery charger test. |
| QE #66 (7.50 hrs) 28Feb19 **[T]**  Topic: Testing the battery charger for functionality and timing.    **Outcome(s):** Battery charger works, but it does take longer than I expected/hoped. |
| QE #67 (0.00 hrs) 06Mar19  Topic: BTB #3.  **Outcome(s):** Have documentation for BTB #3. |