P14045 Week 8 Shared Visions & Individual Three Week Plans

4 Main Questions:

IV.A) What do we need to do for week 8? **(GROUP)**

Sorted in order by priority.

1. Linda/Dr Day Present
2. Ed can drive Stander
    a. Using buttons
3. Complete Battery Box- waiting on welding
    a. Holds components
    b. Mounted on stander
4. Complete Tray System-
    a. Movement 2.0
        i. Show locking hinge movement
5. All Electrical Modules working and ready to be integrated together
    a. PWM and QEI for wheels
    b. ADC for speed control
    c. UART for communication - Martha was working on this code, and she says it works and can communicated between the Launchpad and her computer over a UART connection. I haven't seen it.
    d. Bluetooth for remote - This is an extension of the UART communication. But I haven't looked up the codes that need to get sent over the UART.
    e. I2C and touchscreen - Martha has researched on the I2C, and has most of the functions to make it work on track. Testing with the actual touchscreen hasn't happened yet.
6. Remote - Buttons and control structure work, theres a basic prototype. None of the communication has been implemented.
    a. Everything works except bluetooth
    b. Demonstrated by computer
7. Tests Completed

For all the tests below the standers needs to be fully built.

a. Debug Test 1 - These are dependant on the communication between 2 launchpads, which hasn't been implemented yet.
b. Debug Test 2
c. Remote Control Range Test
d. Remote Function Test

e. Connection Testconduct test
f. Bump TestWeight Test
g. Touch Test

8. Continuation of Instructables build documentation
    a. Tray System Build Revise
    b. Elaboration on build

I.) <u>What did we say we were going to do for week 5?</u>

Group Plan:

1. Complete Battery Box- *MOVED to Week 8*
    a. Holds components
    b. Mounted on stander
        i. waiting for quotes
        ii. switched to aluminum
2. Complete Tray System- Parts waiting to be welded
    a. Movement
        i. test for tray system
3. Wheel System
    a. Drive straight
    b. Figure out power supply.
4. All Electrical Modules working and ready to be integrated together
    a. PWM and QEI for wheels ✓
    b. ADC for speed control ✓
    c. UART for communication ▢
    d. Bluetooth for remote ▢
    e. I2C and touchscreen ▢
5. Tests Completed
    a. Can it be Painted
    b. Usage Test
    c. Budget Test
6. Working skeleton of Remote
    a. Communication between computers
7. Preliminary Instructables build documentation
    a. Tray System Build Complete
8. Up to date documentation

Alex:

1. Assist with redesign/assembly of battery box
2. Finish tray assembly after planning completes

JD:

1. Create Programming Roadmap
2. All modules at basic level of operation
    a. PWM and QEI for wheels
    b. ADC for speed control
    c. UART for communication
    d. Bluetooth for remote
    e. I2C and touchscreen

MV:

1. Communicate with JR in order to cooperate in the creation and development of programming roadmap. (Make sure to have realistic timelines that we follow)
2. Organize team documents.
3. Ask Dr. Bowman if we could borrow his proto board for IC Chip
4. Start cleaning code from last year's group to be used with new environment.

GR:

1. Assist in finishing Battery Box
    a. Finish CAD mock up of Battery Box
    b. discuss with machine shop/modify design as necessary
    c. get quote to build and send out
2. Create plan for Tray Assembly and Document
    a. Clarify and plan on ordering Locking Hinge
    b. Negotiate money for locking hinge
3. Ensure group has necessary documentation complete
4. Begin Instructables Documentation

EC:

1. Order essential parts
2. propose outsourcing box to benefactors
    a. meet with Unifab if approved to discuss order
    b. acquire materials and plan for in house build

II.) <u>What did we actually did do?</u>

Group:

- All the foreseeable design work is completed to the detail required to build
- PWM and ADC are working
- We acquired funding as well as all the material necessary to completely build what is necessary

- Wheels are assembled and bump support reinforced

GR:

1. Assisted in finishing Battery Box
    a. Finished CAD mock up of Battery Box
    b. Discussed with machine shop/modify design as necessary
    c. Emily got quote to build and send out
        i. I made the CAD files to support the self build
2. Created plan for Tray Assembly and Document
    a. Clarified and planned order for Locking Hinge
    b. Negotiated money for locking hinge
    c. Once we received hinge, created
    d. Created CAD files for bracket
    e. Made pieces for brackets, gave them to Rob to be welded
3. Ensured group has necessary documentation complete
4. Began Instructables Documentation

Alex:

1. Got Rob Kraynik to clean up the wheel adapter pieces.
2. Assisted with finalization of Battery Box design
3. Designed new mounting solution for battery box. I made a shelf that will be made out of sheet metal and attached to the stander via some brackets we purchased.
4. mocked up tray design with locking hinge included.
5. helped finalize tray design. Having the hinge allowed us to finalize measurements and come up with a final design. Fell just short of the mark on

JD:

1. PWM code is working with a sensitivity of 50 (there are 50 speeds between stop and full ahead, and 50 speeds from stop to full reverse)
2. QEI module works intermittently, sometimes it updates its position sometimes it doesn't and sometimes it updates it just an arbitrary position count, Code matches examples found online.

MV:

1. I finally managed to complete the Analog to Digital Converter (ADC) module that will be used for setting the speed in the MCU via the speed knob (potentiometer). The main problems I encountered were wrong library files being linked to the program and missed peripheral assignments.
2. I've researched interrupts in order to optimize the ADC module, so that instead of wasting CPU cycles waiting for a change in the potentiometer

voltage value, it works based on actual signal changes. JR and I still have to decide if/when we will actually be using interrupts since operations using the same memory areas could crash if interrupts interfere with one another.

3. I've began working on the Universal Asynchronous Receiver/Transmitter (UART) module available in the Tiva C Series Workshop guide. I am still encountering a few issues in understanding the actual instructions of the assignment.

EC:

1. Ordered materials & updated BOM
2. Obtained quotes for outsourced fabrication - too expensive
3. Worked on box material selection - original plastic would not suffice
    a. met with composites instructor in regards to adding e-glass layer to inside of box (this will insulate the aluminum from galvanic corrosion and the electrical components)
    b. reviewed material properties (Tensile strength, Modulus, Specific Strength…) of the different options (ABS plastic, lexan, aluminum 6061), created a pugh matrix to make selection
    c. paint test

III.) <u>What did we learn?</u>

JD:

1. There are some issues with programming that will take a fresh pair of eyes, but now we are over the hump of getting started with programming. Mark Indovina is a great resource to go to
2. It takes a long time to get anything out of Ken Snyder
3. There are examples for almost anything you want to do in C with the TIVA family of microprocessors
4. Read your datasheets, over loading components with voltage can often give you a lower output than was expected.

Alex:

1. Design work is not always done when you think it is. I thought we would be mostly done designing, but real world challenges and a fresh take on things means that things may not be finished when you think they will be. i.e. the battery box design.
2. we need to order parts/stock sooner!

Greg:

1. Card board design is not sufficient and CAD mock ups are a lot more precise.

2. That aluminum can not be bent at 90 degree angles and had to be cut on the shear.
3. That not having a final product for the week 5 demonstration was not an end all. By having a plan document to strategically go through made the presentation go a lot smoother.

EC:

1. Aluminum is at risk of galvanic corrosion due to battery corrosion
2. Spray paint is durable enough for our application
3. some material properties of plastics vs. aluminum

MV:

1. It's important to not make assumptions about the names of directory paths - everything must be properly labeled for the code to work.
2. Searching through the peripherals document via "Find" proves extremely useful when encountering a specific problem rather than trying to understand the theory behind it.
3. Interrupts are very useful in making overall code efficient, but it is important that they are organized and prioritized correctly so that they don't interfere with one another.
4. The 3.3V pin in the Tiva board is a useful resource in providing power to other areas, which works more efficiently than supplying voltage from the power source (+5V).

IV.B) <u>What do we need to do?</u> - **(INDIVIDUAL)**

Alex:

1. Need to adjust my CAD model of the shelf to accommodate new brackets. These brackets fit the stander better, but are smaller than the ones I used in my CAD model.
2. Once I have the design finalized, I can quickly work with Rob in the shop to make the shelf. We have sufficient sheet metal stock available, and the design is simple enough that fabrication should be relatively fast.
3. Need to assist with the battery box manufacturing once the shelf is done.
4. Once the stander is more complete (fingers crossed), I will also begin running the tests that I am responsible for, as outlined in our test plan.

JD:

1. Finish implementing the QEI Module. Right now it only works intermittently for an unknown reason
2. Make the wheels travel in a straight line with different loads on each

wheel. Also determine the best way to make turning smooth. (find the reset point so that rate of turn / sample)

3. Build a prototype of the remote and make it register button presses which can be transmitted over UART

MV:

1. I need to continue developing the EE modules for programming codes - UART, Bluetooth, and I2C.
2. I further need to start working on stander controls - buttons & touchscreen overlay - when modules are developed. The main milestone to achieve at first is to make sure input signals are being recognized by the controller.

GR:

1. Set up plan for building battery box, tray hinges, and battery box holder.
2. Prep for imagine RIT
3. Visit Linda and discuss having families visit. Fix the stander for her as well.

EC:

1. Build!
    a. slider anchor piece - cut to size and drill/thread holes
    b. box pieces - work with Greg and Alex to divide work appropriately
        i. cut to size
        ii. have welded
        iii. file/grind all edges as needed
        iv. polish all surfaces
    c. apply layer of E-glass
    d. select a paint for the finished box - check on color
    e. paint box
    f. clean, cut, and attach lego board to tray