P14045 Week 11 Shared Visions & Individual Three Week Plans

4 Main Questions:

IV.A) What do we need to do for week 11? **(GROUP)**

Sorted in order by priority.

1. Stander can be driven
    a. Using buttons
2. Tests Completed
    a. Usage Test
    b. Debug Test 1
    c. Debug Test 2
    d. Remote Control Range Test
    e. Remote Function Test
    f. Connection Test
    g. Bump Test
    h. Weight Test
    i. Touch Test
    j. Current Draw Test
    k. Straight line runs
    l. Tire Pressure test
    m. Acceleration Test
    n. Speed Test
    o. Turn Test
    p. Usage Test 1
    q. Usage Test 2
    r. Table Distance
    s. Tilt Test
    t. Liquid Test
    u. Measure distance from table
    v. Stander Modifications
    w. Assembly time

3. Mechanically Sound
    a. Complete Battery Box
        i. E-glass lining
        ii. Drill and thread all holes - assemble pieces
        iii. Mounting - internal and external (box to shelf)
            1. Motor controllers
            2. Tiva board
            3. Battery
            4. Wiring and connections
            5. Hinge
        iv. Prep for Painting
        v. Prime
        vi. Paint
    b. Complete Remote
        i. Physically together
        ii. All internal wiring
        iii. Bluetooth/battery/tiva board/buttons mounted
    c. Complete Tray System
        i. Line at end of tray to show closed position
        ii. Rob needs to reinforce upper bracket holes with weld
        iii. Prime/paint brackets
        iv. Color code control connections
4. All Electrical Modules working and are integrated together
    a. PWM and QEI for wheels - Actually travels in a straight line, doesn't try to catch the wheels up when stopped.
    b. ADC for speed control - Actual know implemented that you can turn to change the speed.
    c. UART for communication - Can send arbitrary messages over bluetooth. And can queue up messages and not interrupt other functions. Remote/Controls: Can detect when a message is waiting to be received. Does 'respond' in call and respond. Stander, can send and receive messages, does 'call and respond'
    d. Bluetooth for remote - Bluetooth can connect and tell when it has become disconnected and will try and reconnect. Can send arbitrary messages, just like over UART. (acts as a UART tunnel)
    e. I2C and touchscreen - This would be literally just the cream on top, I don't expect this to be done.
    f. Remote works with bluetooth - see above. Remote acts just like button controls module on the stander, but communicates over bluetooth as a UART tunnel

5. Develop credible plan for adapting Red Stander to use both new and old systems
6. Continuation of Instructables build documentation
    a. Updates based on build progress and Week 8 review critique
    b. Develop test plan to verify completion and effectiveness
    c. Consult with different fabricators (potential instructables users)
        i. CP Rochester volunteers
        ii. Greg's Mother
        iii. RIT Robotics club
7. Tipping Calculation revisited
8. Consumables Repair Pack

I.) What did we say we were going to do for week 8?

Group Plan:

Sorted in order by priority.

1. Red Stander needs to be used as is and with new generation components
    a. prototyping/testing
2. Linda/Dr Day Present
3. Ed can drive Stander
    a. Using buttons
4. Complete Battery Box-
    a. Holds components
    b. Mounted on stander
5. Complete Tray System
    a. Movement 2.0
        i. Show locking hinge movement
6. 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.
7. 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

8. Tests Completed
    a. Debug Test 1
    b. Debug Test 2
    c. Remote Control Range Test
    d. Remote Function Test
    e. Connection Test
    f. Bump Test
    g. Weight Test
    h. Touch Test
9. Continuation of Instructables build documentation
    a. Tray System Build Revise
    b. Elaboration on build

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

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

Group:

- Linda/Dr Day were Present
- Complete Battery Box- waiting on welding
    - All complete except prime and paint and then controls mounting
- Complete Tray System
    - All complete except controls mounted into controls box
    - Upper bracket needs weld reinforcement to ensure hinge does not shear
- Electrical Modules:
    - PWM and QEI in the Wheel System: position capture works and the feedback/correction is working. Has not been implemented for turning yet. If there is a large difference in position between the wheels, when the stander has stopped, it attempts to 'catch up' the slowed wheel.
    - ADC has code that is working, but the circuit hasn't been built yet and it has not been integrated
    - UART has code that is working between a Launchpad and a computer, but the circuit has not been built and it has not been integrated yet.
    - Bluetooth for remote has not been touched beyond getting the bluetooth working
    - I2C and touchscreen is unknown right now. IT has been looked into and is on the way to being implemented.
    - Remote basic prototype is built, also acts as a prototype for the button control system on the stander. Can accept and sanitize

button inputs.

- Continuation of Instructables build documentation
  - Tray System Build Revise
  - Elaboration on build

GR:

1. Set up plan for building battery box, tray hinges, and battery box holder.
   a. Created CAD documents to support machining battery box pieces, and tray hinges
   b. Machined battery box pieces and tray hinges
   c. Worked with Rob on welding the pieces
2. Prep for Imagine RIT
   a. Proposal is complete and we acquired our demonstration place
   b. Worked on Instructables and added more detail to site, based on what was built
3. Visit Linda and discuss having families visit. Fix the stander for her as well.
   a. visited linda fixed the stander and took measurements with Alex
   b. Linda will be working with families to visit

Alex:

1. Machined battery box parts based off of Greg's drawings.
2. Assisted with assembly of Tray. Mostly involved fitting holes for the hinge and ensuring proper mounting to the stander.
3. Hassled Rob until he actually welded the battery box. Battery box completed shortly after week 8 presentation.

JD:

1. Wheels Now Drive straight, and programming is more ordered
2. Start of remote System is going. The Button debouncing Algorithms work, which is going to be used for both the remote and the button stander controls system.
3. Button System - can debounce buttons, and can detect illegal and combinations of button pushes.

MV:

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
   c. select a paint for the finished box - check on color
   d. clean, cut, and attach lego board to tray

III.) What did we learn?

JD:

1. Programming takes forever(and its mostly the debugging)
2. How to pass pointers of a struct to a function instead of passing 3 whole structs, pass 3 pointers. (also works great(but differently) with arrays)
3. Various debouncing schemes.

Alex:

1. Sometimes you need to keep hassling people to get things done. It took a long time to get Rob to finally do our welding, and we basically had to babysit him to get stuff done.
2. Learned how to delegate some tasks for machining in the shop. Tried to split work by difficulty based on other members' skill level.
3. Learned that we need to take manufacturing lead times into account more.

Greg:

1. Learned how to use a Mill, and what chucks to use and not to use with mills.
2. Learned how make baffles and properly mount aluminum in the vice
3. Learned about preparing aluminum for welding.
4. How to get feedback from group members that were working on project I didn't know too much about.

EC:

1. Always plan ahead for long lead-times - request work as early as possible and have other projects/work items going in parallel to keep moving forward
2. Machining takes a lot of practice and time to perfect - there were lots of learning opportunities through failure in the shop
    a. plenty of more "hands-on" learning points (i.e. how to better use the machine shop and various tools)

MV:

IV.B) What do we need to do? - **(INDIVIDUAL)**

Alex:

1. Need to assist in mounting the electronics in the battery box. Now that it is welded we can see how much room we actually have.
2. Design remote to house electronics, and mount buttons to it.
3. Figure out how to mount Tiva inside project box, both for remote and controls.

JD:

1. Implement Communication system, need to work closely with Martha on this one.
2. Compartmentalize the button functionality more. So that its checking can become a function that can be called in other places
3. Implement Timer functionality in remote and buttons so that Communications will work correctly
4. Implement turning with correction. Device may not keep track of position while turning out of the presumption that the driver will be in enough control to know when they want to stop turning.
5. Fix 'catch-up' while stopped
6. Implement Button mode toggle
7. Implement ADC circuit and add speed control into the algorithm of UpdateSpeed.
8. Remote needs to be completely functional.

MV:

1.

GR:

1. Work on Instructables/test write up once complete
2. Work on tipping analysis
3. Assist with controls mounting
4. Assist with battery box prep
5. Assist with hinge prep
6. Assist with wiring placement

EC:

1. Apply the E glass lining and write up general instructions/the how to while doing it
2. Finish preparing pieces for painting and then painting them
    a. tray brackets
    b. box pieces
3. Assist with instructables write-ups - proofread everything
4. Assist with wiring placement/routing as the electronics get finished and installed