Shared Vision W.9 (P14045)

What are the key questions we need to answer and how will we approach them?

Using our Customer and Engineering Requirements list, the following questions need to be addressed:

High Priority:

Q.1) How will we assure that a single system (kit) will work for both the red and blue stander?

Issue: Dimensions of mechanical additions/modifications may not fit both standers. Also, electrical components may not match both systems.

Analysis: Measure both standers and compare projected dimensions of various components. Design electrical boards to fit on both standers and be independent of mounting surface.

- Test approach/ Experimentation: Design a sketch/simulation that would integrate the components on both standers.

Q.2) Will legacy code work on the new Stellaris Launchpad?

- Issue: Since last year's group had a Stellaris board (not a Launchpad) their code may not be recognized by the new processors.
- Analysis:
- Test approach/ Experimentation: Use old code on a test Launchpad (located on remote).

Q.3) How will we assure Bluetooth connection will be functional with the rest of the system?

- Issue: The previous group had issues with the remote control connection.
- Analysis: Benchmark other types of wireless connections (such as RC) and compare and contrast benefits and drawbacks for each one. (Maybe Bluetooth may not be the most ideal one). Once a specific solution has been selected, find the specific ports in the board that would assure this connection and test.
- Test approach/ Experimentation: Devise a dummy program that will light up an LED light whenever detecting a connection.

Medium Priority:

Q.1) How are we going to guarantee straight travel?

- Issue: There's no velocity feedback with encoder, just position.
- Analysis: Determine parameters (tipping, max. speed…) in order to identify system response.
- Test approach/ Experimentation: Derive motor's transfer function by designing a set of tests.
    * Dead zone
    * Pole determination
    * Damping coefficient

Q.2) How will we make sure the stander runs smoothly?

- Issue: The stander jerks when starting/stopping.
- Analysis: Use Simulink, MATLAB SIA tool… to determine what values would work for transfer function derived above.
- Test approach/ Experimentation: Measure the time it takes for the stander to go from a full stop (0mph) to full speed (and measure this for different selected speeds from speed knob.). Attempt to adjust code to include a ramp-up time from start/run and run/stop.

Q.3) Will adding a movable tray (either automated or manual) surpass the 20 lbs. of weight added that we have set as a limit?

- Issue: Linda cannot carry a really heavy stander, so we must assure that it remains within certain limits.
- Analysis: Weigh current stander and estimate weight of new tray.
- Test approach/ Experimentation: Select various materials and table dimensions and simulate how much weight (and the distribution of this weight) that would be effectively added to the device.

Q.4) How long will the response time of the controls (both on stander and remote) take? (Especially when used in combination = Trainer is assisting child, and may turn override on mid-session.)

- Issue: Big safety concern in regards to how fast the system can react (in hierarchically correct order) to control inputs by both, user and trainer.
- Analysis:
- Test approach/ Experimentation: Test code and debug.

Q.5) What is the current functional state of the bump sensor? What is the goal state? How do we fill that gap?

- Issue: Customer has expressed that after hitting an object, the bumper sensor gets stuck and, thus, needs revision.
- Analysis:
- Test approach/ Experimentation: Functional testing with machine (depends on the issues found).

Q.6) How will the encasing/child/weather proofing compliment the changes made in other areas of the stander without interfering with its functionality/safety?

- Issue: When changes are made to the stander, they may not be accounted for in the packaging plan. This could cause potential problems in integrating all the different functions.
- Analysis: Measure the stander's dimensions and account for possible modifications ahead of time.
- Test approach/ Experimentation: Make designs based on current state and keep updating the system based on modifications made in other areas.

Individual 3 week plans:

Alex:

Things I will do to ensure a successful week 9 review:

- Take measurements of both standers
- Determine how much load is on each corner of the stander
- Create a more final sketch/model of mount.
- Perform hand calculations to determine strength of design
- Possibly supplement with ANSYS calculations
- Look into different manufacturing processes (CNC, 3-D print)
- Look into different materials (Metal, Stick plastic, 3-D printed plastic)

Emily:

Measure available mounting space on both standers - 10/11 (depending on when we can see the blue stander again)
Box material benchmarking – 10/11
Confirm components (i.e. which boards) with EE's – 10/18
Determine cooling needs – 10/19
Determine size of the boxes – 10/20

Greg:

Chosen specific solutions for Motor driving, wheel and battery mounting, control tray mounting,
Engineering analysis done to support these decisions
Have Lvl 2 software flowchart
pseudo code-
Schematics for stander electronics and remote electronics
Calculations of center of mass and basic tipping scenario
Material selection candidates chosen
Have a preliminary B.O.M.

List of what Greg Roeth plans on doing:

1. Finalized design of control mounting system
2. Engineering Analysis of control mounting system
3. Research materials to use
4. Develop ipad integration
5. Research web to wifi integration
6. Work on presentation
7. Complete assign tasks for MSD
8. Lead group in the correct direction.

Martha:

POC: Input Controls Implementation

o Who?

Martha G. Vargas Bogliani

o What?

Research particular models of controls (i.e. Touchscreens, buttons and joysticks) that could potentially be used by the team and select the most viable choices via comparative Pugh charts. Use this information to draft early Bill of Materials (B.O.M.)

Review P13045's code for remote control interface and find possible issues that made have made the device not functional. In addition, check for possible hardware issues on actual remote and Bluetooth module located on main stander block.

Develop a Level 2 System Architecture (together with John R.) on electrical system of device.

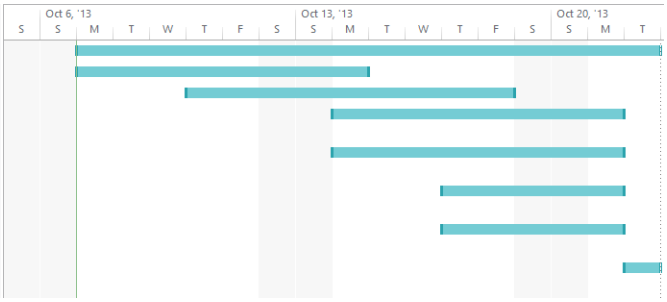
Develop a Level 2 Software flowchart (integrating hierarchy for input decisions).

Draft a pseudo code for remote controls and modular inputs.

Compose a basic schematic diagram for connections between input controls and main decision center.

o When?

	Task Mode	Task Name	Duration	Start	Finish
1		Subsystem Review Prep	12 days	Mon 10/7/13	Tue 10/22/13
2		Draft Preliminary BOM	6 days	Mon 10/7/13	Mon 10/14/13
3		Old Code Debug	7 days	Thu 10/10/13	Fri 10/18/13
4		Develop Level 2 System Architecture	6 days	Mon 10/14/13	Mon 10/21/13
5		Develop Level 2 Software Flowchart	6 days	Mon 10/14/13	Mon 10/21/13
6		Develop Initial Pseudo Code for Control Inputs	3 days	Thu 10/17/13	Mon 10/21/13
7		Design Basic Schematic Diagram for Connections	3 days	Thu 10/17/13	Mon 10/21/13
8		Subsystem Level Presentation	1 day	Tue 10/22/13	Tue 10/22/13



o Why?

This will aid the team in understanding the feasibility of the current state of the plan by weeding out possible detail-specific issues, and help orient the team in making any adjustments necessary before submitting an official proposal.

It will prove that P14045's plan for modular input controls is doable and is technically solid.

o How?

Making sure all available resources at RIT are investigated, researching different distributors of materials needed, and creating a comparison chart based on cost factors (e.g. Price, power cost…)

Review P13045's code and test on simulator (maybe even test on old system stander if given the chance).

Work together with John Daley to set up a system-specific design (both system architecture and software flowchart) that will encompass Main-stander subsystems, Modular Input Control subsystems (for the controls selected) and Remote Control subsystems.

Brushing up on old concepts and possibly recycling parts of the old code, create a first draft of the pseudo code for remote and control systems.

Once all parts have been pre-selected and assigned (both modular controls and main system boards), look into how they will interface together (what ports would connect to which and how) and develop a preliminary spice model of the system.

JR:

Goals for the subsystem design review
-Have pseudocode written for Motor driving (updating speed and reading encoders), Bluetooth or wireless, UART communication
-Test out old stander and see what worked on the red stander (encoders and driving straight) vs the blue stander