Robo410 memorandum

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| to: | Dr. berry |
| from: | team d – thcm |
| subject: | teamwork memo |
| date: | November 12, 2014 |
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***Overview***

Our project involves the design and construction of a race track exhibit for the Terre Haute Children’s Museum. We want to provide a simple and entertaining way of moving a toy race car around a track while also performing minor maintenance such as refuelling and changing the tires. The goal of this project is to make the exhibit floor ready by creating a robust design and developing an easy to use interface. Placing the exhibit on the floor will allow children to interact with it at the children’s museum and also pique their interest in science, technology, engineering, mathematics, and robotics.

At this stage, many of the functional components of the design have been implemented in their proof of concept stage. Certain interactive components include a Leap motion sensor, which allows the user to control the speed of the car by extending different fingers, and a button, which will make a checkered flag wave. Other features include break beam sensors that will light up different sections of track with LEDs and a group of seven segment displays that will work as a speedometer. The next steps are to implement the other functional features such as the fuel and tire gauges, to improve the overall robustness of all components, and to improve the aesthetics of the exhibit.

***Problems***

While making modifications to the aesthetics of the exhibit we decided to raise the track vertically by six inches.  This places the car closer to the blacktop and allows easier access to the wiring and connections.  To complete this task Stuart procured nails and wood, and then Meredith and Daniel installed them.  Once the plywood and supports were cut, the supports had to be mounted by inserting a screw into the support through the bottom of the exhibit.  This required two people, one to align and hold the support on the top of the exhibit while the other secured the screw from the bottom.  Even the clients were involved in this solution, pointing out possible problems before they arose.  One of the clients, John, had prior experience with model train tracks and recognized that the track would not be stable enough with supports located only at the intersections between track pieces.  He suggested to instead mount the pieces on a sheet of plywood to stiffen the track, and mount the entire structure to the supports.  This method proved to be much more stable and saved us hours of troubleshooting.

***Team Member Roles***

Daniel

Daniel originally focused on the interface between leap motion controller and computer, turning to the software related to the leap once this was completed.  With functional software, the next step was to interface between the computer and Arduino, allowing the Leap to control the Arduino.  Controlling a servo with the Arduino was next, followed by using a button to wave the flag.  When the break beam sensors arrived he investigated their function, soldered on connections and tested them in a bread board.  The break beams then needed something to control, so he soldered together the LEDs encircling the track as well as the LEDs on the tire and fuel gauges.  He acquired extra wire and connected the LEDs to the central Arduino and breadboard.  With the extra wire he and Meredith were able to drill holes into the control box, set in buttons and wire the button controlling the servo to the Arduino.  Next they cut the plywood and supports necessary to raise the track just below the level of the poster.  After the pieces were cut they worked together to mount the pieces to the exhibit.  By this point we had a blank Arduino shield so he got male headers and soldered them in the appropriate places to connect to the Arduino.  The other connections were left blank to allow soldering wires to the green board.  Daniel then cut out a hole in the central section of plywood for the flag pole, and hid the servo on the underside.  At the same time he created mounts for the break beams that facilitated seeing the car as it passed slightly below the bottom of the plywood.  Throughout the processes described above he also worked with the software components to ensure each piece of hardware was functioning properly.

Meredith

Meredith originally focused on PWM control of the track through the Arduino.  Then she worked with Daniel interfacing between the Arduino and the computer to receive serial input from the leap motion software.  Once the car could change speeds with gesture control, she worked on creating a system to wave a small servo-powered flag on a button press. Next, she created a new ground poster for the exhibit with new elements such as track LEDs and the fuel and tire gauges added. As parts began to come in, Meredith worked with Daniel to install them. When the break beams and track LEDs came in, she helped Daniel install the LEDs and solder the connections. She mounted and connected the arcade-style button that powered the servo-controlled flag. She removed the connections from the previous Arduino shield and soldered them into the new Arduino shield so there would be better connections. Next, she and Daniel worked to raise the track to a more manageable height that will provide more stability to the car later when a 3D printed model is attached. Next, Meredith’s focus shifted to attaching components such as break beams and the servo to the center piece. Throughout the processes described above, she has worked with the software to integrate each component as it was implemented.

Luke

Luke’s main focus through the quarter has been electronics. He helped with the implementation of the PWM controlled track. He installed a mosfet to regulate the signal between the Arduino and the power source to the track. He soldered on the connections to the seven segment displays and figured out how to do multi-plexing.  He then soldered the seven segment displays to a PCB to be later mounted in the central piece of the exhibit.

Stuart

Stuart obtained plywood, nails and other supplies necessary for raising the track.  He also cut these pieces down to the correct size.  He acquired extra wire with Daniel to allow for wiring of the LEDs and buttons.  He helped Meredith with the initial testing of the servo motor.

***Progress***

When the level of effort of team members varies, we are still able to make progress by having those with available time and motivation step up and take on the others’ responsibilities.  Since we started leaving our work in the BIC any of us can walk in, pick up the work, and finish it.  Each of us is capable of learning parts of the project outside our focus so if someone is struggling the work will not go unfinished.