Work Completed

During the first week back from break we became familiar with the lab setup and which bench area we would be working at for the remainder of the semester. The Minimoto go-kart was ordered and received prior to break, but there were other new items in our mailbox that had been ordered previously. We all looked over and become familiar with the new parts: linear actuator, wireless kill-switch, joystick, and other parts we found in the spare parts room that would be useful for our project. Next we got to working on the go-kart. We each chose different aspects of the project to tackle first.

For the rest of the first week of classes I worked on researching potentiometers to use for the steering assembly. The client’s mother asked that the go-kart be operated by a joystick and also be able to switch to manual operation with the steering wheel. A potentiometer will need to be attached to the steel steering column so that as the steering wheel is manually turned from side to side to turn the wheels, the wheels will turn accordingly. I decided a simple panel mount potentiometer would be easier and cheaper to mount compared to an angle potentiometer that was previously thought to be the best type of potentiometer for the application. The advantage to using a panel mount potentiometer is that it is limited to only turn about 350°. Most angle potentiometers I found only would rotate 360° and weren’t as heavy duty compared to ordinary potentiometers. Plus I looked at a lot of video game steering wheel assemblies, and they all used simple potentiometers to transform the distance the wheel is turned into a voltage to output to a microprocessor.

I found a potentiometer that would work perfectly in our application in the storage room. This potentiometer is pictured below in Fig. 1. I tested the potentiometer to see if it was working by simply hooking it up to a power source at the bench and using a DMM to see the output voltage. There are three leads on the potentiometer. The left lead is for positive voltage, the right lead is for ground, and the middle lead outputs a voltage depending how far the shaft is turned. The shaft turns 350°, mentioned earlier, and varies the output voltage from 0V to the maximum input voltage when it is completely turned. The potentiometer has a 1 inch diameter base and ¼ inch diameter shaft. I found two washers in the parts room that fit the threads at the base of the shaft to help with mounting the potentiometer.
The one problem with the potentiometer that I found in the parts closet is that the shaft has a top with a slot that seems very complicated to attach to our steel rod steering assembly. I would have to fabricate some way of sticking something into this slot that would attach to the steering column, which seems impossible and very inaccurate. After some research and reading online I discovered potentiometers with different shafts and various other ways that people have mounted the shaft to a control mechanism (we’re using the steering wheel as the control mechanism). Below in Fig. 2 is a picture of the ideal potentiometer shaft for my application. This potentiometer costs $12, but I will probably just use the Miller Press at the machine shop to make a notch similar to this in our potentiometer’s shaft. I will first discuss this with Dave Price and the teachers at the machine shop to make sure it won’t damage the internal components of the potentiometer.

The potentiometer will be mounted to the steering assembly using a modified steel cylinder. Figure 3 below shows a diagram of how this cylinder will be modified. I will take a steel cylinder 1 inch in diameter and 2.5 inches long. In the base of the
cylinder, I will drill a hole 3/8 inch in diameter to fit the shaft of the potentiometer into. The hole will be ½ inch deep. A hole will then be drilled perpendicular to the original hole from the side of the steel cylinder. This hole will also need to be tapped and threaded to allow a grub screw through in order to secure the shaft of the potentiometer in place.

![Figure 3: Modified Steel Cylinder to Attach Potentiometer to Steering Column](image)

The existing steering column on the go-kart consists of a steel rod extending from the back of the steering wheel down to the front of the go-kart that is used to turn the wheels. This rod will be cut down to 6 inches in length. The top of the modified steel cylinder above in Fig. 3 will be welded to the base of the 6 inch steering column rod.

I also helped the group hypothesize different ways to turn the front wheels mechanically. The final decision was to install a linear actuator to the front of the go-kart frame that would push a connecting rod attached to the front wheels back and forth perpendicular to the direction of operation. The group brought the go-kart over to the machine shop, where it will remain for several weeks while all the group members modify it. Rich and Surge, the machine shop teachers, also helped give guidance and opinions on different problems we were encountering.

**Future Work**

In the next week I plan on researching and designing a metal box to enclose and mount the potentiometer in. I also need to figure out a way to restrict the steering wheel to only turn the distance that the potentiometer can spin to prevent damaging the potentiometer. I also need to figure out an exact location to weld the steel cylinder to the
steering column rod so that when the potentiometer is attached to the base of the steel cylinder it is exactly halfway along its rotation to allow equal turning of the wheel in either direction. I also hope to get feedback about whether it is safe to modify the existing potentiometer or whether I will need to purchase a new one with a different shaft.

**Project Review**

The project is progressing really well and the group is continuing great communication via phone calls and emails. Kevin emailed the clients and there is a conference call planned for Thursday 1/31/08 at 9PM to discuss current plans for the E-Racer and hopefully get feedback from the clients about modifications the group plans to make. There still are several small parts and another linear actuator that must be ordered to build the go-kart. All the parts we have received so far seem very promising and accurate enough to work in our desired applications. The hardest part the group is facing right now is figuring out the programming aspect for the microprocessor.

**Hours Worked**

Hours spent working on the project, Week 1 (1/28/08- 2/1/08): 12