E-Racer

Week 8 (3/20/08 – 3/26/08)
March 26, 2008
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Work Completed

This past week I was able to make considerable progress in the modification of the steering system for control by a linear actuator. This was achieved through the fabrication of a custom-made bracket and modifications to the frame and steering linkage of the vehicle. Additionally, I was able to find a vendor who is willing to donate a linear position sensor which is required for the successful operation of the steering control system.

In order to install the steering linear actuator on the vehicle I first devised a plan for mounting the device. I decided to attach one end of the linear actuator to the frame rail of the kart and to attach the other end of the actuator to the half-linkage of the steering rack. The installation also required an additional link from the actuator to the floor pan of kart to ensure the stability and proper operation of the actuator. This link was fabricated in the UConn machine shop on Monday of this week. I started with a ½” X 2” length of solid aluminum and cut it down to a size of ½” X 2” X 1.5”. I then used three successive pilot drill sizes to arrive at a final drill size of 27/32” to accommodate the outer diameter of the linear actuator shaft. Two screw holes were drilled and threaded into the side of the plate and a small set screw was drilled and threaded on the linear actuator side of the plate. The part has been reproduced through the use of AutoDesk as shown below in Fig. 1.

![Figure 1: Steering linear actuator mounting bracket.](image)

Once this part was machined I was able to drill two holes in the floor pan of the vehicle and install the component. After this was done I drilled through the vehicle frame to
provide the other point of attachment for the linear actuator. The installed bracket is shown in Fig. 2.

![Installed bracket](image)

Figure 2: Installed bracket.

To secure this end of the linear actuator I used a bolt which goes through the hole at the end of the linear actuator and through the hole that I had drilled in the vehicle frame. The bolt was secured with a nut.

Since the steering linkage was too long to be attached directly to the linear actuator in its stock form, I had to make modifications to make the system work correctly. I removed the full and half linkages from one of the wheels and cut off about a 2.5 inch length of the half-shaft. Once this was done I was able to re-thread the outer surface of the shaft as shown below in Fig. 3.
Once the shaft was re-threaded I was able to re-install the stock hardware and connect the shortened linkage to the end of the linear actuator. The final product is shown below in Fig. 3.

After installing the linear actuator I was able to hook the device up to a power source and test its operation. The linear actuator works very well and is able to move the steering rack through its full range. I was also able to test to see if the system works well when there is additional weight on the vehicle and the linear actuator was able to supply the needed force to move the wheels.
This past week I was also able to find a vendor that is willing to donate a linear position sensor for the modification of the steering system for the effective operation of the control system. Last week I found that these sensors were very expensive (in the range of $200 to $300) and were out of the price range allowed by our budget. However, a representative from Novotechnik contacted me on Friday to let me know that his company was willing to donate the part. In a conversation with the representative on Monday he informed me that the part would be shipping out that day and would arrive to UConn within the week.

**Future Work**

Next week I hope to mount the linear position sensor and incorporate it into the existing work that has been completed on the steering rack. I plan to mount the device parallel to the linear actuator and have given myself ample room by designing the linear actuator mounting bracket to be quite small. This is contingent on the position sensor arriving by the end of this week at the latest which the representative from Novotechnik assures is the case. Additionally, I hope to mount the steering wheel switches when they arrive, which is again dependent on when they are delivered to the design lab. Since they were ordered about a week ago they should be arriving soon. Finally, I hope to look into a way of folding the steering shaft out of the way to provide Mason with easier access to the seat.

The week after I plan to install the remote kill switch in Kevin’s completed control system to allow for the removal of power to the motors in an emergency situation.

**Project Review**

This past week has shown that although we still have a great deal of work to do we can pull together as a team and get a lot of things done in a relatively small amount of time. Allison is doing a fantastic job in the braking modifications, Kevin continues to near completion of the control system, Travis has installed much of the manual steering hardware, and I am working to finish up everything needed for the steering system to be a success. While we only have three weeks remaining at this point I believe that we will be able to arrive at a good finished product.

**Hours Worked**

Time spent on the project 3/20/2008 – 3/26/2008: 18 hours