Cowdog

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Section 1, problem description

The initial problem was to enter a 4 digit numeric password on my laptops number pad, to open a locked door on a web page. I never made the web page to be used a lock. The idea was to have Cowdog execute a linear search across the 10,000 combinations until it detected a tone from my laptop with the ultrasonic sensor, signaling Cowdog to stop. That proved to be impossible, but more on that latter. Once I relied that I had to figure something else out as. My second idea was to implement a menu to allow a user enter a password on runtime, for Cowdog to enter the code on the number pad. During some last minute testing I was trying fix the accuracy problem with the turn table. During this time I ardently left the EV3 on. I think I may have wired the motors wrong at some point while wiring the motors. This happened on the Sunday before the presentation. I knew the interesting part of the design was typing on the keyboard, so I decided I would change the problem slightly, and just have Cowdog press the enter button. Apparently even that was too much to ask, but at least I tried.

Section 2, hardware design summary

I design Cowdog’s hardware around the idea of a two jointed arm on a turn table. The turn table aspect of the design lead to a very embarrassing presentation. I used the three 24-tooth gears to connect the Medium Motor to a turn table. The gears and the turn table were not quite in a straight line, I may have had a more precise turn table otherwise. Below the turn table, I had some scaffolding that I had hoped would give the base of Cowdog a consistent location relative to the laptop. Not consistent enough it seems. Directly on top of the turn table was a basic frame which held the EV3 brick. On top of the brick I build Cowdog’s arm. In my earlier design I overestimated the large motors ability to hold another large motor. After initial testing I realized that i would have to figure something else out. In the final design I had the second motor on a sort of seesaw like structure that stayed mostly in place even when the motor I used, as the middle joint, was not connected. Mostly, It moved some. One top of middle motor was the steel ball and the ball bearing. This was in place so that Cowdog would have at least some hope of pressing the button. Before I added the extra weight, the Cowdog could not press any keys, even with no one else was watching. The rest of Cowdog’s arm was made from two beams and some connectors. I experimented with using a color sensor or a touch sensor bring the Cowdog’s arm to a known configuration, to reset the tachometer. Even if I had done this successful I still would have had problems with the arm being too far from the correct position, relative to the keyboard. I i were to attempt the project again, I would ditch the turn table entirely. I would leave the brick unattached to anything. I would use the color sensor to detect a correct password. I would hang the new arm from a table like structure. The arm would have no joints, but would have a two axis gimbal. I would have to figure out some way to lengthen the arm, or raise and lower the table, but doing that would be much more precise that what I did. Even if I had used a large motor for the turn table and the medium Motor for the turn table, I would have had much better results.

Section 3, software design summary

I had had some trouble with eclipse the day I first started working on the project and had the turn table build, but not the final version of the arm. I had done something wrong setting up the project. I ended up putting of the project for a while after that because I didn’t want to deal with eclipse for hours. It ended up being an easy fix. Windows 10 crashed several times when uploading new versions of the project to the EV3 brick. I think this happened when the EV3 brick had not been plugged in long enough for the operating system to establish a network connection. The blue screen of death showed KERNEL\_SECURITY\_CHECK\_ERROR as the problem. The data collecting progress bar seemed to move faster each time. Mostly I just have some motor commands. I set the motor speed to 20 degrees per second. I move the turn table motor into position. After that I put the second joint into position. Then I move the middle joint to press the button. I picked this order of movement from watching myself press buttons on a keypad. I noticed that I first move my wrist, then I bend my finger, and final press down the button by bending the first joint on my index finger, that is the joint closest to my wrist. I have an unused method called press, which takes an integer argument, and used it to access predetermined degree values for the motors stored in an array called angles. Each keys number was used as that keys index. Had my robots hardware been better, and all of the angle values correct. I would have had a for loop go from 0 to 10,000 passing the digits of the base 10 representation of the index to pass starting with the most significant digit. I would have the loop break when the ultra-sonic sensor heard a tone. Or I would if I could have even generated a sound within in the ultra-sonic sensors range of hearing, with the hardware I had available. I might have considered using the color sensor if I had made it to that point. By that I mean I could have added a css class to some element on the lock page, to change the color of the web page, when the lock was unlocked.

Section 4, conclusion

I think my overall strategy for picking a project was faulty. I mainly wanted to build a robot arm. I task became coming up with an excuse to build one. I focused on making something that would be fun to watch, but not necessarily difficult. Certainly not something likely to fail after transporting it to school. In all my other projects I focused on making them run reliably. On the first project I had so much confidence in my project that I was willing to just stand in place while my robot was completing the course. I decided I should follow it just in case, after someone called me out on it, but it was almost half way through the course. On the second project, I only communicated with my partner over text message, except for one meeting we had to figure out what was wrong with our sensor, (it was broken). After that I was able to make what I though was a very reliable controller. I thought the corse was going to be more maze like, so my focus was on making the car handle well. I forgot to consider speed again, but at least I felt like I had a quality project. I felt pretty good about the middle and last joint on the final project, but that turn table and the scaffolding connecting the turn table to the arm felt like I had done a bad job designing them, but I wasn’t sure how to fix then, and was running short on time, with another project due in a class for which I have a lower overall grade.