2019

AUTONOMOUS CAR

MAZE SOLVING ROBOT CAR WITH LCD DISPLAY

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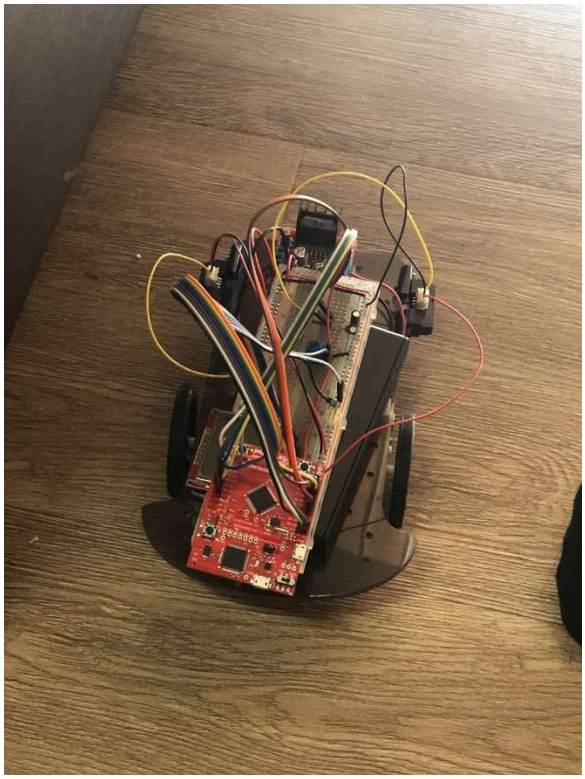
Robot car with three IR sensors and a potentiometer to Control the speed of the wells



For this project, we implemented the use of IR sensors with the use of the Analog to Digital converter in the TM4C launchpad. After we calibrated the 3 sensors, we came up with 3 independent linear equations that would determine the distance of the right, left and in front of our car. This distance calculation was crucial since we needed the car to make precise turns in order to not crash into the walls. We also use another ADC input for a potentiometer that would control the speed of the car, this would make the car run at any desirable speed. We were able to display speed, and distance of obstacles into a Nokia LCD using Synchronous Serial Interface, which was very helpful for debugging while running the car.

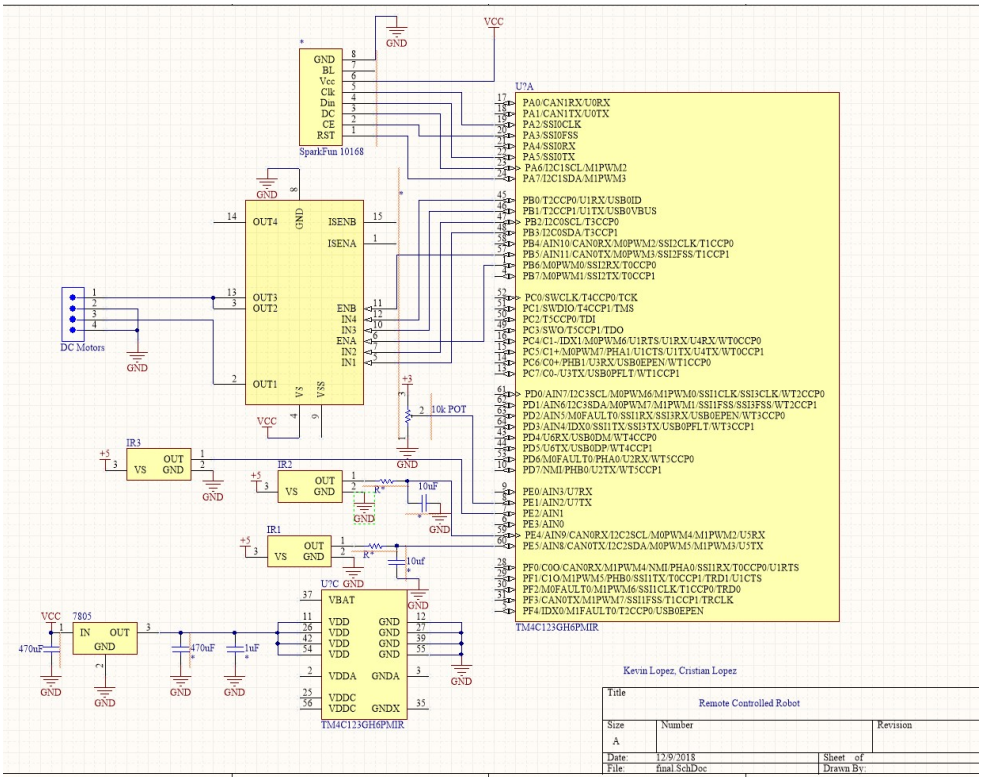
The remote-controlled car is able to drive itself, it does this by using three IR sensors. Our sensors are located to the left, right and front of the car. When the car sees that an object is closer to the left the car will adjust by changing the PWM of the significant wheel. If the car encounters an object right in front of it, the car will back up and go to the direction where the farthest object is. We also have the ability to control the speed of the car by having a potentiometer and using the ADC functionality of the TM4C. Our car stops when is done completed the course and it stops, we have completed this by checking when the objects in the sensors are farther than fifty centimeters. I have uploaded videos on YouTube to show the functionalities mentioned above.

●https://youtu.be/z_O-xN0HL10 ●https://youtu.be/VgCzlzzqXxE

●https://www.youtube.com/watch?v=70YP6wduYSs ●https://www.youtube.com/watch?v=LWUeiogDEkk

●https://www.youtube.com/watch?v=HGZ-YaoAVzA ●https://www.youtube.com/watch?v=dgCti_hMgW8

The components we used were the TM4C launchpad, an H bridge, a Nokia 5110 display, and three IR sensors. We use the functionality of the interrupts, PWM modules, Analog to Digital Converter (ADC) and SSI from the TM4C. To use the PWM hardware of the microcontroller we used given pins and we enable the PWM functionality with the PCTL register. we created a fixed frequency by using the LOAD register and we would change our duty cycle with the COMP register. We used the TM4C to control the direction of the wells using the H bridge(L298N), we used two pins for the motor to do so. One pin needs to be high and another pin is low. To change the direction, we changed both pins from low to high and the other pin from high to low. We used a potentiometer and three infrared sensors. We used these two pieces of equipment to control different functions. The potentiometer is used to control the speed of the car by inputting into an ADC module.



We used ADC, PWM, and SSI functionality of the tm4c, we implement such functionalities in different files and just implemented in our testing file. We can see the logic of how our car dealt with the walls and objects in front of it. We made three while loops, of which was a different circumstance in which our car could be. We made our car to check for the values of the IR sensor inside the while loops

so if such not meet anymore our car will exit the while loop. If our car was not in not of any of the conditions our car will just be going straight at the speed given by the potentiometer. For us to change the ADC inputs into usable distance we used an inverse regression formula so that we will be receiving an ADC value and it will be outputting a distance. Such formulas were also called inside the while loops.

For this project, we implemented knowledge that we have obtained throughout the semester, PWM, ADC, and SSI for the LCD display. Along the way, we encountered some problems, first we tried to use two IR sensors and one ultrasonic sensor but the Ultrasonic sensor we had did not work, the PPL module we used for the ADC would use a different clock frequency from the requirements for the ultrasonic. We decided to work using three IR sensors to avoid that problem. Everything worked fine when the board was powered by the power supply in the Vbuss port. We used the LCD to our advantage, using it to debug our project since the batteries will get worn down and the sensors needed to be calibrated after a while. We also used the LCD to guide us in the creation of the code, it helped us when it was a good idea to start turning and adjusting.