CSC 615.01

Team Green

Final Project Documentation

Fall 2020

Instructor: Robert Bierman

Table of Contents:

Team Members:

George Freedland (Hardware manager)
Geroge Shen
Cameron Cirini
John Freirez

GitHub Repository:

https://github.com/gfreedland/csc615-group-term-project

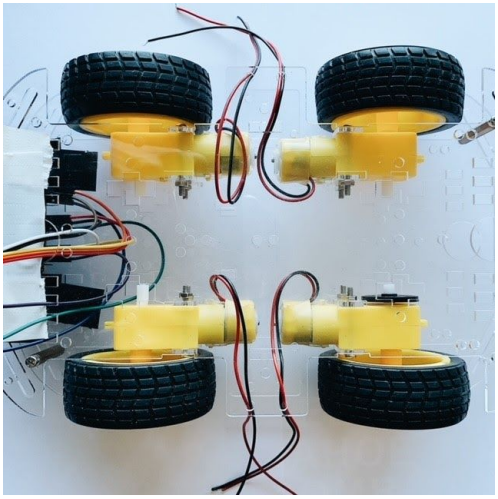
Task Description:

Tasks were evenly distributed within the group.

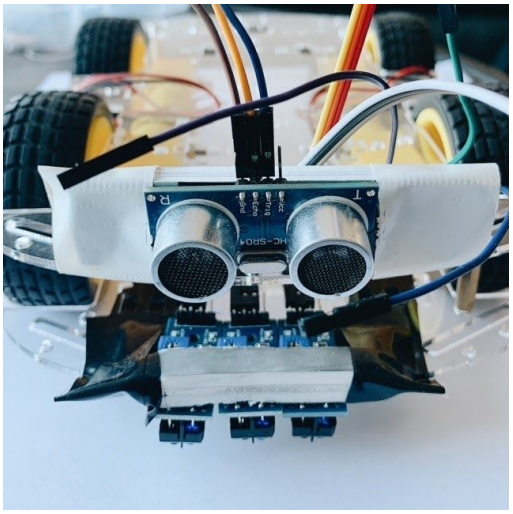
George Freedland:	Team lead, Programmer, Debugging, provided his place to work.
George Shen:	Debugging, Testing, Hardware diagram, provided materials.
Cameron Cirini:	Programmer, Build, provided back up hardware.
John Freirez:	Documentation, Testing, Flow chart, provided materials.

Building The Robot:

Motors set up

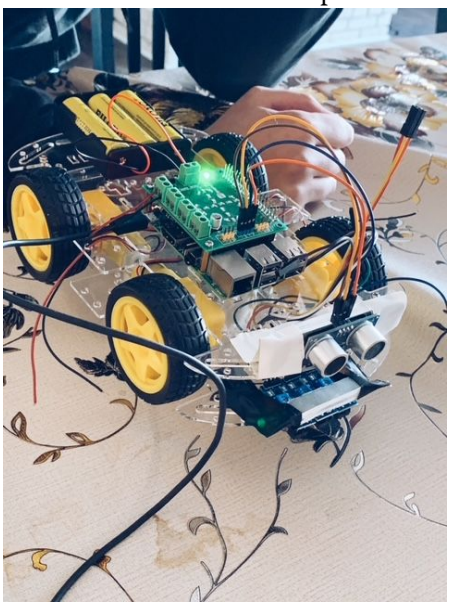


Front | 1 Echo Sensor (HC-SR04) | 3 Reflective Sensors

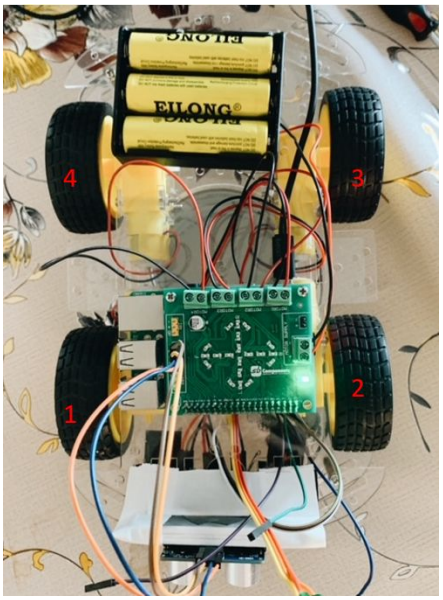


Motor Shield

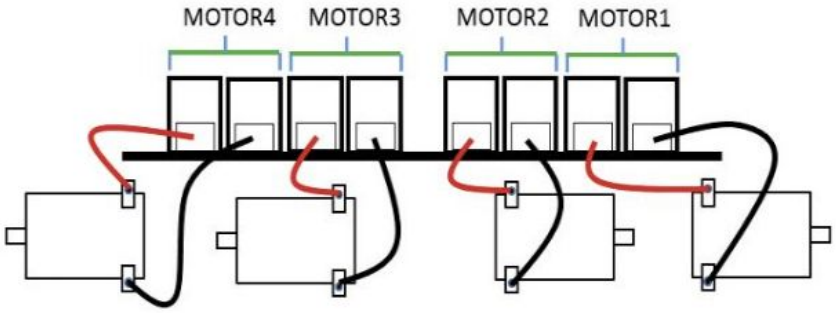
1 motor connected + power



All 4 connected to the shield

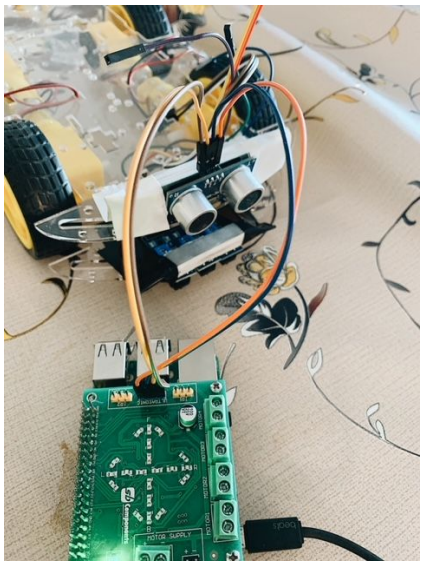


Reference for the motors

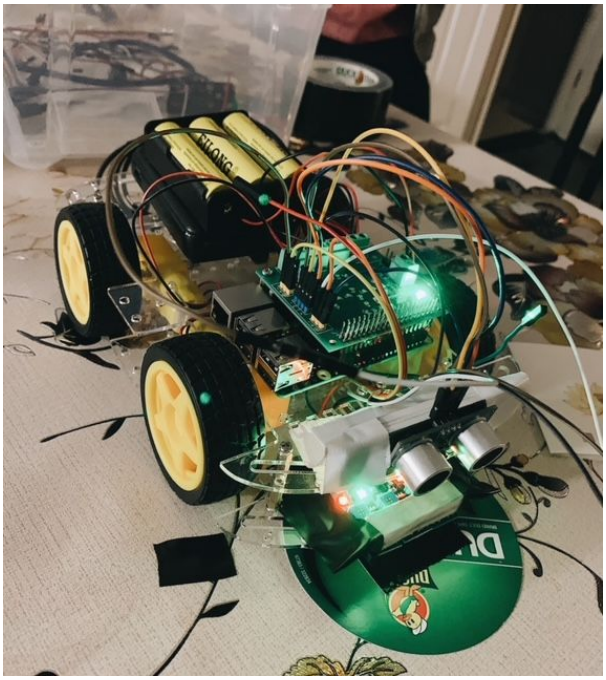


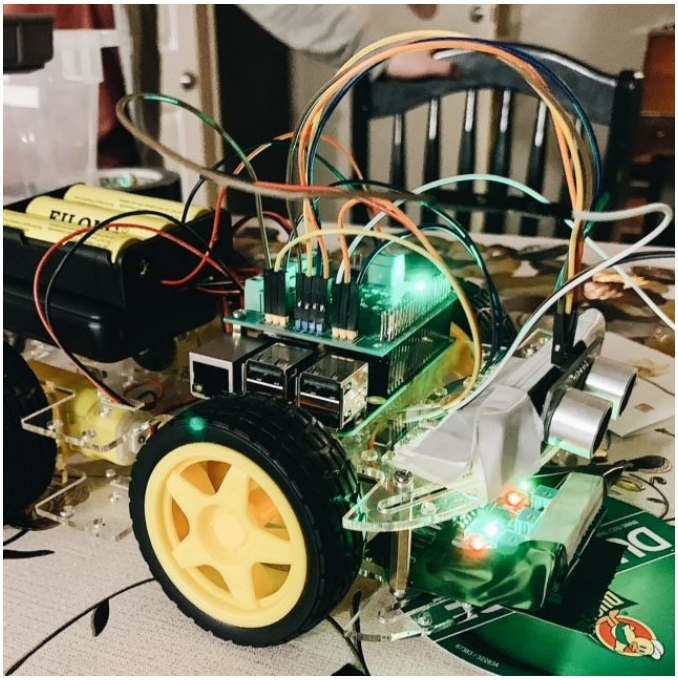
Cameron's Raspberry pi 3

Echo sensor using pins 29, 31

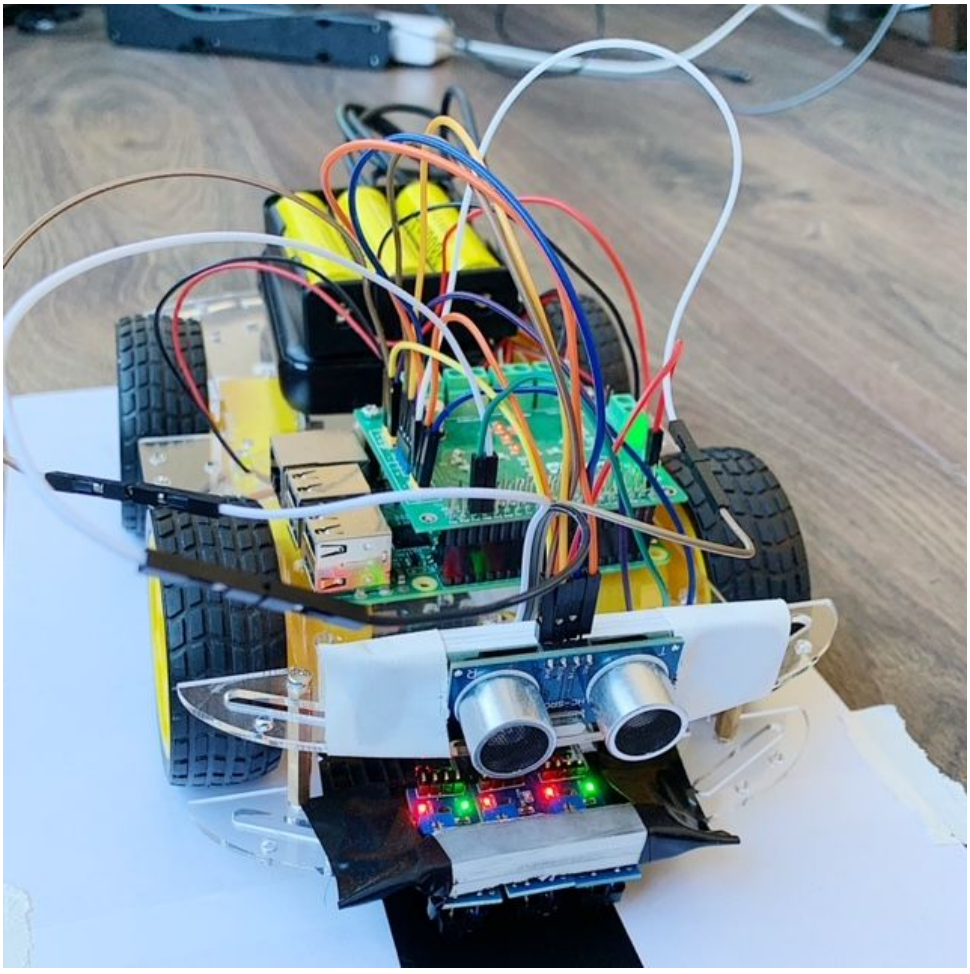


Left and right sensors connected to shield





Final setup



Libraries Used:

- stdio.h
- unistd.h
- stdbool.h
- time.h (used for delay)
- pthread.h (used for multithreading line sensors/echo sensor to not block main thread)
- wiringPi.h (used to enable pins and have the functionality of write and read)
- softPwm.h (used to manipulate speed on the motors)

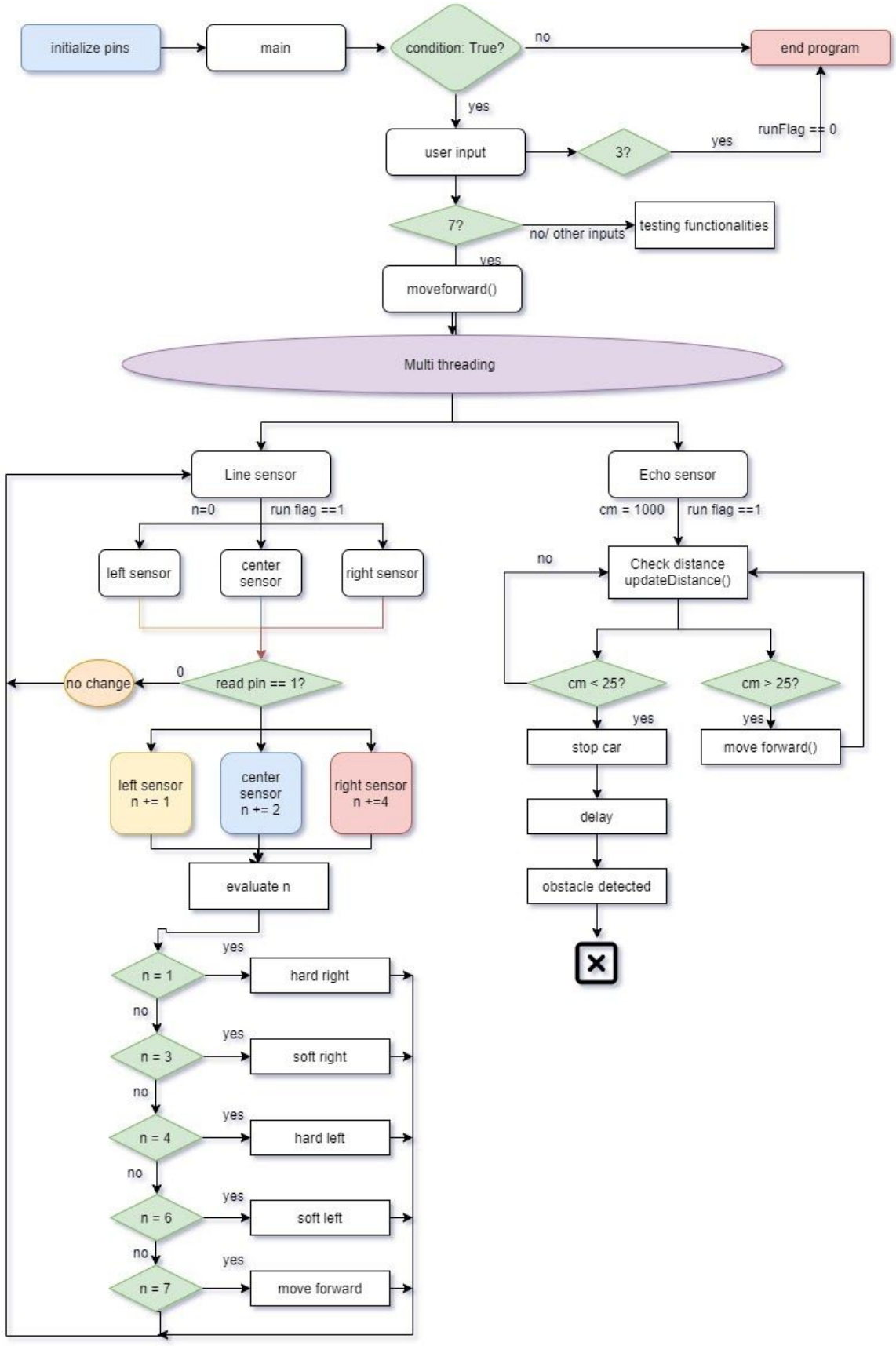
Pins Assignment Used:

Motor 1: front right	Physical pins: 11, 15, 13	wPi: 0, 3, 2
Motor 2: front left	Physical pins: 22, 16, 18	wPi: 6, 4, 5
Motor 3: back left	Physical pins: 19, 21, 23	wPi: 12, 14, 13
Motor 4: back right	Physical pins: 32, 25, 27	wPi: 26, 10, 11

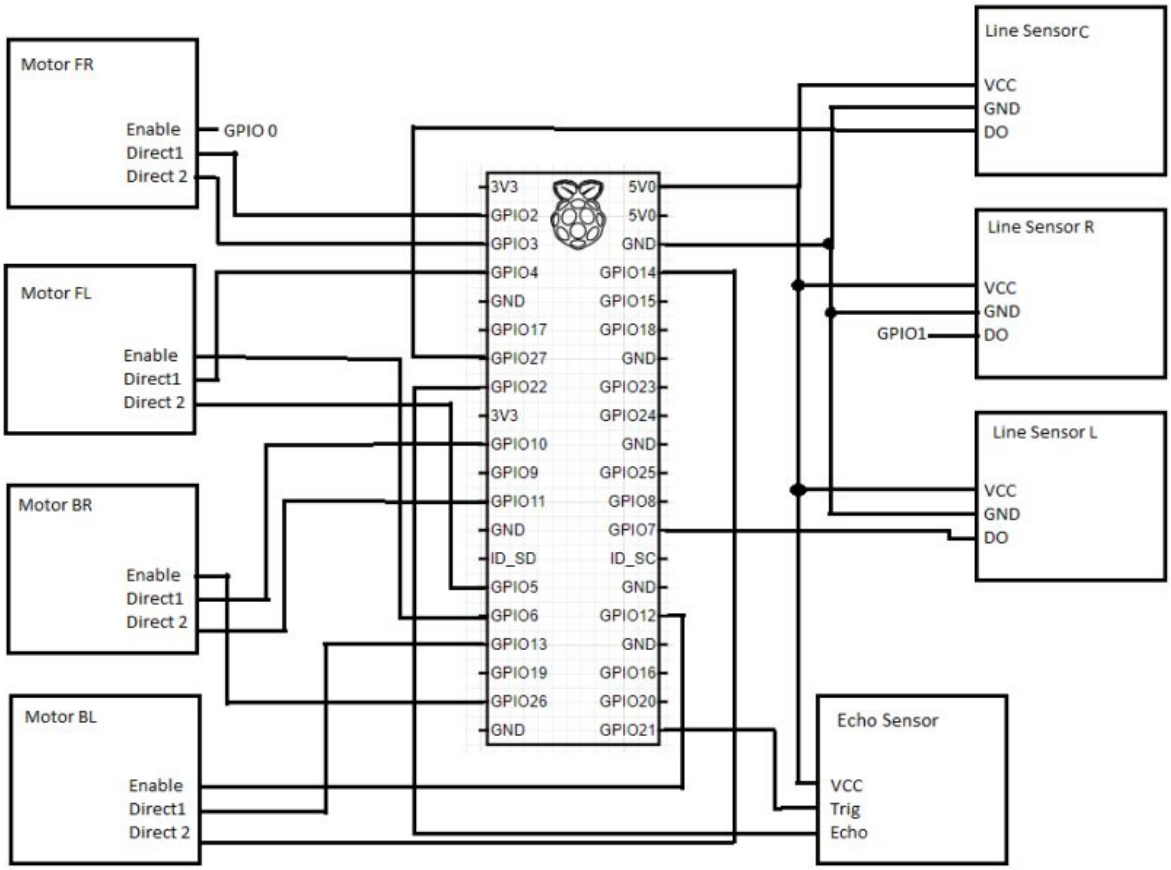
Left line sensor	On shield: IR1	wPi: 7
Right line sensor	On shield: IR2	wPi: 1
Center line sensor	Physical pin: 36	wPi: 27

Echo trig	Physical pin: 29	wPi: 21
Echo echo	Physical pin: 31	wPi: 22

Flow Chart:


initialize pins
main
condition: True?
no
end program
yes
user input
3?
yes
runFlag == 0
7?
no/ other inputs
testing functionalities
yes
moveforward()
Multi threading
Line sensor
n=0
run flag ==1
left sensor
center sensor
right sensor
Echo sensor
cm = 1000
run flag ==1
no
Check distance updateDistance()
cm < 25?
cm > 25?
yes
yes
stop car
move forward()
delay
obstacle detected
0
no change
read pin == 1?
left sensor n += 1
center sensor n += 2
right sensor n +=4
evaluate n
yes
n = 1
hard right
no
yes
n = 3
soft right
no
yes
n = 4
hard left
no
yes
n = 6
soft left
no
yes
n = 7
move forward

Hardware diagram:



Notes: SB Motor Shield not included.
Physical pin numbers listed in pin assignment section.

What worked well:

- Our team worked well together especially trying to meet up during a pandemic.
- Team communication was great.

Issues encountered:

- Issue with the raspberry pi (the one given to our hardware manager) can't ssh to it causing set back on our progress, ended up using a personal pi (Cameron's pi)
- Motor shield, trying to make the wheels all run not responding to the code, figuring out how to make them all run.
- (4:46 pm) All wheels are turning, fixing directions, wheels 1 and 3 are going opposite.
- Tweaking code having issues with the line sensors not being able to cooperate properly.
- Issues with weight distribution some parts of the wheel get lifted up depending on where we set up the battery pack.
- Issues with turning, the car can turn left slightly, but right turns were not executing.