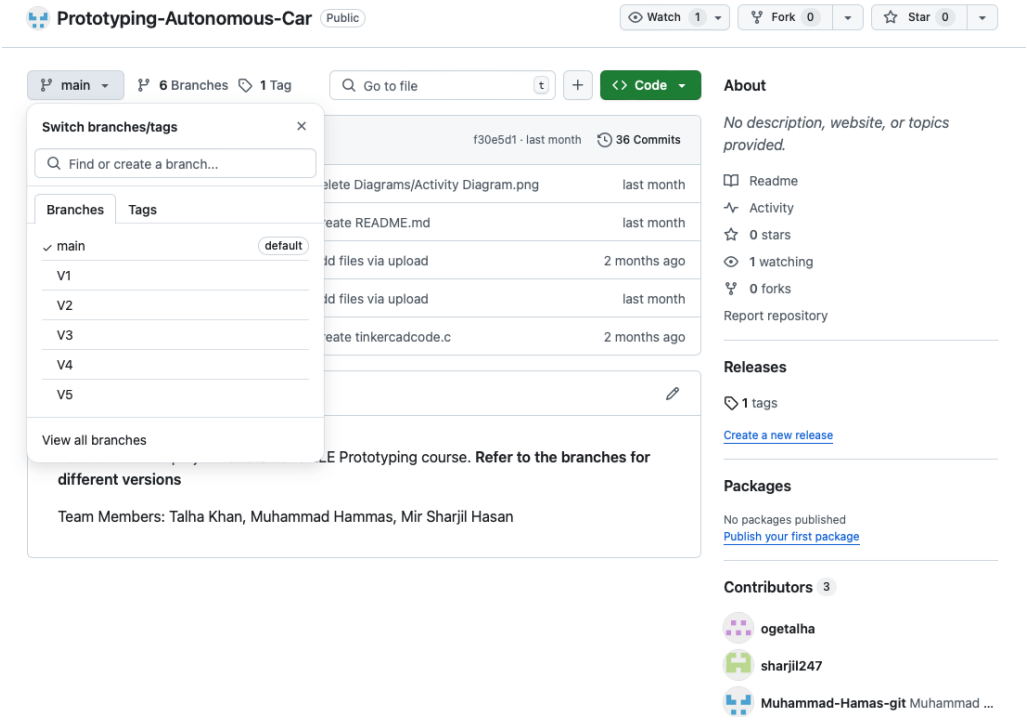
// prototyping //

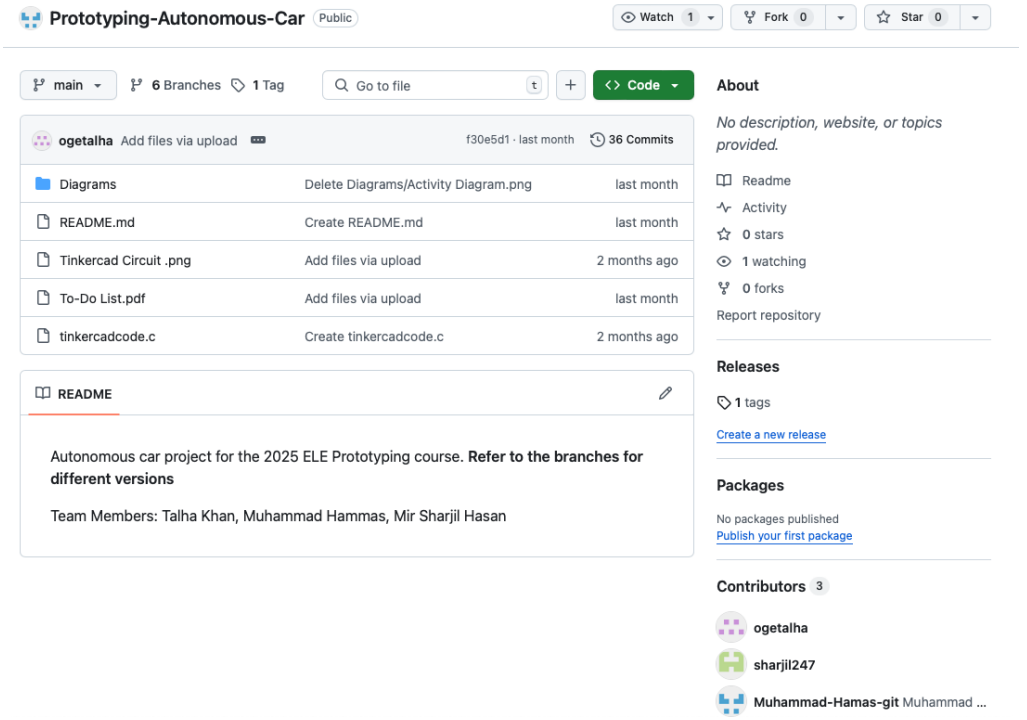
<--!autonomous car-->

MIR SHARJIL HASAN

TALHA KHAN

MOHAMMAD HAMAS

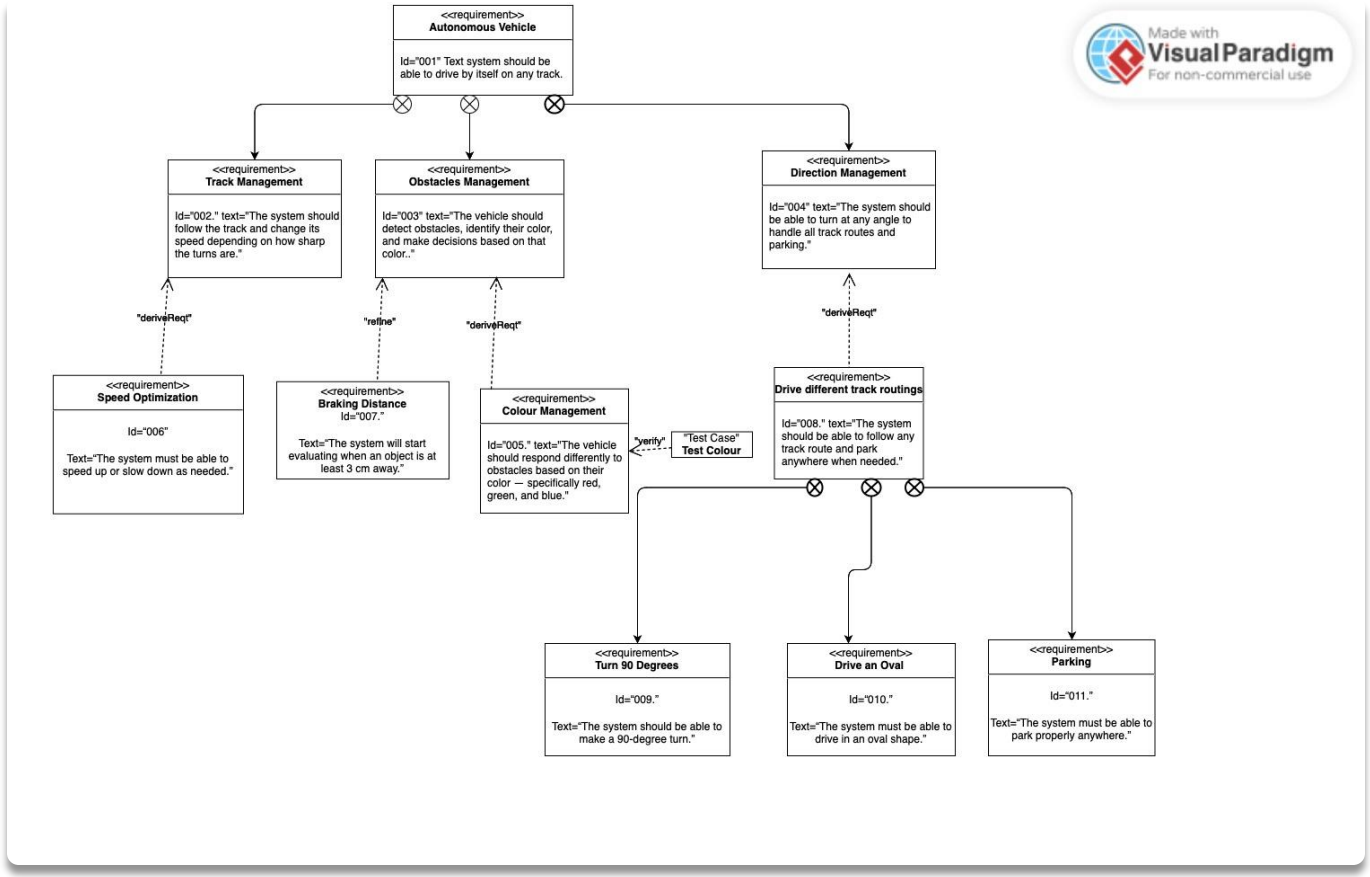




workload distribution

REQUIREMENTS:

- Can Follow a Line?
- Can optimize speed ?
- Can detect obstacles?
- Can take 90 degrees turn?
- Can evaluate colour of Object?
- Can take 180 degrees turn?
- Can overtake an obstacle?
- Can park?

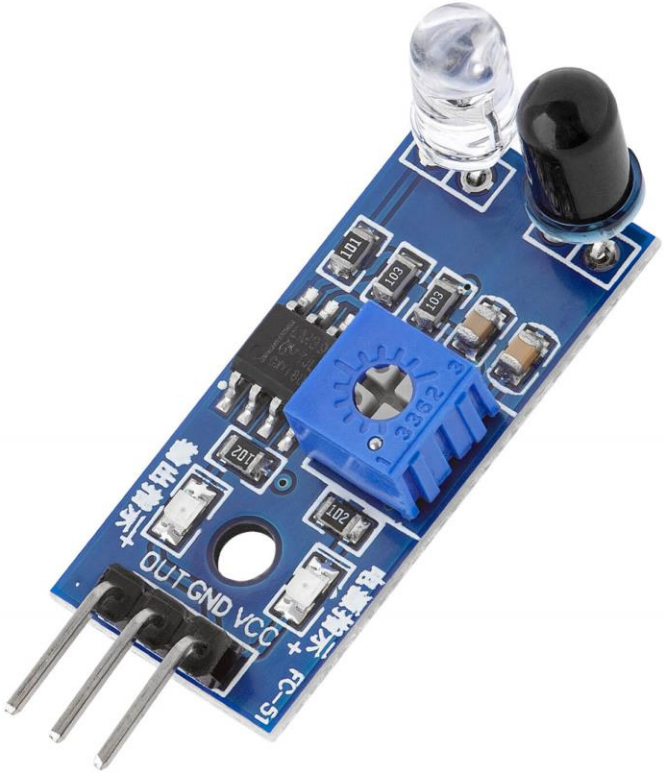


REQUIREMENT DIAGRAM

// sensors

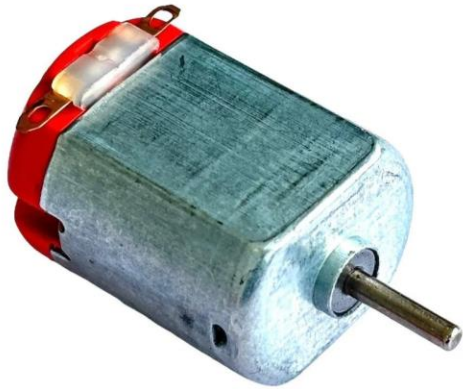

HC-SR04
Vcc
Trig
Echo
Gnd


Color Sensor
VCC
GND
S0
S1
S2
S3
OUT
R4
R3
D3
D4


OUT GND VCC

// actuators

To enable the car to move in any direction.



L298N Motor Driver

Input of 12V from Battery.

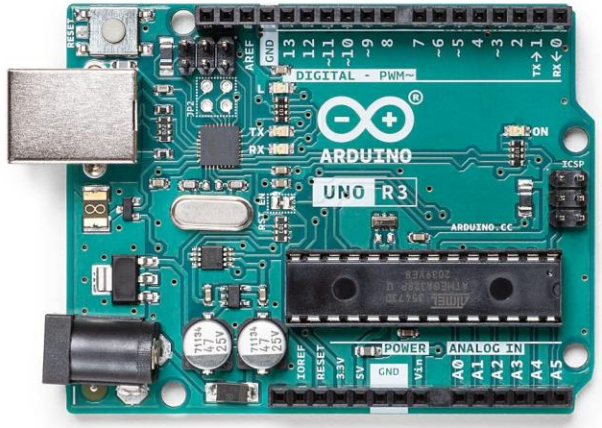
Output of 5V to Arduino

Used to control speed and direction of DC Motors.

[3]

// microcontroller & power

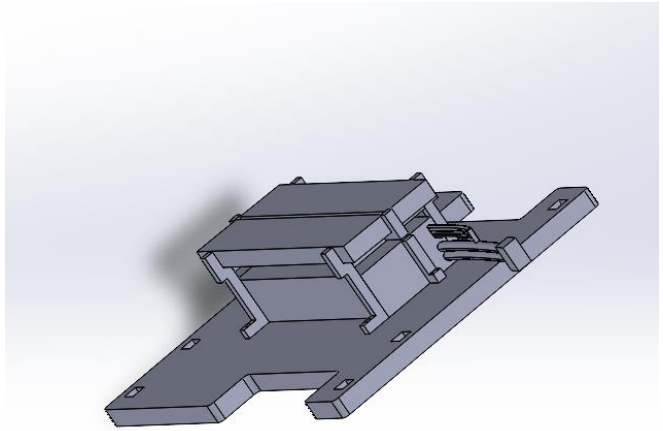
- Technology LiPo
- Cell number 2
- Tension 7.4V
- Capacity 3000mAh
- Resilience 20C
- Weight 210g

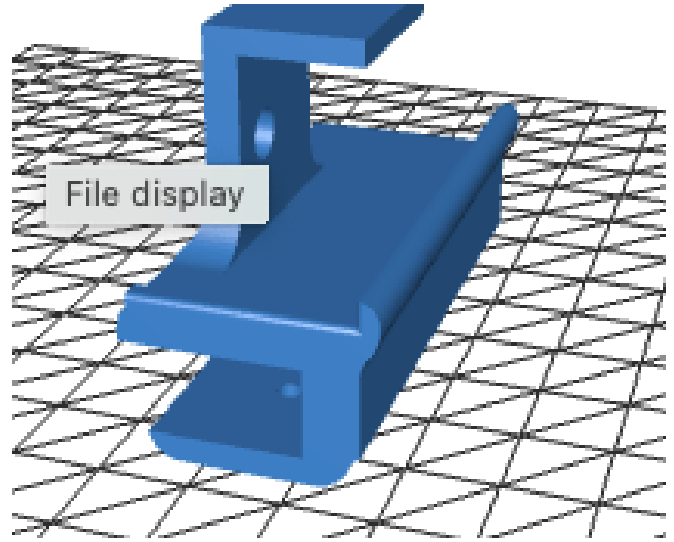


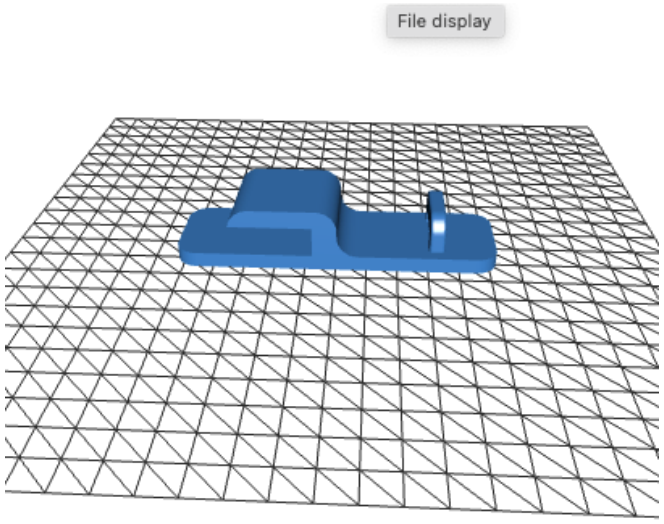
- 5V Input
- 14 Digital Pins
- 6 Analog Pins
- Used with Arduino IDE

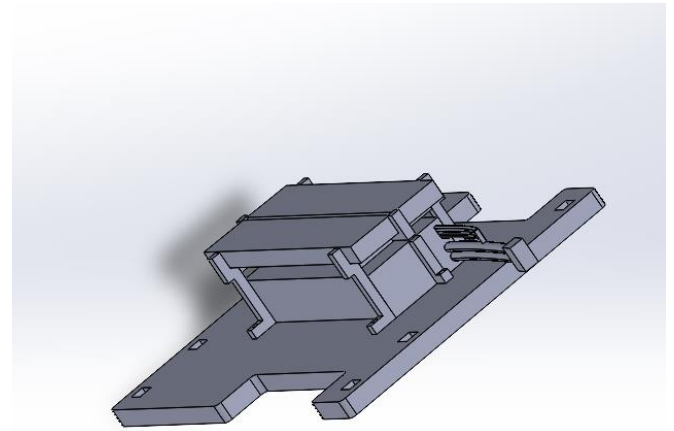
[4]

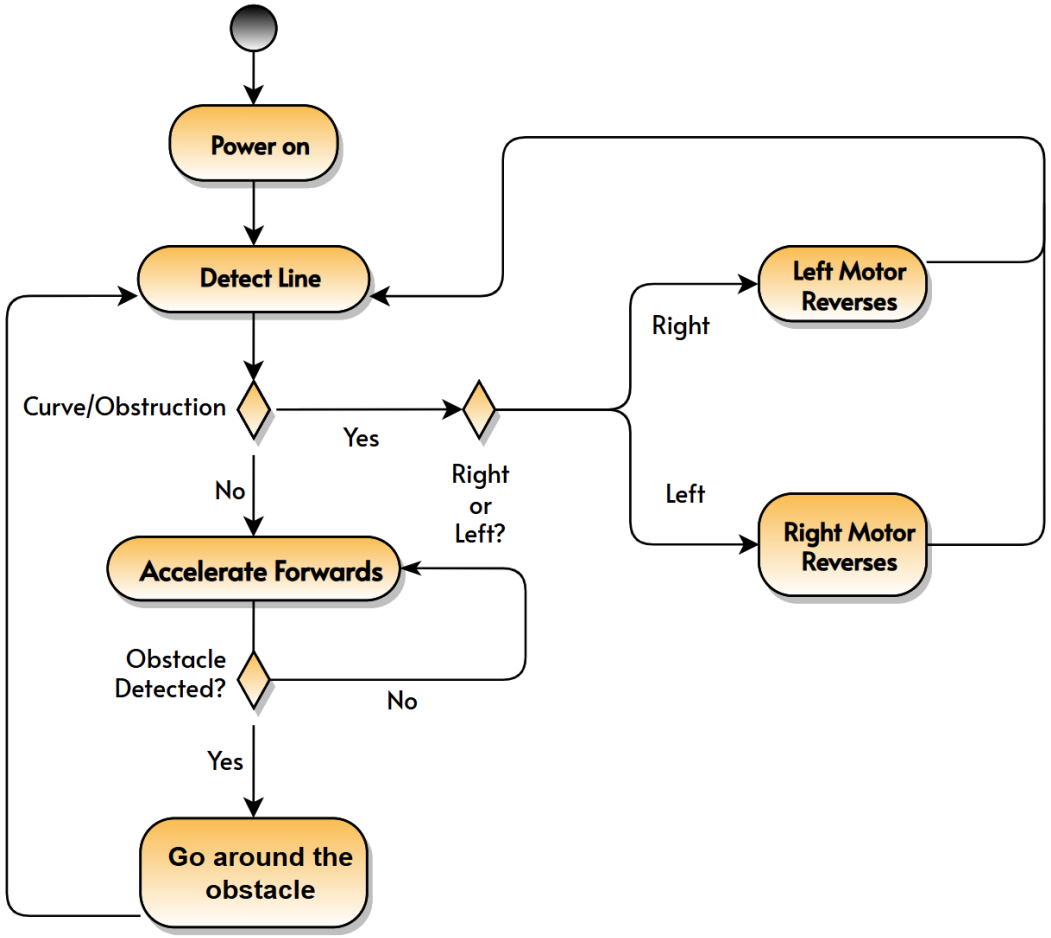
// component design



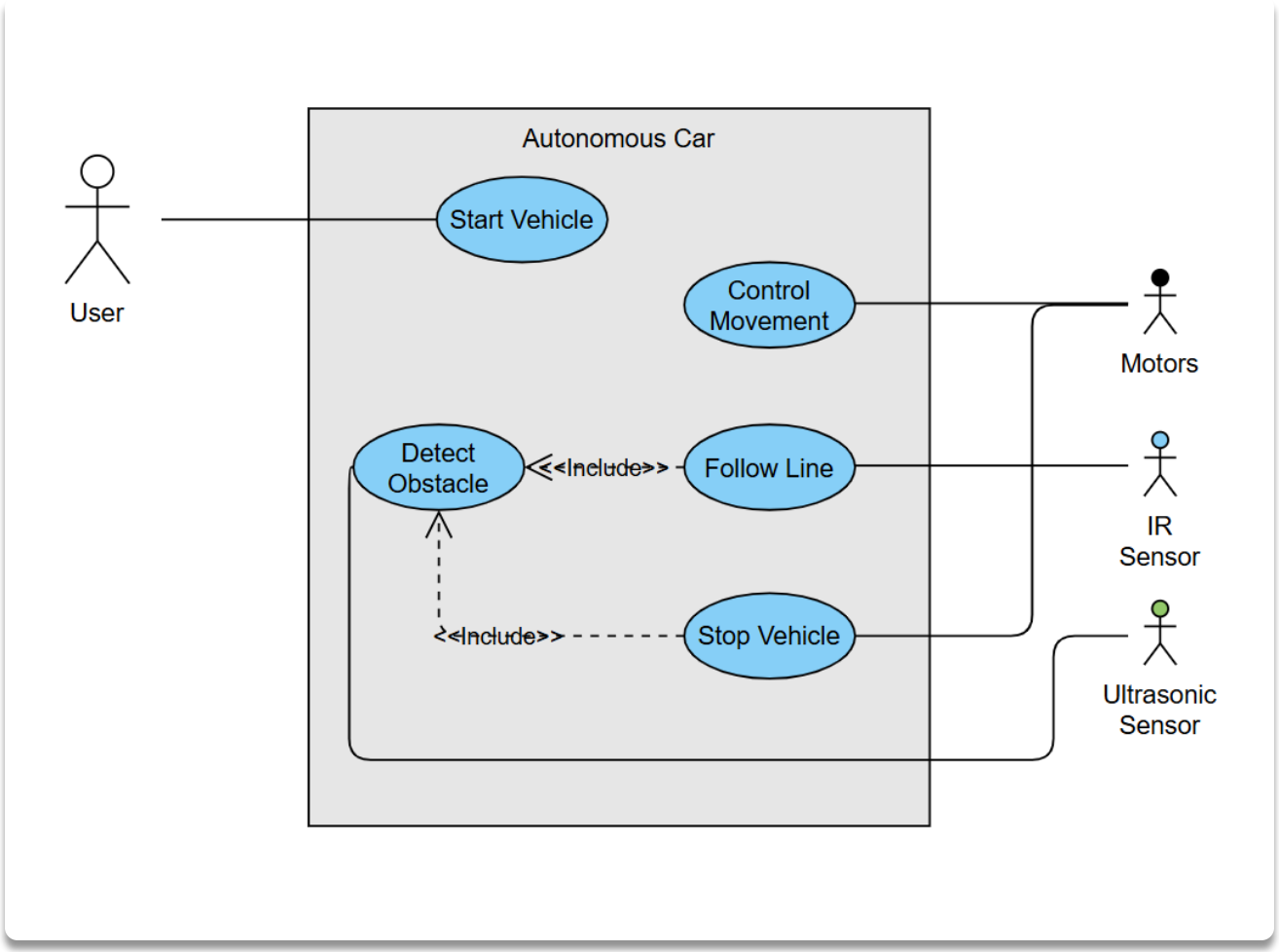








activity diagram.



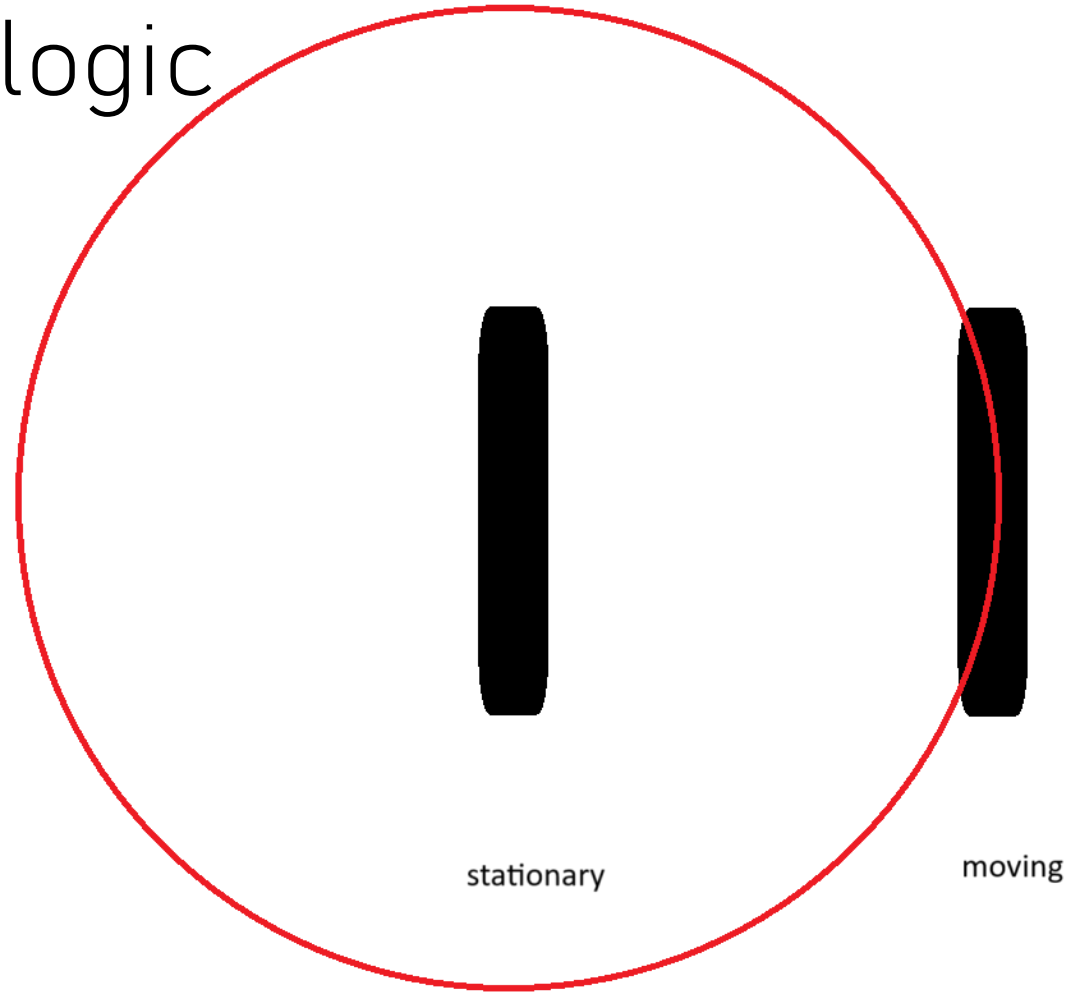
use case diagram.

// general movement logic

- Dual motor based turning.

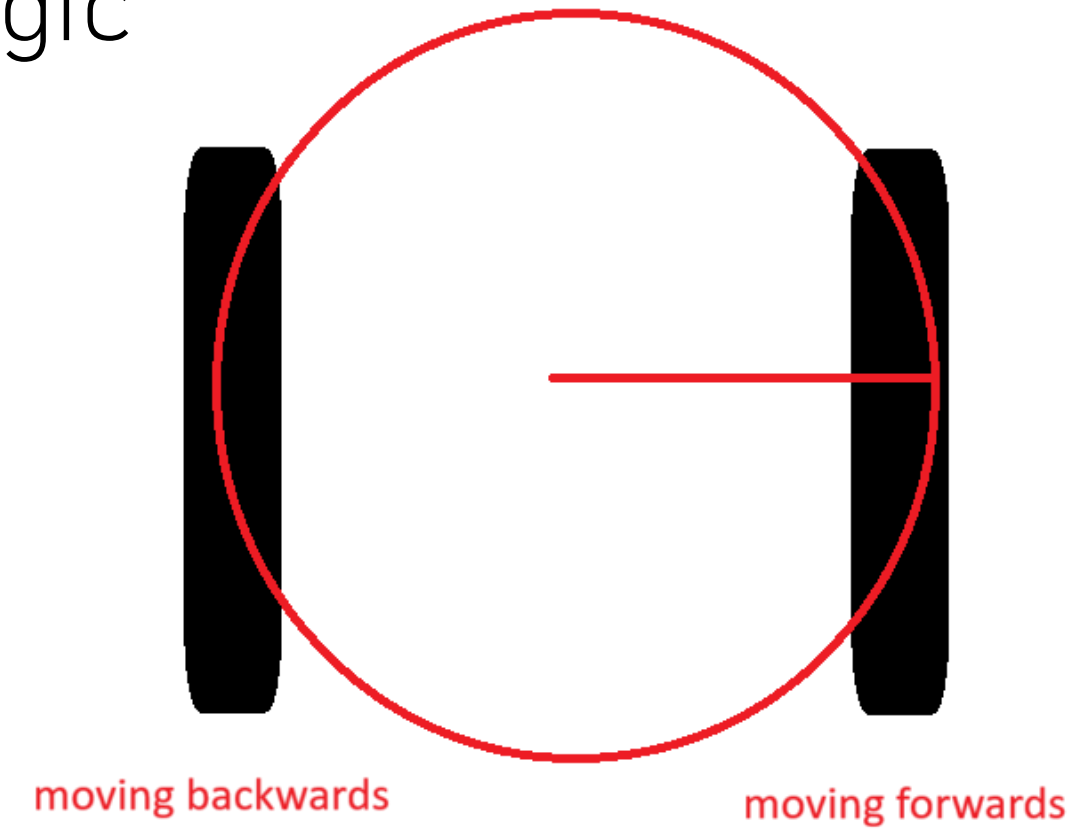
// general movement logic

- single motor based turning.



// general movement logic

- dual motor based turning.

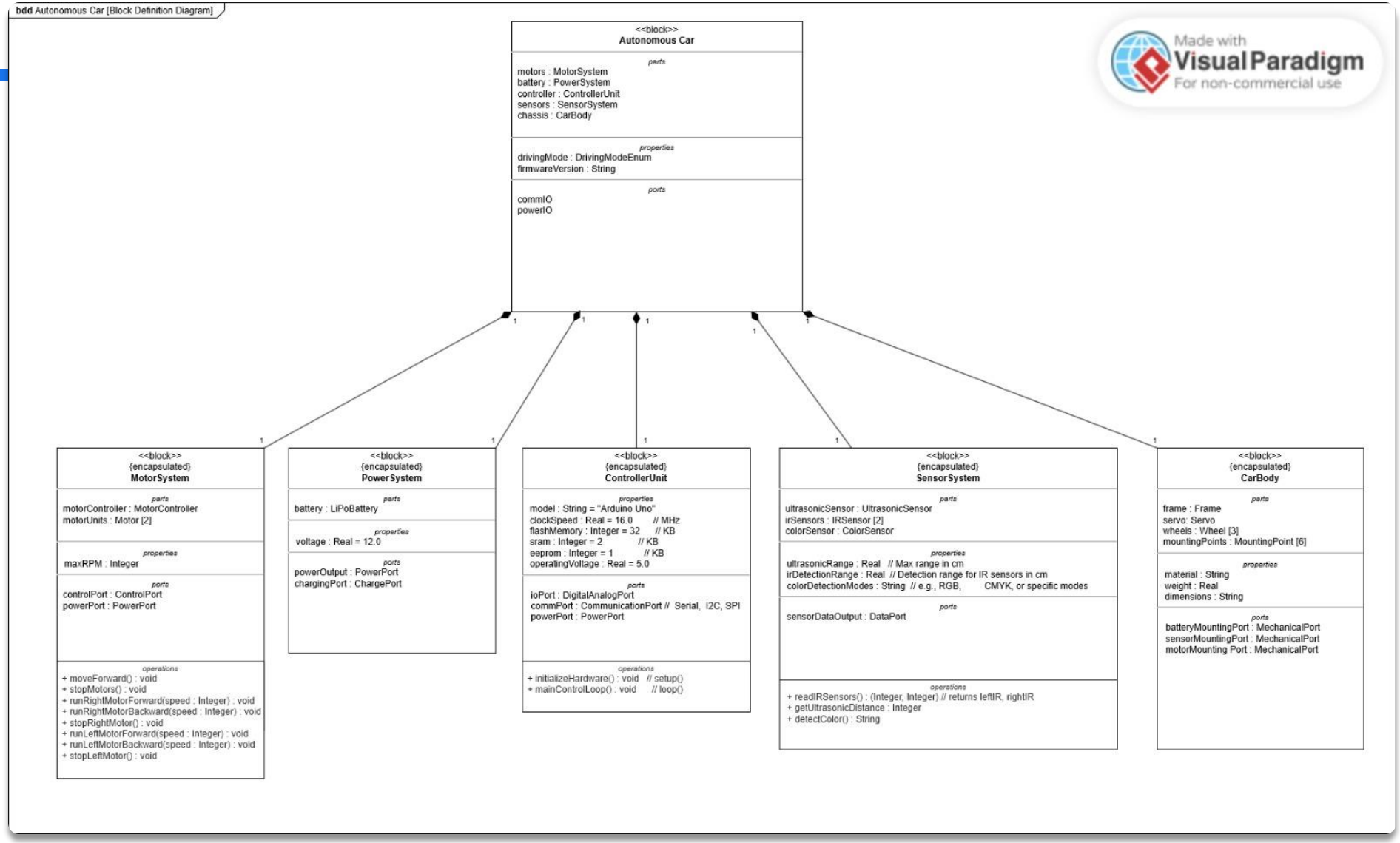


Position orienting

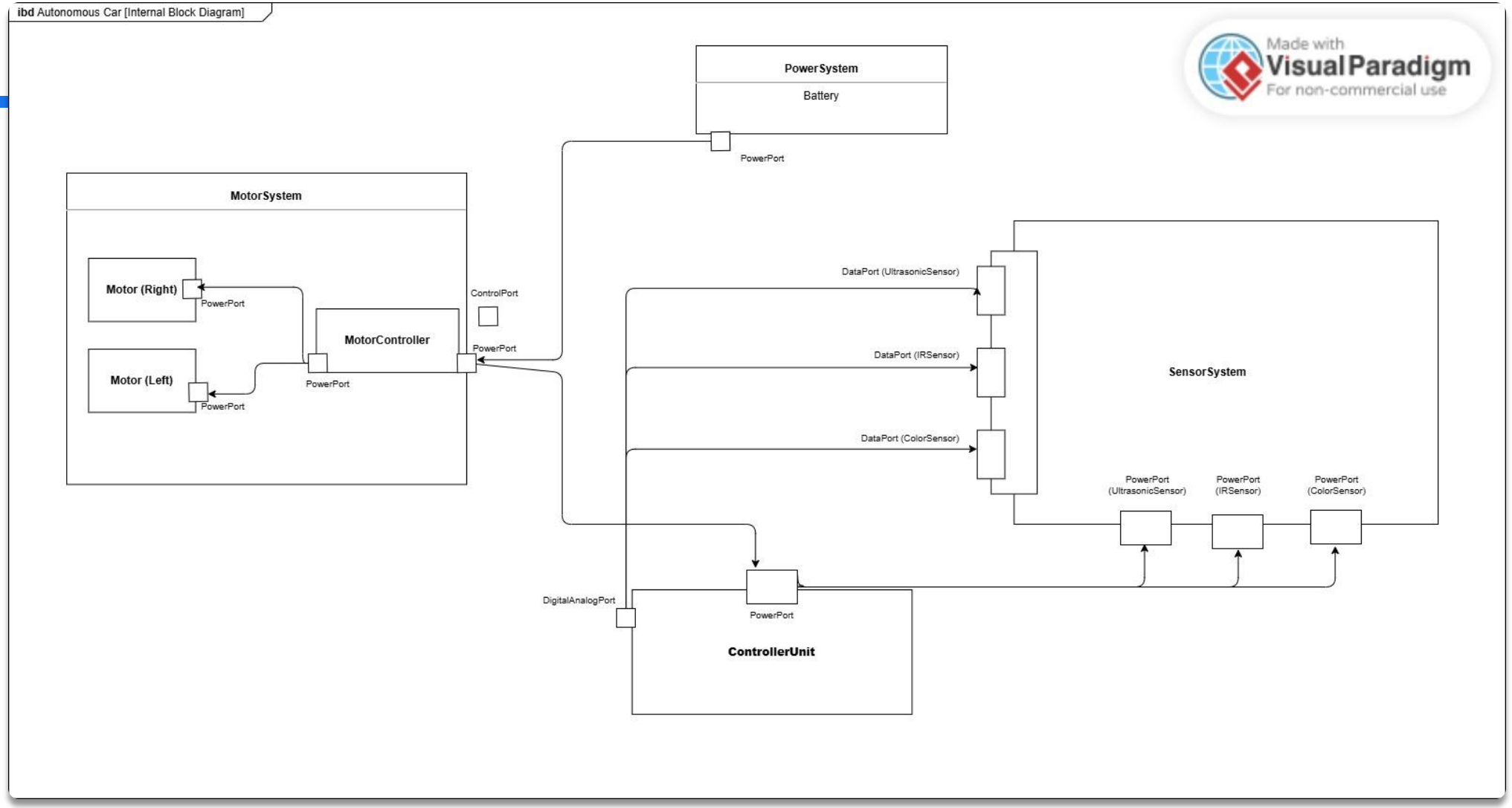
- The car loses position after avoiding obstacle.
  Hence the ultrasonic sensor was utilized to relocate the position relative to the line.

Experimentation with single IR

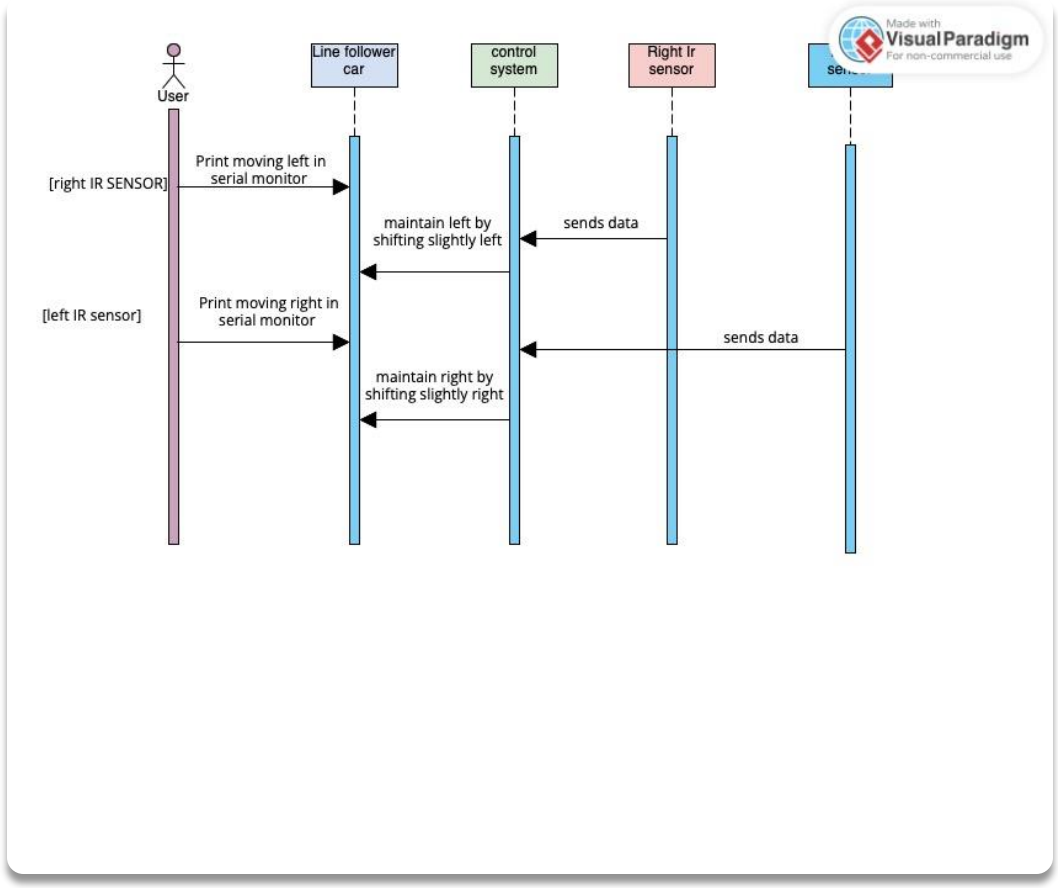
- Crab dance procedure; the car would wiggle left and right with different amplitudes to find the line.



Block Definition Diagram (BDD)



Internal Block Diagram



INTERACTION STRUCTURE FOR FOLLOWING LINE

Outcomes and Achievements

- Can Follow a Line? ✓
- Can Take Turns at any angle (i.e 90 degree turn)? ✓
- Can optimize speed ? ✓
- Can detect obstacles? ✓
- Can evaluate colour of Object? ✓
- Can take 180 degrees turn? ✓
- Can overtake an obstacle? ✓
- Can park? ✓

FUTURE WORK:

- Four-wheeled autonomous vehicle prototype
- Servo motors mounted at the front and back to rotate ultrasonic sensors for environmental scanning
- Current use of Arduino may be limiting due to insufficient digital pins
- Considering switching to a different microcontroller with more I/O capabilities
- Possible integration of a Real-Time Operating System (RTOS) for improved responsiveness and control

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