**Documentation for Servo Motors**

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**Servo Motor for Ultrasound sensor**

***What’s the Purpose?***

Objective is to move the ultrasonic sensor to the right direction to check if the space to the right of the rover is clear. If right is not clear then check if the left side of the rover is clear. This makes it easier to navigate around an obstacle obstructing the rover.

Cases to consider:

If the right side of the rover is free then the sensor will return back to facing the front of the rover. From then the MoverMovement will handle the navigation of the rover. If the right side is blocked then immediately check for the left side of the rover to see if it is clear.

If the left side of the rover is clear, then return the sensor back to front position. From then the MoverMovement will handle navigation of the rover.

If neither side of the rover is clear then return the sensor back to the front AND return a “reverse” to let the MotorMovement know that the rover should reverse.

***How does the motor move the sensor?***

First of all the front direction will be when the duty cycle is at 7 under a 50Hz frequency. If you were to think of a navigational compass the North of the rover would point to 7, the WEST of the rover would point to 2, and the EAST of the rover would point to 12.

Every increment or decrement of change of value to the duty cycle would change the degree of the spin by 15 degrees. When duty cycle is at 0, that is when the motor is basically paused and does not move. This makes for a more stable turn.

There needs to be a time.sleep after changing the duty cycle because the motor needs time to turn before another line is read in the program.

**Servo Motor for Front Wheels**

***What’s the Purpose?***

In order to turn left or right the servo motor that acts as an axle for the rover’s front wheels will need to adjust accordingly. Inside MotorMovement there are 2 functions for turning the axle left and right. How the turning works in the function is by letting the servo motors turn either left or right, then let the motors run forward to move the rover toward the same direction. After that return the motor back towards the front.

***How does the motor turnings work in the program?***

Basically the motors will turn 15 degrees to the left or right. This is done by changing the duty cycle to 8 for a left turn and a duty cycle to 6 for a right turn. After the rover moves towards the turning direction, it will then set the front wheels back to the original position at duty cycle 7.

**Additional navigation added**

In the main program file, there is a new function called Normalizing\_Path. This function is meant to normalize the path of the rover after facing an obstacle. To further explain, it tells the system that the rover still needs to make another turn to be on the right path.

For example, say that a rover is going straight and needs to continue going straight, but there is an obstacle in front of it. After stopping the rover, it would then turn to a direction that is clear to cross. But then after turning the rover isn’t facing the path it needed to go anymore. Luckily we have the normalizing\_path to help guide the rover back towards the path it was going before the obstacle appeared.

Normalizing\_path will move the rover back to the intended path by doing an additional turn. So if the rover turned right to avoid the obstacle, it would then turn to the left, thus facing the correct path. If the rover turned left then vise versa.