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DarkNUS Control Assessment

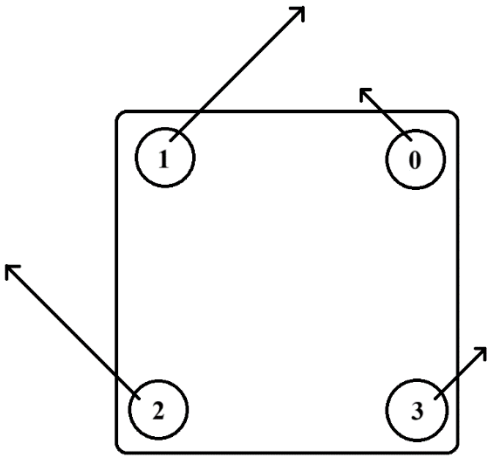

Fig. 1.

Let the motors be labelled motor 0, 1, 2 and 3 as shown in **Fig. 1.** For the robot to rotate on its axis in a clockwise direction, the net force acting to the right near the front of the robot must be equal to the the net force acting to the left near the rear of the robot. To maximise the speed of rotation, the wheels will be angled in a 45-degree angle from north. The four motors will be angled, 45° (0.785 rad), -45°, 45° and -45° respectively. **Fig. 1.** shows the direction of the wheels and their relative rpm when the robot is moving forwards.

The speed of motor 0 and 3 can be increased simultaneously to increase the forward speed of the robot, while decreasing the speed at which the robot rotates, provided that the speed of motor 0 and 3 are less than that of motor 1 and 2, to allow for the clockwise direction of the robot.

The formulae were derived using newtons first law. Since the net force produced by the motors is vertical (relative to **Fig. 1.**), the robot can move forwards. Similarly, since the net horizontal force is zero, the robot does not drift to the left or right, while the forces acting on the front and rear of the robot create a moment around the centre of the robot, allowing for the clockwise rotation.

void swerve_turn (uint8_t module_num, float gm6020_ang, int16_t m3508_rpm)

swerve_turn(0, (rel_yaw - 0.785), chassis_rpm * 0.25);
swerve_turn(1, (rel_yaw + 0.785), chassis_rpm);
swerve_turn(2, (rel_yaw - 0.785), chassis_rpm);
swerve_turn(3, (rel_yaw + 0.785), chassis_rpm * 0.25);

The swerve_turn function is used for the movement of the robot, including in the forward direction. When rel_yaw is zero, the robot will move forward while rotating clockwise, as there is no net force towards the left or the right. However, when Rel_yaw is non-zero, all the wheels would rotate more towards one direction (the right when Rel_yaw is positive and to the left when Rel_yaw is negative), resulting in the robot strafing towards that direction as there is now a net horizontal force on the robot.