# Analytical Analysis

# Introduction

As the project is to make the robot which can stand, move and balance without any support so the team is developing a robot with two wheels and this robot has capability to stable in all the direction without any support and some sensors are adding in it which can track down the robot to move correctly and detect the hurdles coming into the way. In this way the robot is useful in many features.

In this assignment the analysis is performing for the robot which will check the require amount of torque that need to apply by the motors to move the robot at the start. This analysis is useful for the team to select the motors because motors will move the robot.

# Assumptions

Some assumptions related to analysis

* No friction is present in moving

As the length for the rod that need to assume that connect with the wheels to move

And consider the minimum torque

Angle to move

And the inertia that can assume for the wheel

# Equations

And the equation to use

Equation of torque [1]

Angular acceleration [1]

# Physical Modeling

And the physical modeling is to develop the robot in prototype version and then test the required torque that need to move the robot.

# Diagram of project

And the schematic for the torque to understand the torque is



Figure 1: Torque [1]

# Equations to work

As the equation of torque is [1]

Radius for wheel

Angle assumed

So calculating the torque as

This is the minimum amount of torque that need to apply over the robot to move it. When the robot is moving then the torque require for it is

Calculating the torque

Calculating the angular acceleration

Friction of wheels with the ground is

So the

And the torque to keep the robot moving is 1.0125 Nm and the required torque to start the robot from rest is 1.61 Nm.

# Conclusion

Purpose of this paper was to perform the analysis regarding the torque that need to use by the motors to move the robot. So this analysis has done and found that at least the torque of 1.61 Nm is required to move the robot and then while in moving the constant torque need to provide to the robot is 1.0125 Nm. This analysis is quite helpful for the team because the team is going to use this torque to select the motors and hence this analysis is helpful in the implementation.

# References

[1] M. Kroupa, “Torque Load and Induction motor. Load Torque Analysis of Induction Machine”, available [online], https://www.electrical4u.com/torque-equation-of-three-phase-induction-motor/

[2] R. Bjok, “Analysis of the Torque system”, available [online], https://www.engineeringtoolbox.com/electrical-motors-torques-d\_651.html

[3] G. John, “Electrical machines torque”, available [online], https://people.ucalgary.ca/~aknigh/electrical\_machines/induction/im\_trq\_speed.html

[4] G. Weiss, “Induction torque and Servo Motors”, available [online], https://ieeexplore.ieee.org/document/6442377/