# Project Module 7b Acceleration

## Project Objectives

In this project, you must adjust a provided program to produce a specific velocity at the end of a specified distance.

## Robot Design

This robot will able travel forward or backward, and it has the ability to turn. It should have at least three points of contact with the floor to prevent it from tipping over when it is properly balanced.

### Design Restrictions

* No gearing system can be used in conjunction with the Large Motors.

### Design Requirements

* There must be Two Large Motors
* The Large Motors must operate wheels of equal diameter.
* The Large Motors must be able to rotate independently of each other.
* All points of contact with the floor must use wheels or the steel support ball.
* There must be at least three points of contact with the floor, all of which must roll.

## The Physics

Recall the definition of average acceleration.

and the kinematic equations

Remember that we do not control the velocity directly with the robot, but rather we control the power. We have seen this relationship before.

This means the acceleration can also be written in terms of the change in power

For most robots, the constant K is approximately . We will assume this is true for all robots for this project. So we can write the average acceleration as

**Programming Task 1**

Create a program that will have your robot travel forward on a linear journey in three parts. The robot should start from rest. It should accelerate at a constant rate for 1 m, reaching a target speed. It should continue traveling forward for 1 meter at the target speed. Finally, it should decelerate at a constant rate for 1 m where it will come to rest at the end of its journey. The target speed will vary from 0.15 m/s to 0.35 m/s.

*Steps:*

**1.** Build a MyBlock that calculates the acceleration of the robot if the target speed and distance (1.0 m) is known. (Look at equations (6.1)-(6.5) and determine which equation is the appropriate equation.)

**2.** Use the output from the MyBlock in step (1) to find the appropriate ratio for . (The ratio will no longer be 0.459)

**3.** Adapt the provided program so that you can complete the task. The program is the same as the one we used last week, I have replaced the blocks within the loops with MyBlocks so that it is easier to work with your whole program.

Include a menu so that the user can select a value for the target velocity from 0.15 m/s to

0.35 m/s by 0.05 m/s.

Troubleshooting Tips: Make sure that the gyro and the motors are plugged into the correct ports.

**Deliverables from the Team**

Demonstration that the program works.