**Center of Gravity of the Mobile Robot**

The location of the center of gravity of the robot is very important for a mobile robot. Since the robot is intended to travel specially on inclined surfaces and manipulate objects with a movable arm, it is vital to have the center of gravity as lower as possible (closer to the bottom of the robot), to increase the stability of the robot. This can be achieved by placing relatively heavy objects like batteries and motors close to the bottom. Other than that, the length and the expected spanning distance of the robot arm should also be considered because the movement of the arm, and having external objects carried by the arm, cause the center of gravity to move.

The following figure (INSERT A LABELLED FIGURE) shows how gravity acts upon the robot when it climbs up and down on the ramp. The angle of inclination of the ramp also plays a part in how big the effect of the location of the center of gravity is. If the angle of inclination is too steeper, the robot should have its center of gravity very low. However, since this information is given, the constraints (height and horizontal distances) for the location of the center of gravity can be calculated considering the robot’s dimensions, weight, and weight distribution.

**Robot Arm**

A mechanical arm is integrated into the mobile robot in order to give it the capability to manipulate the objects found along the path. These manipulations can include objects dragging, lifting, turning, carrying, and placing them in another place, etc. Since the given objects are expected to be light-weight and cause low-friction when dragging, a plastic robot arm is adequate.

When the arm is not in use, it will be kept at rest without interfering with other sensors and modules. However, when it is needed, the arm will be deployed to the front of the robot. Servo motors are used for the precise movement of the arm.

(YOU MAY NEED TO CHANGE THE FOLLOWING SENTENCE.)

It is expected that the arm must be designed to have 2 degrees of freedom (DOF) for the seamless completion of the required tasks. As a result, a minimum of two servo motors will be used to control the movement of the robot arm.