

Targets

Target 1 quantifies the accuracy of the robotic trash cart to reach the dispensing location for curbside pickup. From this point on, the robotic trash cart will be referred to as the unit. This target is necessary to ensure reliability of the unit's operation to maintain an arrival area for consistent waste removal operation. It was chosen based on the needs of the user and the service provider to eliminate delay in trash removal operations. To assess whether the target has been successfully achieved, multiple tests will be done. The objective of this project is to facilitate the dispensation of trash for curbside pickup; therefore, the importance of this target is rated at 5. The waste needs to be removed and placed in a designated area to ensure proper removal. Failure to meet this target would result in calibration and reconfiguration of set point.

Target 2 quantifies the necessary battery capacity to ensure that the robotic trash cart operates long enough to complete its intended tasks. It is assumed that the unit will be stored at a location on the side of the house when not in use. This will be referred to as the home base. The marginal value for the battery capacity was chosen to be twice the capacity needed to complete four round trips from the home base to the dispensing location and back. One trip from the home base to the dispensing location will take a maximum of 10 minutes. It is also assumed that the maximum distance from the home base to the dispensing location is 90 meters. If the motors on the unit draw a combined 2.25A (with the help of gearboxes), then the unit should operate for 40 minutes resulting in 1500 mAh of charge being required for 40 minutes of operation. Under these conditions, the round trip dispensation of trash could be completed without the battery being depleted below 50%. The ideal value would be 4500 mAh. With this capacity, eight rounds could be completed if necessary without overly depleting the battery. This target will be verified by running the motors for a 10 minute duration and testing the battery afterwards to assess its remaining charge. This target is rated at 5 for importance, because it is absolutely essential for the operation of the unit. Failure to meet this target can easily be corrected by adding batteries, but is nonetheless an absolute requirement.

Target 3 quantifies the speed at which the robotic trash cart can maintain stability and prevent the unit from tipping over. The marginal value was chosen to be the same as the ideal. There is no real urgency to get to the designated pick up point since the operation can be started at an earlier time to achieve the same results. This target will be verified by using weights hanging from different points and applying manual resistance using scales and load cells to determine the tipping points. This target is rated at 5 for importance because it is absolutely essential to the robotic trash cart operation. Failure to meet this target can easily be detected by providing overloading alarms triggered from load cell differential detections at tipping limits. To get waste to the designated point, is an essential requirement.

Target 4 quantifies the necessary limits the robotic trash cart can travel over obstacles, such as a garden hose, extension cord, etc. The marginal value was chosen to be the approximate diameter of an extension cord and the ideal is that of a water hose. This target will be verified by using an actual extension cord and water house to determine the dexterity of the unit on real life obstacles. This target is rated at 3 for importance because although it may impede the movement

of the unit, it can go in a sleep mode until the obstacle is removed and the unit is restarted. Failure to meet this target can easily be detected by providing sleep mode and alarm/notification of immobility.

Table 1: *Target Catalog*

Target No.	Need	Metric	Priority	Units	Marginal Value	Ideal Value
1	Transport	Within Destination Target Area	5	meters	1	0.5
2	Battery Life	Capacity V.S. Runtime	5	mAh	3000	4500
3	Transit Stability	Speed V.S. Wind	5	m/s	0.10	0.10
4	Drive over Obstacles	Obstruction Height	3	cm	1	2