

Test Project

Module C Prototyping

Autonomous Mobile Robotics

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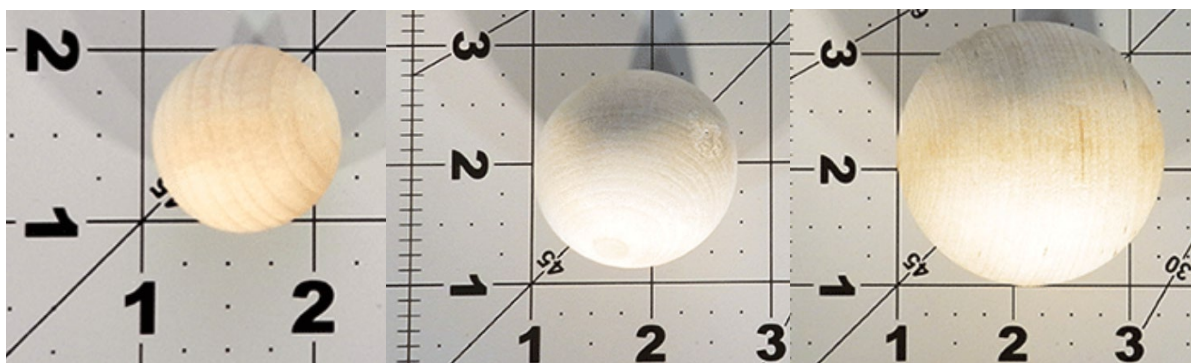
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Introduction

The sorting and collecting of various produce, seeds etc. is a tedious and time-consuming activity. Farmers invest a significant amount of money in the sorting process as many labourers are required in the collecting and sorting process.

Traditional methods rely on sophisticated sensors and automation systems. However, this challenge strips it down to the basics: using purely mechanical means to achieve the sorting process. Based on this you will prototype a device to aid in the sorting and collection of 3 sizes of objects to help increase productivity and generate more revenue for farmers.



Description of project and tasks

This task has two deliverables that must be met:

1. Prototype a stand to accommodate a pickup point for an autonomous mobile robot.
2. Develop another prototype that is capable of sorting objects into three different size categories.

Task 1

Develop a functional, and stable stand from which your robot can **collect/pickup all three sized objects**. *The stand must be capable of holding one of each object at the same time.*

Task 2

Design and build a stand-alone sorting device that fits within a 300 mm x 300 mm x 300 mm area. The device must be capable of sorting objects into three categories: small, medium, and large.

The developed prototypes will be used in another module of the competition.

Instructions to the Competitor

Key Requirements (Stand)

Design a stand with the following specifications:

- **Size Constraints:** The stand must be between 50 mm and 250 mm from the ground.
- **Holding Area:** The stand must include a holding area that can accommodate all the three different size objects.
- **Robot interaction:** Your robot may be required to be able to collect/pickup these objects placed in the holding area on top of the stand. Be prepared for this possible future task.
- **Stability:** The stand must be stable and not fall over when the robot interacts with the object.
- **Available components:** Competitors can only use the components in the provided prototyping kit. *No other components may be used.* Refer to the attached list for available parts in the kit.

Key Requirements (Sorter)

- **Mechanical Sorting:** The sorting process must be entirely mechanical. No electronic sensors or computerized systems are allowed.
- **Size Constraints:** Your device must fit within a 300 mm x 300 mm x 300 mm space.
- **Holding Area:** The device must include a holding area where your robot will place each object before sorting. The holding area must be between 50mm and 250mm from the ground.
- **Release mechanism:** The device must have a release mechanism to release the object from the holding area. When the release mechanism is activated, the object will be sorted.
- **Three Size Categories:** The device must sort eggs into three distinct size categories: small, medium, and large.
- **Available components:** Competitors can only use the components in the provided prototyping kit. *No other components may be used.* Refer to the attached list for available parts in the kit.

There are three hours allocated to complete this task, it is up to the competitors how they use this time and what tasks they perform. Competitors are not restricted to working on this task alone either as a pair or as a single Competitor.

Competitors will receive their prototyping kit at the start of their three hour time block, at the end of the three hours competitors will leave their completed prototypes back into the box that the parts came on and leave them on their workstation, they will then go to the briefing area.

Other

Competitors will manually place the objects onto the stand as required.

After the object is placed in the holding area on the sorter, Competitors will manually release the object to allow for sorting.

This task is designed to encourage innovation and creativity. There are no prescribed methods or specific solutions. Participants are free to explore various mechanical designs, such as gates, slots, inclined planes, or other mechanical sorting mechanisms. The objective is to develop a functional, efficient, and reliable object sorter using only mechanical components.

Sorter Parts List

48 mm L-Beam (2 Pack)	76118-2	5
96 mm L-Beam (2-Pack)	76117-2	4
288 mm L-Beam	76133-2	1
48 mm Flat Beam	76048	6
96 mm Flat Beam (2 Pack)	76047-2	2
48 mm Square Beam	76108	10
96 mm Square Beam	76107	10
288 mm Square Beam	76103	2
96 mm X 40 mm Flat Bracket (2 Pack)	76065-2	4
96 mm Adjustable Flat Bracket (2 pack)	76083-2	2
192 mm X 96 mm Flat Bracket (2 Pack)	76066-2	1
96 mm U Channel (2-Pack)	76017-2	3
Rubber Foot (4 pack)	76506-4	2
M3 Kep Nut (100 Pack)	76204	2
M3 x 10 mm BHCS (50 Pack)	76203	1
M3 x 10 mm SHCS (100 Pack)	76201	1
M3 x 20 mm SHCS (50 Pack)	76209	1
M3 x 12 mm SHCS (100 Pack)	76202	1
Rack and Pinion Set (2 pack)	76170	1
Bronze Bushing 6 mm ID x 14 mm OD (12 pack)	76301-12	1
6 mm x 96 mm D-Shaft (6 Pack)	76161-6	1
6 mm x 140 mm D-Shaft (6 Pack)	76164-6	1
Shaft Spacer 2mm (24 Pack)	76306-24	1
6 mm D- Shaft Hub (4 Pack)	76284-4	1
90 Tooth Gear	76501	1
30 Tooth Gear	76500	1
30 Tooth Bevel Gear x 1-to-1 Set (2 pack)	76219-2	1
Intake Hub Kit D-Shaft	70210	2
Silicone Rubber Tubing	76410	1
End Piece Plate (2 Pack)	76143	2
L Bracket	76087	2
Shaft Spacer 1 mm (24 pack)	76305-24	1
48 mm Standoff	76181-12	1
25 mm Standoff	76182-12	1
42 mm Hinge with Bearings	76321	2
120 Degree Bracket (2 Pack)	76080-2	1
T Bracket (2 Pack)	76084-2	1
240 mm Low Profile U-Channel	76029	1
Hex Key Metric 7 Piece Set (1.5, 2, 2.5, 3, 4, 5, 6)	70144-7	1
5.5 mm Combination Ratchet Wrench	70147	1
5.5 mm Nut Driver	70146	1