

# Design & manufacturing a Delta-Robot

## Summary:

Delta robots have positioned themselves in industry as a solution to tasks that require high speed and precision especially in the area of packing, inspection and assembly.

Currently MSU does not have a robot of this nature which is a great limiting factor in the training of students. For this reason, the design and construction of a Delta-Robot is necessary for educational purposes.

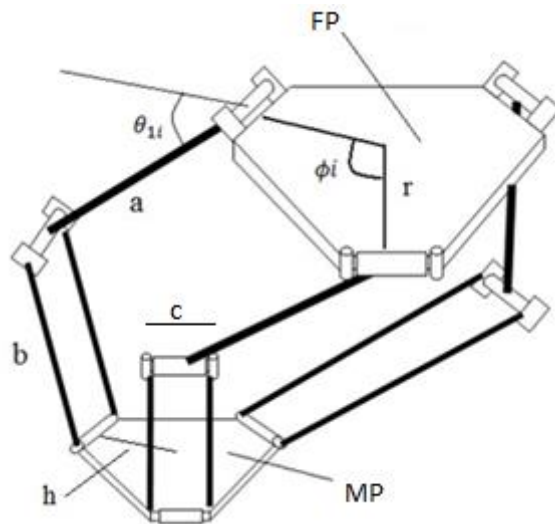
The purpose of this project is for the robot to act as the training platform for students taking classes in the department of Engineering and Technology Management in the following areas: Electronics, Control, Automation, Computer Sciences and Mechanics. With this new development the students will have better practical training with these types of mechanisms and thus will possess a broader vision of the challenges they can be expected to face in industry.

## Commercial Delta Robots:



## Specifications:

- Dimensions:



FP: Fixed Platform.

MP: Mobile Platform.

$r = 150$  mm.

$h = 50$  mm.


$\phi_i = 120^\circ$

LA = 200 mm.

LB = 400 mm.

LC = 100 mm.

- Materials:



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 <p><b>SMITH BEARING Cam Follower, Heavy Stud, Hex Socket Head</b> Item # 11Y046 Your Price: \$25.40 / each</p> <p><input checked="" type="radio"/> Deliver one time only</p> <p><input type="radio"/> Auto-Reorder Every <input style="width: 40px;" type="text" value="1 Month"/> <span style="font-size: small;">i</span></p>	<input style="width: 30px;" type="text" value="12"/> <a href="#">Update</a> <a href="#">Remove</a>	<p>Expected to arrive Wed. Aug 26.</p>	<p><b>\$304.80</b></p>
 <p><b>GRAINGER APPROVED Locknut, Nylon Insert, 1/4-28, PK25</b> Item # 4CAE8 Your Price: \$35.45 / pkg. of 25</p>	<input style="width: 30px;" type="text" value="1"/> <a href="#">Update</a> <a href="#">Remove</a>	<p>Expected to arrive Wed. Aug 26.</p>	<p><b>\$35.45</b></p>

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9	R3112	1-1/2 inch Dia. 6061-T6 Aluminum Round	0' 6" Custom Size	✓ In Stock	\$11.02 <del>\$11.36</del>	\$99.18
3	F412	1 X 2 6061 Aluminum Flat	0' 2" Custom Size	✓ In Stock	\$7.47	\$22.41
6	R312	1/2 inch Dia. 6061-T6 Aluminum Round	1' 5" Custom Size	✓ In Stock	\$4.22 <del>\$4.35</del>	\$25.32
6	F4145	1/4 X 5 6061 Aluminum Flat	1' 1" Custom Size	✓ In Stock	\$16.19 <del>\$16.69</del>	\$97.14
1	F4145	1/4 X 5 6061 Aluminum Flat	0' 5" Custom Size	✓ In Stock	\$9.69	\$9.69

Total = \$600.21

## Groups:

### Persian Team.

Design and manufacturing of fixed platform and supports with bearings.

Considerations:

1. Use the table located in the laboratory, the instructor will point this out and give further instructions.
2. 3 supports, of which each individual support must be one continuous piece
3. The materials you will need to use are the following:
  - a. 3 pieces of 1 X 4 X 6, 6061 Aluminum Flat.
  - b. 6 pieces of 1/4 X 5 X 1'1", 6061 Aluminum Flat.
  - c. 3 BL Needle Brg, Drawn Cup, Bore 1.000 In.

### English Team.

Design and manufacturing of the coupling and the base that connects the LA with the motor.

Considerations:

1. Each of the 3 coupling should consist of one continuous piece
2. The 3 bases should be able to be adapted to any servomotor with a flange no greater than 2"
3. The materials you will need to use are the following:

- a. 3 pieces of 2 inch Dia. X 5", 6061-T6 Aluminum Round
- b. Flat aluminum (according to the design of the bases for the motors)
- c. 3 GRAINGER APPROVED Retain Ring, Ext, Shaft Dia 1, PK50

### **English Team**

Design and manufacturing of the LAs that connect the coupling with the shaft of the LBs.

Considerations:

1. Each of the 3 LAs should consist of one continuous piece
2. The materials you will need to use are the following:
  - a. 3 pieces, 1 X 6 X 1'4", 6061 Aluminum Flat
  - b. 3 BL Needle Brg, Drawn Cup, Bore 1.000 In

### **American Team**

Design and manufacturing of the 6 shafts that connect the LAs to the LBs and the LBs to the mobile platform.

Considerations:

1. Each of the 6 shafts should consist of one continuous piece
2. The materials you will need to use are the following:
  - a. 12 GRAINGER APPROVED Retain Ring, Ext, Shaft Dia 1, PK50
  - b. 6 pieces, 1-1/2 inch Dia. X 6", 6061-T6 Aluminum Round
  - c. 12 pieces, SMITH BEARING Cam Follower, Heavy Stud, Hex Socket Head

### **American Team**

Design and manufacturing of the 6 LBs

Considerations:

1. Each of the 6 LBs should consist of one continuous piece.
2. The materials you will need to use are the following:
  - a. ½ inch Dia. 6061-T6 Aluminum Round
3. The spinning angle on the LBs should be 20<sup>0</sup>-340<sup>0</sup>

### **Mexican Team**

Design and manufacturing of the mobile platform

Considerations:

1. The Mobile Platform should be one continuous piece
2. The 3 supports of the shafts should be independent and contain the cylindrical bearings.
3. It should have a configuration that adjusts easily to the effector without the use of tools.
4. The materials you will need to use are the following:
  - a. 3 pieces, 1 X 2 X 2, 6061 Aluminum Flat
  - b. 3 pieces, ¼ X 5 X 5, 6061 Aluminum Flat
  - c. 3 BL Needle Brg, Drawn Cup, Bore 1.000 In

## Schedule

Activity	Week															
	8/24	8/31	9/7	9/14	9/21	9/28	10/5	10/12	10/19	10/26	11/2	11/9	11/16	11/23	11/30	12/7
Formulation	Yellow	Yellow														
Concept			Light Blue	Light Blue												
Configuration					Dark Grey	Dark Grey										
Parametric							Gold	Gold								
Detail								Green	Green							
CAD & Assembly			Red	Red	Red	Red	Red	Red	Red	Red						
Manufacturing											Brown	Brown	Brown	Brown	Brown	
Senior Project P.	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue

**\*\*\*Note: These are only the general requirements, you have to use the Formulation Activity in the first two weeks to finalize all the details.**