

# Session on Hydranoid

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# Problem Statement

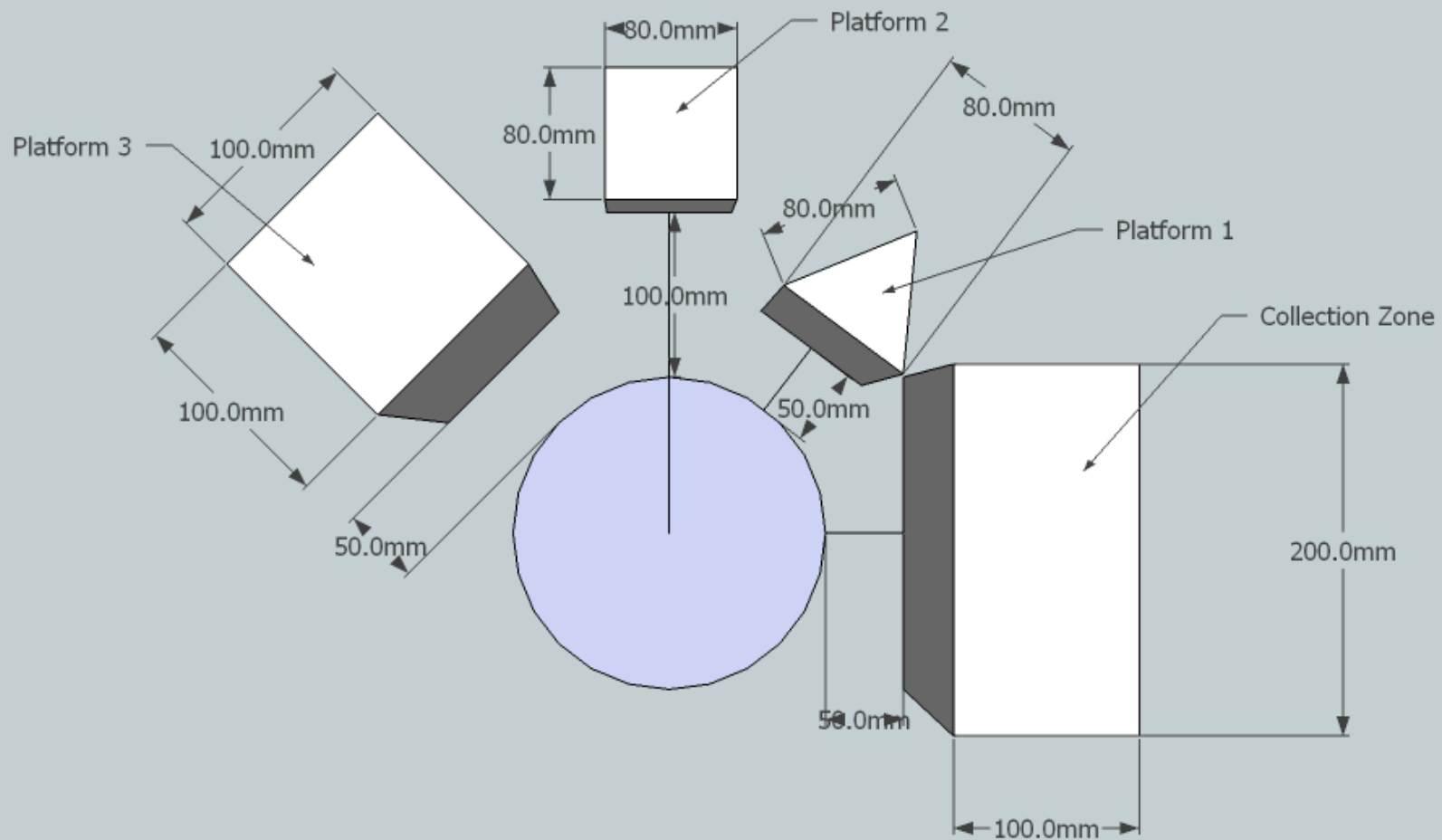
## Task :

- Teams have to make a machine using only hydraulic mechanisms, that should stay stationary in the circular region(Refer Figure 1) and has to **pick up blocks(containers) from the collection platform(ships) and place them at platforms(loading trucks)** of different heights and at different distances from circular area.

## Specifications:

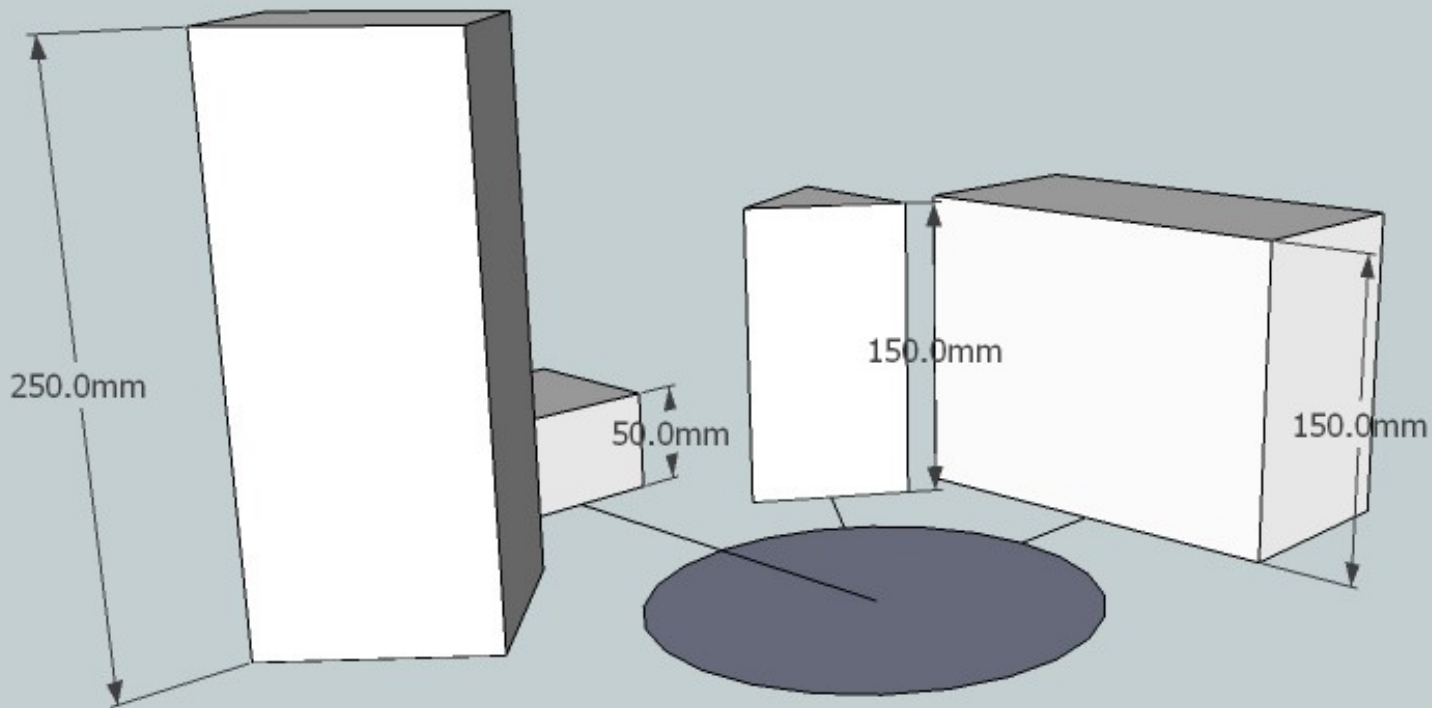
- Base area of the machine should fit into a square of dimension **150 mm x 150 mm** at the time of start. There is no restriction on the expandable height or length of the machine. The extensions used to control the machine are excluded while measuring the machine dimensions.
- Machine can expand or compress during the run.
- Locomotion of any part of the machine should be governed by some **hydraulic force**.

# Arena



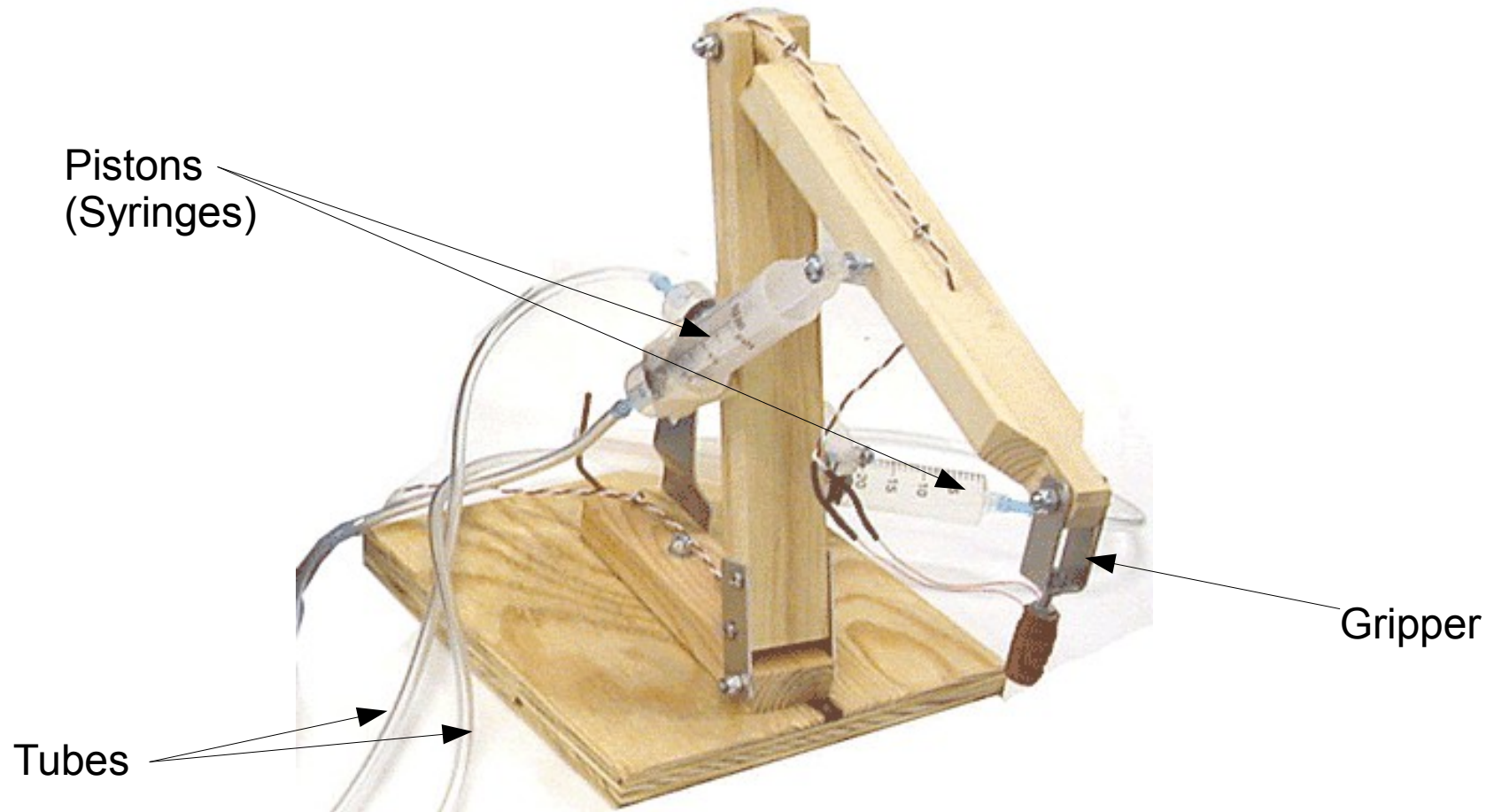
Top View

# Arena



Isometric view

# Sample Bot



# Hydraulic Cylinder

- Also called a **linear Hydraulic Motor**
- **Mechanical Actuator** used to give unidirectional force through a unidirectional stroke
- Parts-
  - Base
  - Cylinder Barrel
  - Cylinder head
  - Piston
  - Piston rod



# Some (boring) Theory!!

- Pressures at bottom are equal

$$P_1 = P_2$$

$$\therefore F_1/A_1 = F_2/A_2$$

$$\therefore F_1/F_2 = A_1/A_2$$

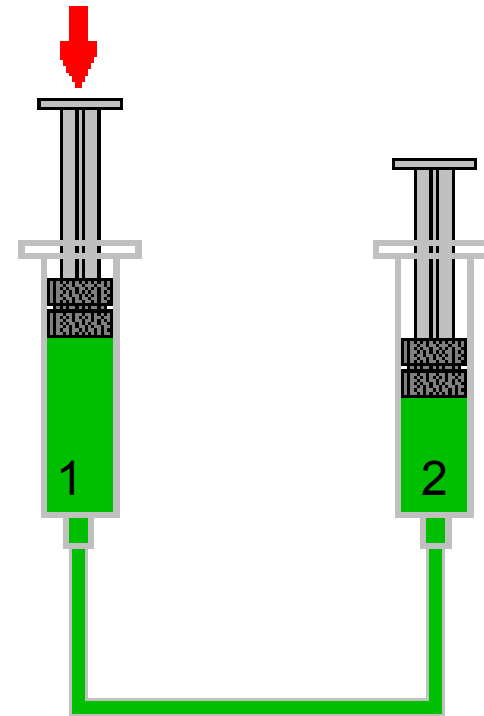
$\therefore$  Larger the diameter of output cylinder  
→ Larger is the force transferred

- Also there is no volume loss (assume incompressible fluid)

$$A_1 \cdot d_1 = A_2 \cdot d_2$$

$$\therefore d_1/d_2 = A_2/A_1$$

$\therefore$  Larger the diameter of output cylinder  
→ Smaller is the displacement



- Recommended – Use both cylinders of equal diameter

# Hydraulic fluid

- Function: Medium for power transfer and control
- Desired properties: Low compressibility  
Low volatility
- Common Examples: Mineral Oil, Water
- In hydranoid competition only water can be used.

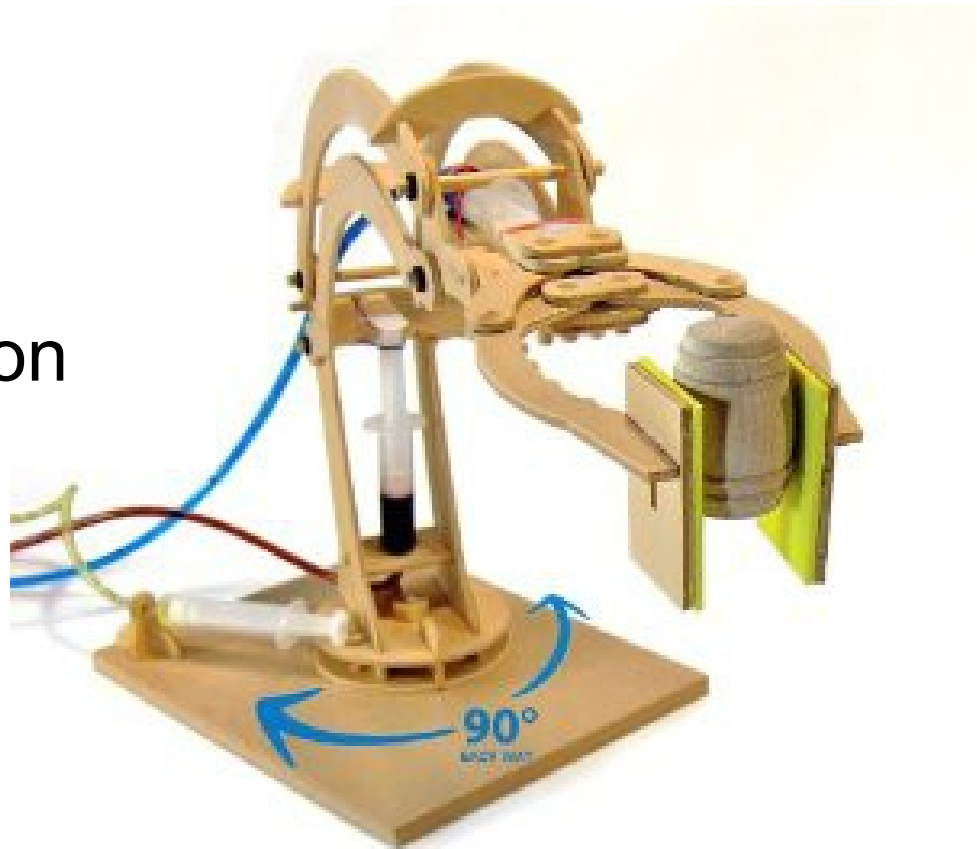


# Turning Mechanisms

1. Syringe directly connected to the base

:-) Easy to make

:-( Less angle of rotation



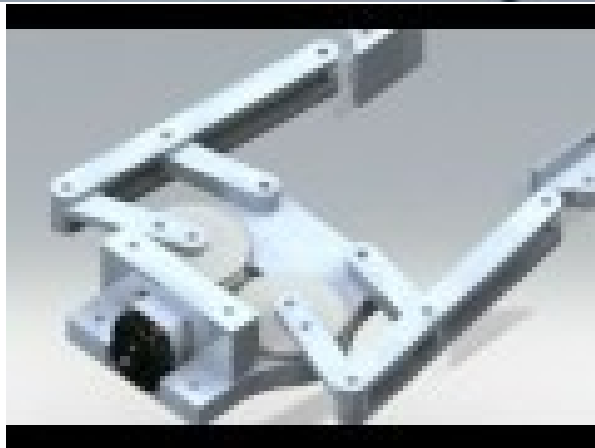
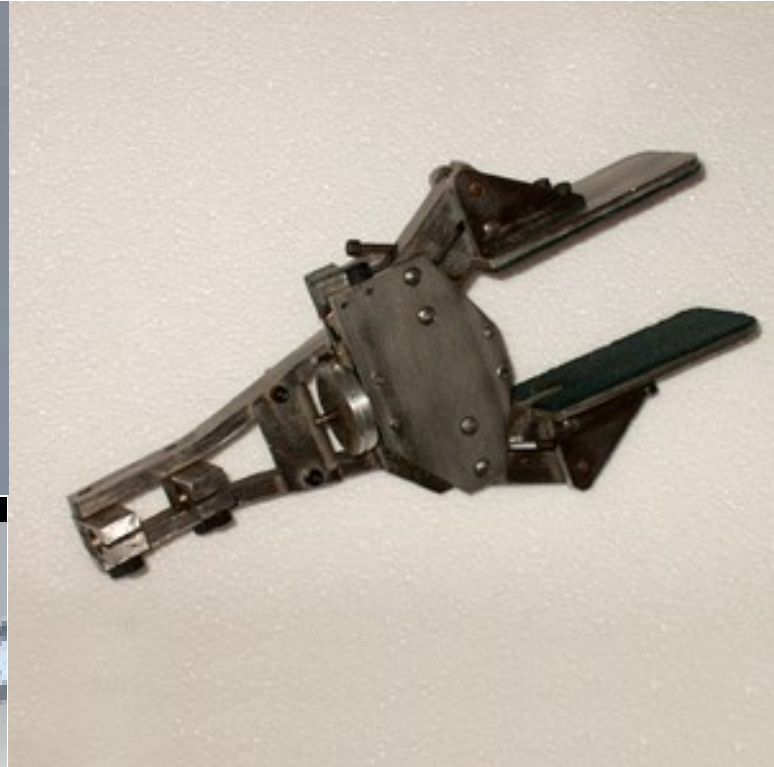
# Turning Mechanisms

## 2) Rack and pinion assembly

- :-) Can get 360 degrees angle of rotation
- :-( Slightly difficult to assemble
- :-( Slipping may occur



# Gripper



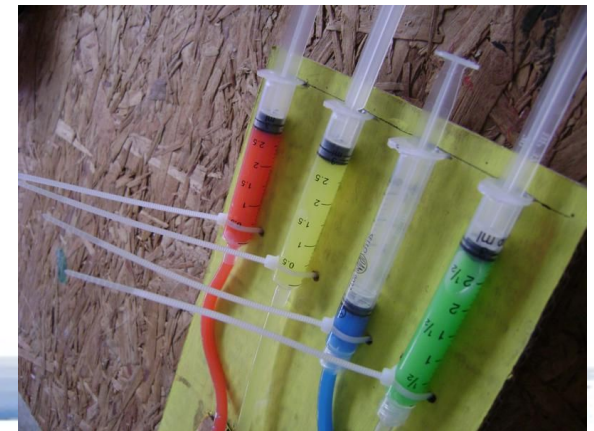
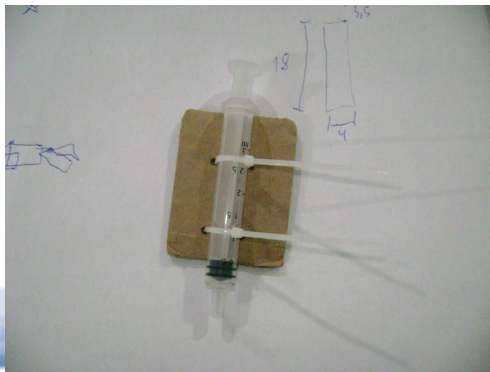
# Preliminary steps

- Make a rough sketch of your machine
- 3D CAD (not necessary but useful)
- Finalize the dimensions of each link and syringes
- Get the material
  - Wood or acrylic or metal frames
  - Tubes
  - Syringes etc.

Now you're ready to start the fabrication

# Some tips...

- Syringe mounting fixtures
- Keep some spare syringes
- Remove all the air bubbles while filling the tubes with water (it's the most annoying part :P)
- Prevent leakage at joints between tube and syringe
- Add different colours to distinguish links
- Practice



**Thank You!!!**