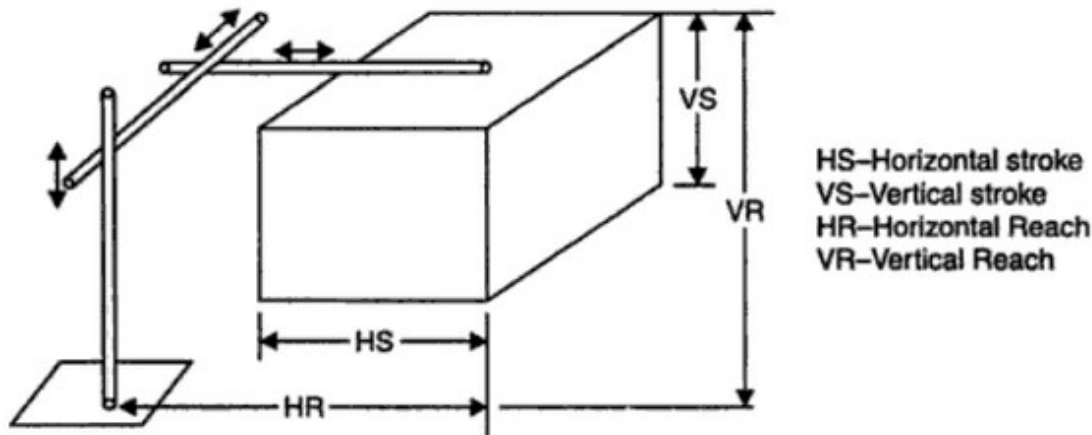


Introduction to Robotics

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- **Reachability:** reachability of a robot manipulator to a target is defined as its ability to move its joints and links in free space in order for its hand to reach the given target.



- A cylindrical coordinated robot has a vertical reach of 500mm and a stroke of 320mm. What is the minimum height of the work table to be to able the robot to reach the object kept on the table??
- Maximum vertical reach – stroke length

- Resolution: Least count of movement in incremental or decremented steps.
- Control Resolution :
- Mechanical Resolution :

- The telescopic arm of an industrial robot obtains total range of rotation of 120deg. The robot has a 12 bitt storage capacity for the axis. The arm fully extends to 1500mm and fully retracts to 750mm from the pivot point. Determine the robots control resolution (i) for the axis in degree of rotation and (ii) on linear scale in fully extended and retracted position.

$$\bullet A_c = \frac{\phi}{2^k} \quad 0.0293\text{deg}$$

$$\bullet S = H_{\max} - H_{\min} \quad 750\text{mm}$$

$$\bullet Rt = \frac{S}{2^k} \quad 0.183\text{mm}$$

- The mechanism connecting the wrist assembly is a twisting joint which can be rotated through 8 full revolutions from the start to end position. It is desired to have control resolution of 0.70deg at the least. What is number of bit storage capacity to achieve this resolution??

- Degree of rotation = $360^\circ \times \text{no. of revolution}$ 2880°

- $A_c = 0.70^\circ$

- $A_c = \frac{\phi}{2^k}$ $K = 12.006$

- An incremental shaft encoder with 2 emitter detector pairs and 1 slots around the circumference is used to monitor the angular position of a high speed motor shaft the precision of the load shaft is measured and found to be 0.05 deg per count. What is the gear ratio between high speed shaft and the load shaft??

- $A_C = \frac{2 \cdot \pi}{n Z 2^k}$

K= emitter pair

Z= Speed reduction ratio

n= no of slots

- $Z = \frac{360}{12 \cdot 0.05 \cdot 2^2}$



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