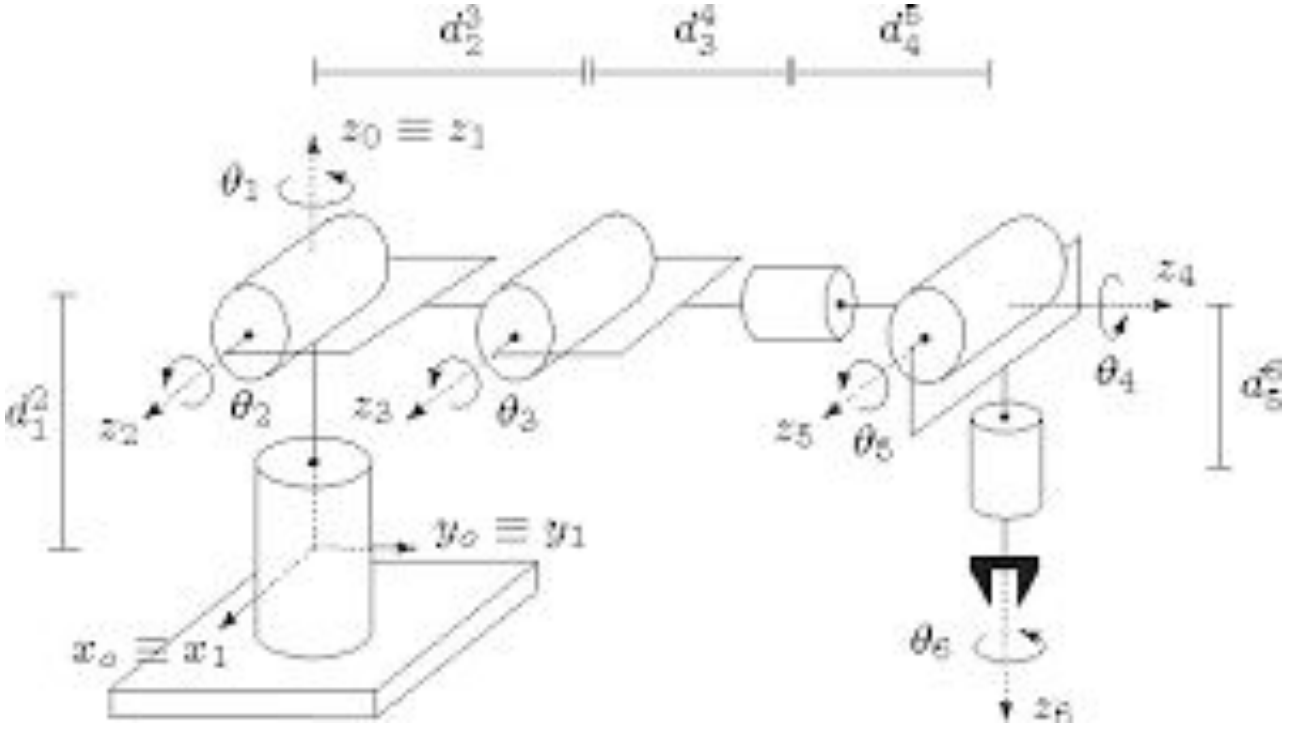
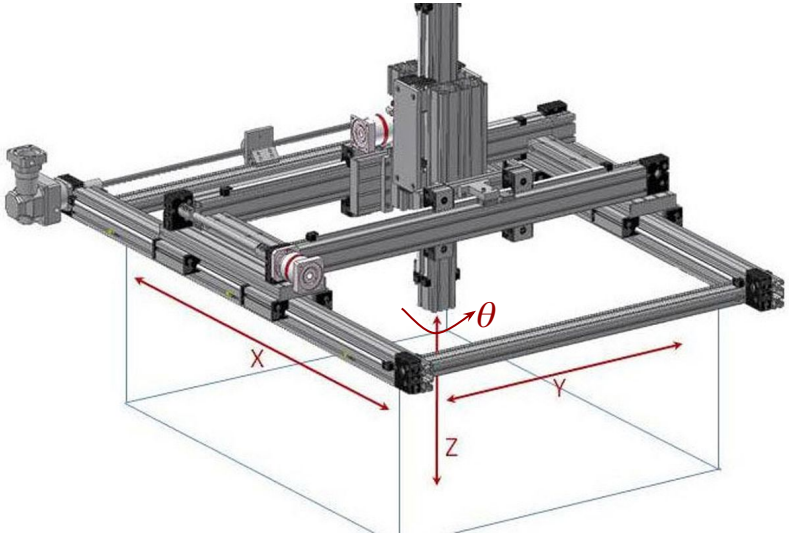
Elbow Manipulator

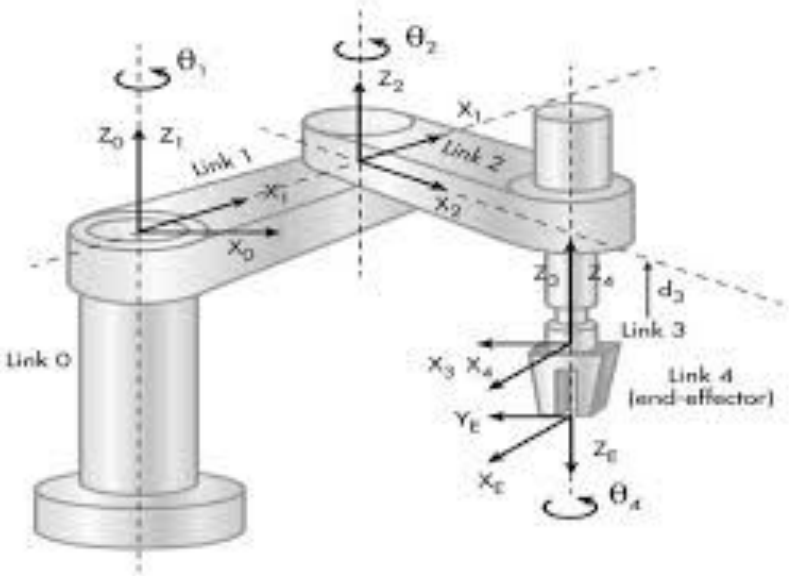


Some common singularities

Two robot designs for control in x,y,z,θ



Cartesian



SCARA

Invertible Matrix Theorem

The for an nxn matrix A, the following statements are equivalent:

- A is invertible
- The columns of A are linearly independent
- The reduced row echelon form of A is $I_{n \times n}$
- The rank of A is n
- The range of the rows is $\mathbb{R}^n$
- The range of the columns is $\mathbb{R}^n$
- A doesn't have a null space (only the zero vector)
- The nullity of A is zero
- The determinant of A is nonzero