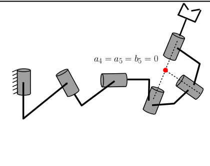
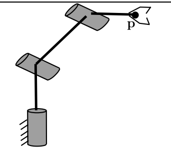
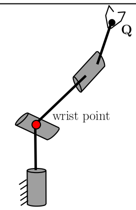
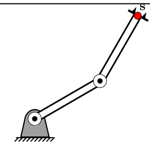
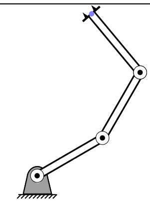
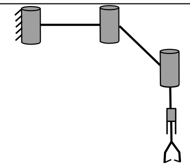
Manipulator	Cartesian Variable	Joint space	Cartesian velocity	IKP	Jacobian	Schematic
Spatial 6-DOF	$\mathbf{p}$, $\mathbf{Q}$	$\boldsymbol{\theta} = \begin{bmatrix} \theta_1 \\ \vdots \\ \theta_6 \end{bmatrix}$	$\mathbf{t} = \begin{bmatrix} \boldsymbol{\omega} \\ \dot{\mathbf{p}} \end{bmatrix} = \mathbf{J}\dot{\boldsymbol{\theta}}$	8 solutions if decoupled and 16 otherwise	$\mathbf{J} = \begin{bmatrix} \mathbf{e}_1 & \dots & \mathbf{e}_6 \\ \mathbf{e}_1 \times \mathbf{r}_1 & \dots & \mathbf{e}_6 \times \mathbf{r}_6 \end{bmatrix}$	
Spatial 3-DOF for positioning	$\mathbf{p}$	$\boldsymbol{\theta} = \begin{bmatrix} \theta_1 \\ \theta_2 \\ \theta_3 \end{bmatrix}$	$\dot{\mathbf{p}} = \mathbf{J}\dot{\boldsymbol{\theta}}$	4 solutions	$\mathbf{J} = \begin{bmatrix} \mathbf{e}_1 \times \mathbf{r}_1 & \mathbf{e}_2 \times \mathbf{r}_2 & \mathbf{e}_3 \times \mathbf{r}_3 \end{bmatrix}$	
Spatial 3-DOF for orientation	$\mathbf{Q}$	$\boldsymbol{\theta} = \begin{bmatrix} \theta_1 \\ \theta_2 \\ \theta_3 \end{bmatrix}$	$\boldsymbol{\omega} = \mathbf{J}\dot{\boldsymbol{\theta}}$	2 solutions	$\mathbf{J} = \begin{bmatrix} \mathbf{e}_1 & \mathbf{e}_2 & \mathbf{e}_3 \end{bmatrix}$	
Planar 2-DOF	$\mathbf{s} = \begin{bmatrix} x \\ y \end{bmatrix}$	$\boldsymbol{\theta} = \begin{bmatrix} \theta_1 \\ \theta_2 \end{bmatrix}$	$\dot{\mathbf{s}} = \mathbf{J}\dot{\boldsymbol{\theta}}$	2 solutions	$\mathbf{J} = \begin{bmatrix} \mathbf{E}\mathbf{r}_1 & \mathbf{E}\mathbf{r}_2 \end{bmatrix} \quad \mathbf{E} = \begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix}$	
Planar 3-DOF	$\mathbf{s}$, ϕ	$\boldsymbol{\theta} = \begin{bmatrix} \theta_1 \\ \theta_2 \\ \theta_3 \end{bmatrix}$	$\dot{\mathbf{t}} = \begin{bmatrix} \dot{\phi} \\ \dot{\mathbf{s}} \end{bmatrix} = \mathbf{J}\dot{\boldsymbol{\theta}}$	2 solutions	$\mathbf{J} = \begin{bmatrix} 1 & 1 & 1 \\ \mathbf{E}\mathbf{r}_1 & \mathbf{E}\mathbf{r}_2 & \mathbf{E}\mathbf{r}_3 \end{bmatrix}_{3\times 3}$	
Scara–4-DOF	$\mathbf{p}$, ϕ	$\boldsymbol{\theta} = \begin{bmatrix} \theta_1 \\ \theta_2 \\ \theta_3 \end{bmatrix}$	$\dot{\mathbf{t}} = \begin{bmatrix} \dot{\phi} \\ \dot{\mathbf{p}} \end{bmatrix} = \mathbf{J}\dot{\boldsymbol{\theta}}$	2 solutions	$\mathbf{J} = \begin{bmatrix} 1 & 1 & 1 & 0 \\ \mathbf{e}_1 \times \mathbf{r}_1 & \mathbf{e}_2 \times \mathbf{r}_2 & \mathbf{e}_3 \times \mathbf{r}_3 & \mathbf{e}_4 \end{bmatrix}$	

Table 1: Some serial manipulators with their kinemagtic properties.