

IP-rating:

| <u>IP Rating</u> | <u>Solid Object Size</u> | <u>IP Rating</u> | <u>Type of Water</u> |
|------------------|---------------------------------------|------------------|----------------------------------|
| IP1X | $\geq 50\text{mm}$ (1.97") diameter | IPX1 | vertical dripping |
| IP2X | $\geq 12.5\text{mm}$ (0.49") diameter | IPX2 | dripping (up to 15° tilt) |
| IP3X | $\geq 2.5\text{mm}$ (0.098") diameter | IPX3 | spraying (up to 60° angle) |
| IP4X | $\geq 1.0\text{mm}$ (0.039") diameter | IPX4 | splashing from any direction |
| IP5X | dust-protected | IPX5 | jets from any direction |
| IP6X | dust-tight | IPX6 | powerful jets from any direction |
| | | IPX7 | temporary immersion |
| | | IPX8 | continuous immersion |

robot-typer:

- scara (RRTR)
- kartetisk (TTT)
- artikuleret (RRRRRR)
- ...

Diverse sinus, cosinus og tangens + relationer:

dexterous workspace og reachable workspace

måder at beskrive orientation og position:

- rotationsmatricer

- Rotation about X

$$R_x(\theta) = \begin{bmatrix} 1 & 0 & 0 \\ 0 & C\theta & -S\theta \\ 0 & S\theta & C\theta \end{bmatrix}$$

- Rotation about Y

$$R_y(\theta) = \begin{bmatrix} C\theta & 0 & S\theta \\ 0 & 1 & 0 \\ -S\theta & 0 & C\theta \end{bmatrix}$$

- Rotation about Z

$$R_z(\theta) = \begin{bmatrix} C\theta & -S\theta & 0 \\ S\theta & C\theta & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

- transformationsmatricer
- euler angles

Extrinsic rotations:

- are **elemental rotations** that occur about the axes of **the fixed coordinate system**.

Intrinsic rotations:

- **elemental rotations** that occur about the axes of **the rotating coordinate system**, which changes its orientation after each elemental rotation.

- angle-axis
- quaternions

Forward/direkte kinematik:

- Denavit-Hartenberg parametre

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Invers kinematik:

- analytisk
- geometrisk

Trajectory generation:

- Jointspace vs Cartesian space
- Cubic polynomials
- Cubic polynomials with via points
- parabolic blend

Jacobian:

Singularities

Singular points are such values of θ that cause the determinant of the Jacobian to be zero

$$\det [J(\theta)] = 0$$

assorteret ting

- Korrekt højrehåndsregel (tommelfinger x, pegefinger y, lange finger z 😊)
- transformations matricer
- Transformationer mellem frames
- baneplanlægning
- Kunne forskellen på joint move og lineare move
- Rotations retning (højrehåndsregel)
- IP-rating (maybe?!?!?)
- Repeatability vs accuracy (hvad betyder disse)
- Baseskifte
- quaternions
- Parabolic blends + via points
- Cubic functions
- Forwards kinematics
 - Placering af link koordinatsystems + rotationsretning
 - DH parameters -> forwards kinematics model
 - Inverse kinematics model
- Typer af robotter etc scara
- Reachable of dexterous workspace
- Rotations repræsentationer
 - angle-axis
 - etc
 - etc
- cubic polynomials

- sketch angular position and angular velocity over time
- eccentric and intrinsic
- Jacobian
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