

# REP 103 { Standard Units of Measure & Coordinate Conventions }

⇒ We have chosen to standardize on **SI Units**.

## \* Coordinate frame Conventions

① All systems are right handed.

{ i.e. they comply with right hand thumb rule }

② In relation to a body the standard is:

X ⇒ forward

Y ⇒ Left

Z ⇒ UP

③ In the case of Cameras, there is often a second frame defined with a "-Optical" suffix.

This uses a slightly different convention:

→ Z ⇒ forward  
→ X ⇒ Right  
→ Y ⇒ down

## \* Rotation Representation

⇒ There are many ways to represent rotations.

⇒ The preferred order is:

① Quaternion

② Rotation matrix

③ fixed axis roll, pitch, yaw about X, Y, Z axes respectively,

④ Euler angles yaw, pitch, and roll about Z, Y, X axes respectively.

Counterclockwise rotation  $\Rightarrow$  +ve

### \* Covariance Representation

① linear

$\rightarrow$   $3 \times 3$  row major matrix in X, Y, Z order.

② Angular

$\rightarrow$   $3 \times 3$  row major matrix about X, Y, Z order with fixed axes.

③ Six Dimensional

$\rightarrow$  Row-major representation of the  $6 \times 6$  Covariance matrix.

$\rightarrow$  In order, the parameters are:

$\left\{ \begin{array}{l} X, Y, Z, \text{ rotation about X axis,} \\ \text{rotation about Y axis, rotation about Z axis} \end{array} \right\}$

