유자차

Unbelievable 자율주행 자동차

TI DSP, MCU 및 Xilinx Zynq FPGA 프로그래밍 전문가 과정

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Ch5. Non-inertial frame

Analytical Mechanics.7th(Grant R. Fowles. George L. Cassiday)
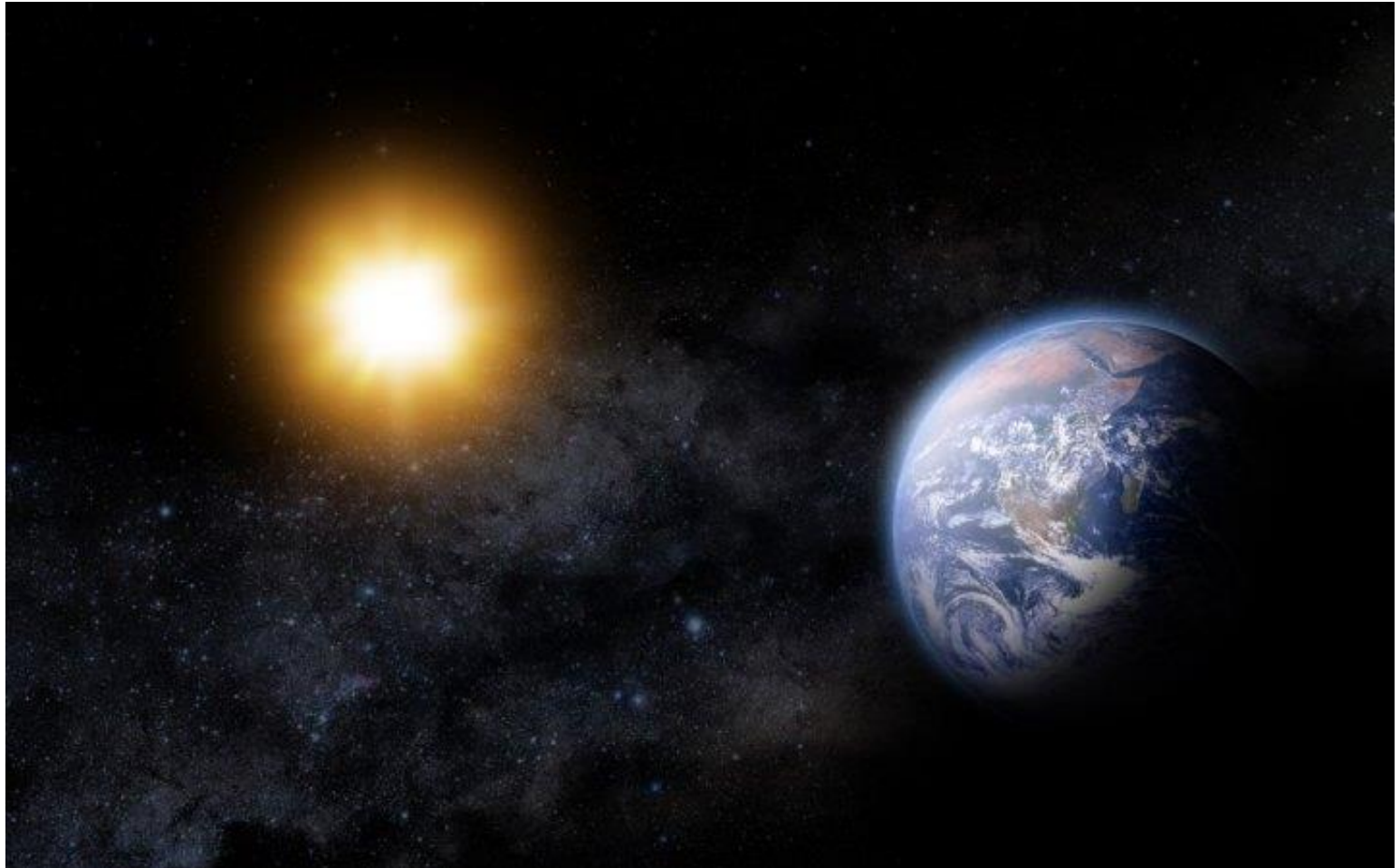
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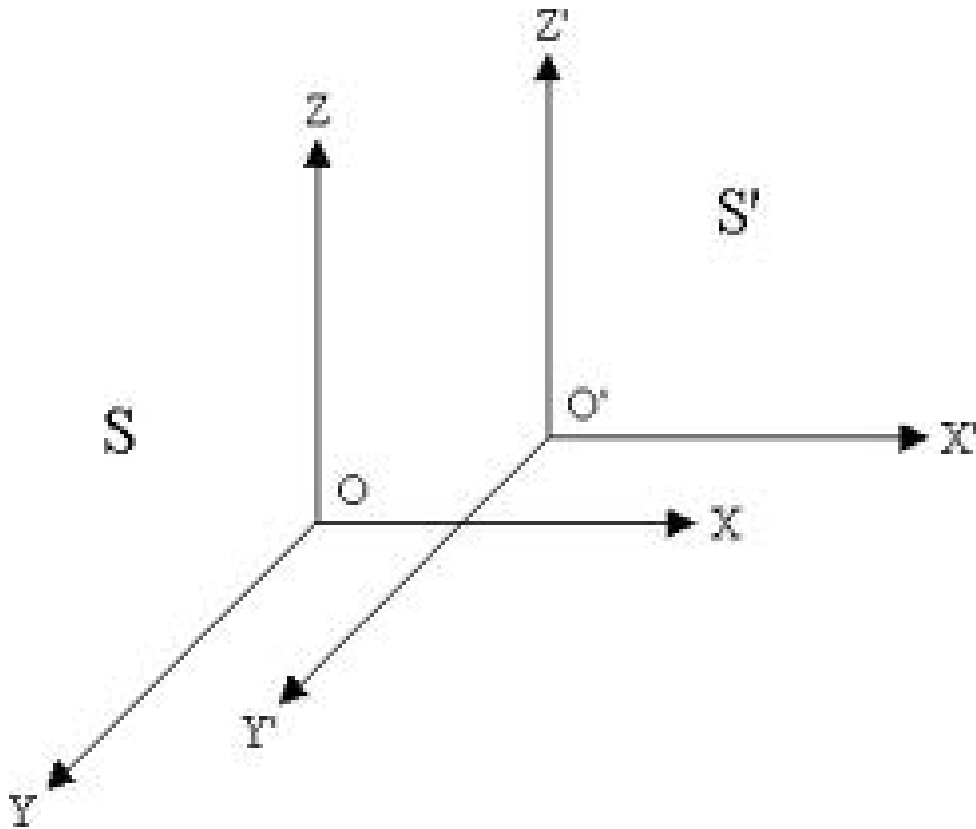
A frame of reference

Inertial frame.

Non – inertial frame.

Check this video which is about coordinate system illustrated on robot arm.

Video

Translation motion

$$\vec{r} = \overrightarrow{R_0} + \overrightarrow{r'}$$

$$\vec{v} = \overrightarrow{V_0} + \overrightarrow{v'}$$

$$\vec{a} = \overrightarrow{A_0} + \overrightarrow{a'}$$

$$\vec{r} = \vec{R_0} + \vec{r'}$$

$$\vec{v} = \vec{V_0} + \vec{v'}$$

$$\vec{a} = \vec{A_0} + \vec{a'}$$
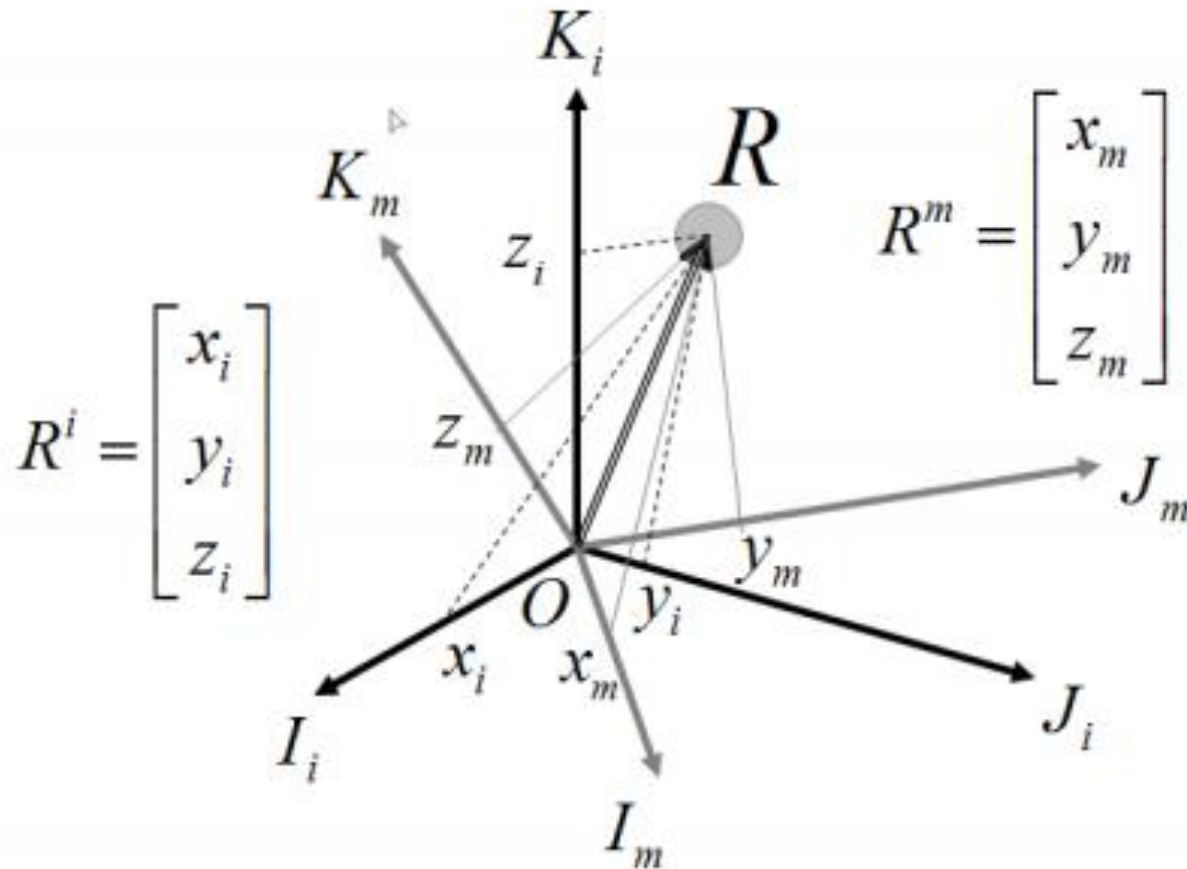
$$if \; \vec{A_0} = 0, \; m\vec{a} = m\vec{a'}$$

$$if \; \vec{A_0} \neq 0, \; m\vec{a} = m\vec{A_0} + m\vec{a'}$$

$$\therefore \vec{F} = \vec{F'} + (-m\vec{A_0})$$

$-m\vec{A_0}$: fictitious force

Rotation motion

- $\vec{v} = \overrightarrow{v'} + \vec{\omega} \times \overrightarrow{r'}$
- $\vec{a} = \overrightarrow{a'} + \dot{\omega} \times \overrightarrow{r'} + 2\vec{\omega} \times \overrightarrow{v'} + \vec{\omega} \times \left(\vec{\omega} \times \overrightarrow{r'}\right)$

Translation & Rotation

$$\vec{v} = \overrightarrow{v'} + \vec{\omega} \times \overrightarrow{r'} + \overrightarrow{V_0}$$

$$\vec{a} = \overrightarrow{a'} + \dot{\omega} \times \overrightarrow{r'} + 2\vec{\omega} \times \overrightarrow{v'} + \vec{\omega} \times \left(\vec{\omega} \times \overrightarrow{r'}\right) + \overrightarrow{A_0}$$

Reference

1.https://www.youtube.com/watch?v=LBGEGiIB3iU

2.http://physicsrebel.blogspot.com/2012/02/inertial-frame-of-reference.html

3. http://nisl.kau.ac.kr/easy1.pdf