F14

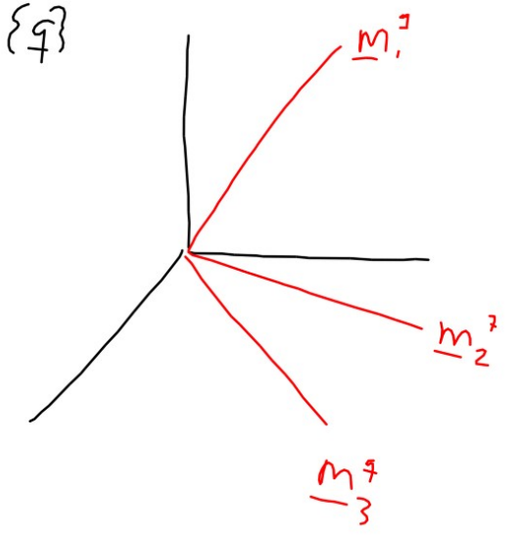
Lecture F15 - Repetition
— Questions
Monday 2. des 13:15–16:00

Exam: Oral
12. dec (Thursday)
16. dec (Monday)

Dadline for assignment: 1. Dec

Contact me at: anders.rodningsby@ffi.no

... continuation from L13, p. 11 :



$$\underline{X}^q(t) = M_m^q \underline{X}^m(t) = \underline{m}_1^q x_1^m(t) + \ldots + \underline{m}_n^q x_n^m(t)$$
$$= \underline{m}_1^q e^{\lambda_1 t} x_1^m(0) + \ldots + \underline{m}_n^q e^{\lambda_n t} x_n^m(0)$$

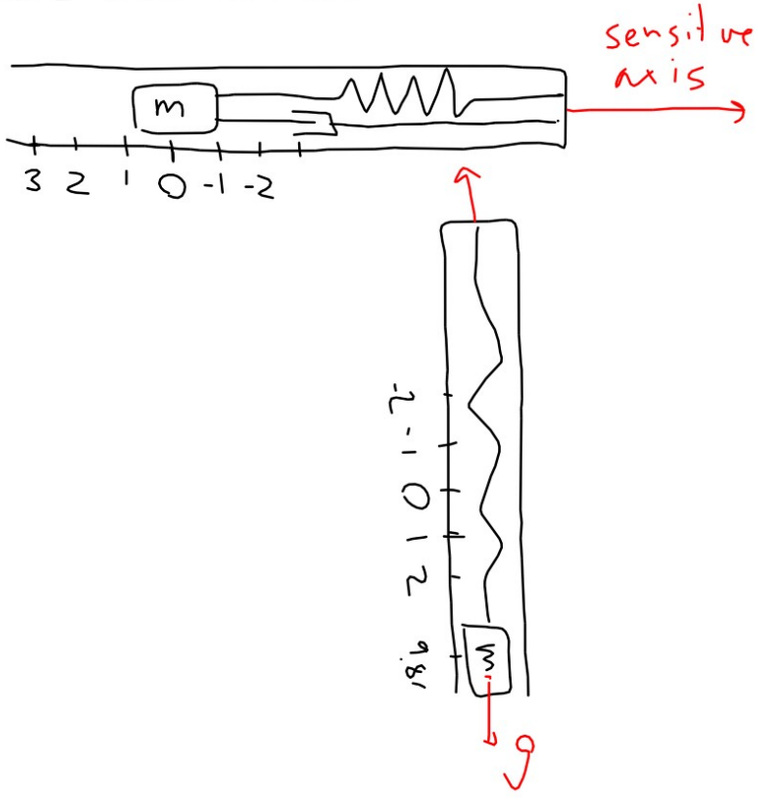
$M_m^q = \left[\underline{m}_1^q, \underline{m}_2^q, \underline{m}_3^q\right]$

NB! We have assumed <u>distinctive</u> eigenvalues
=> linear independent eigenvectors. But we can have complex conjugated eigenvalues (which gives complex eigenvectors).

In the figure we have assumed that all eigenvalues are also real.

Part E: Inertial navigation system (INS)

Accelerometers

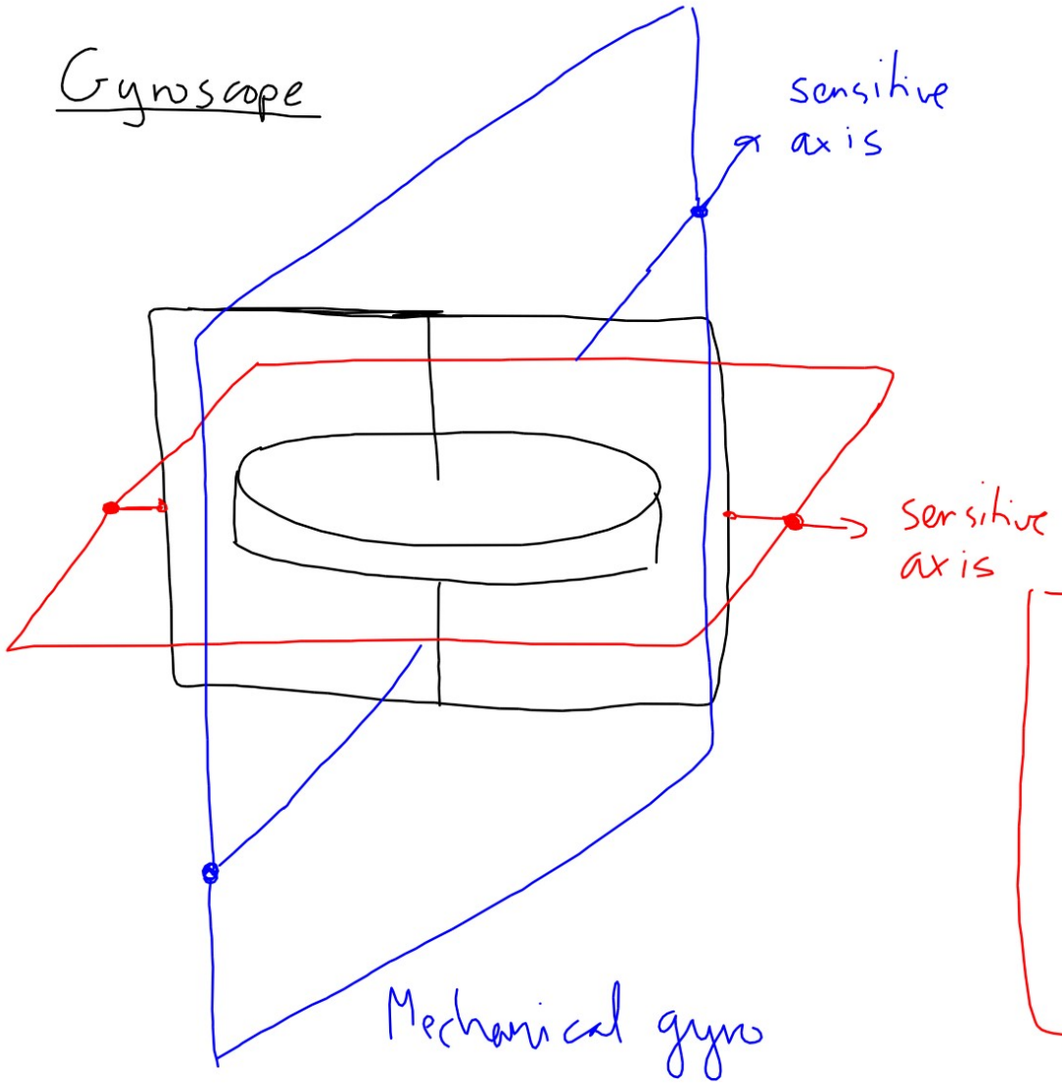


Measure specific force:

$$\underline{f}^a = \underline{a}^{i\,i\,a} - \underline{g}^a$$

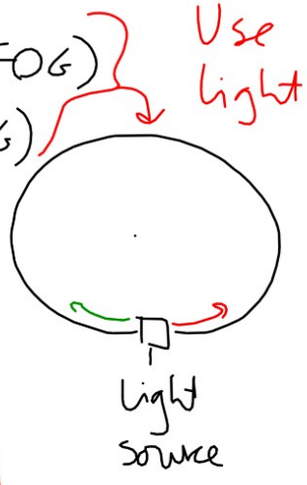
$$\underline{a}^{i\,i\,a} = \underline{f}^a + \underline{g}^a$$

Gyroscope



Types of gyros

Mechanical gyro
Fiber optical gyro (FOG)
Ringlaser gyro (RLG)
MEMS



Measure $\vec{\omega}_g^{\,"} - \underline{\omega}_g^{\,"g}$

We know:

$$\dot{R}_g^{"} = R_g^{"} \leq (\underline{\omega}_g^{"g})$$

Navigation equations

$\mathcal{F}^b = \mathcal{F}^a = \mathcal{F}^g$ – body frame

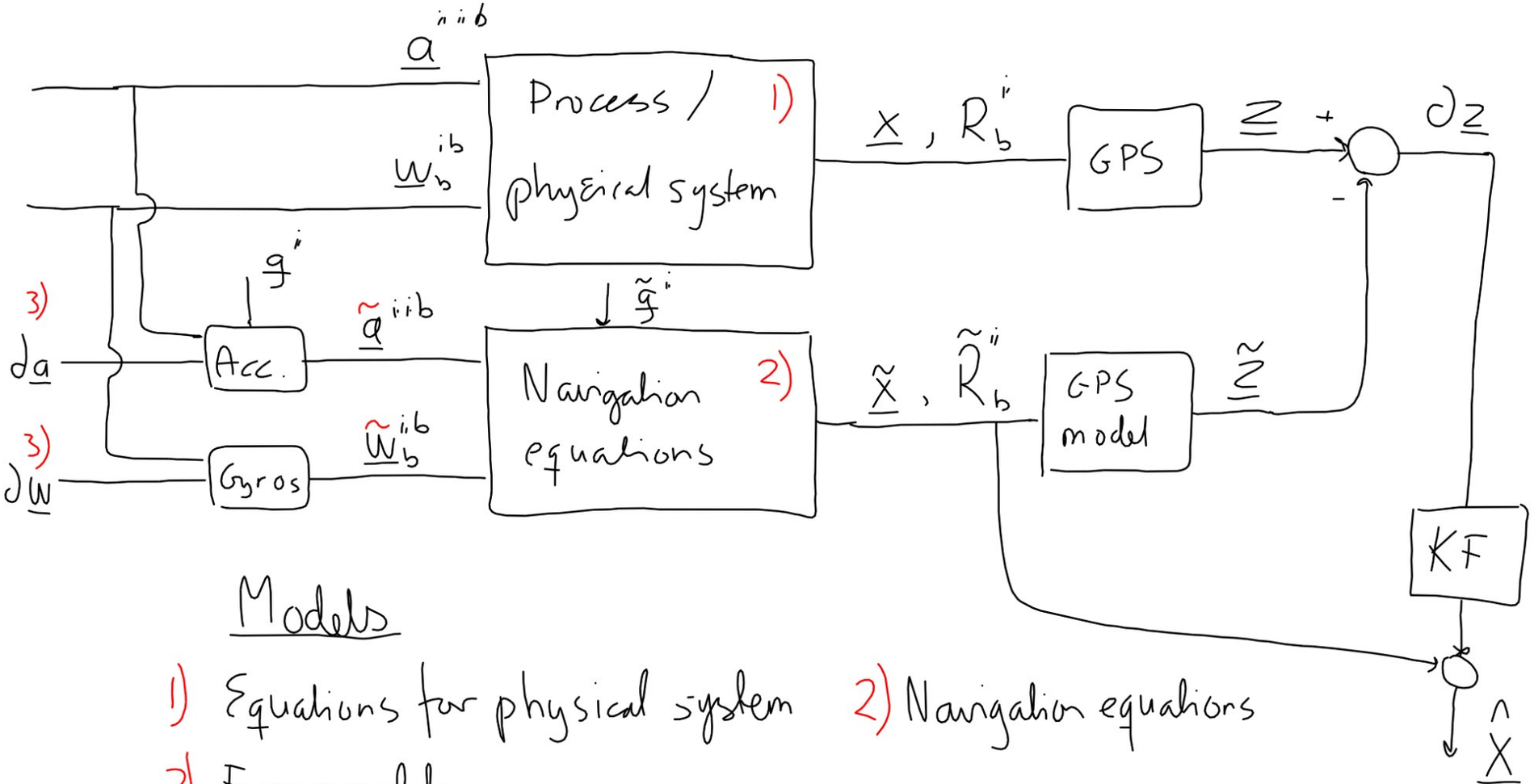
$$\dot{\tilde{p}}^{i} = \tilde{v}^{i}$$

$$\dot{\tilde{v}}^{i} = \tilde{R}_b^{i}\,\tilde{f}^{b} + \tilde{g}^{i}$$

$$\dot{\tilde{R}}_b^{i} = \tilde{R}_b^{i}\, S\left(\tilde{\omega}_b^{i,b}\right)$$

$\tilde{(\,)}$: Measured values

$\hat{(\,)}$: Calculated values



Models

1) Equations for physical system
2) Navigation equations
3) Error models

END OF PENSUM

Pensum:
* Part A and B
* INS