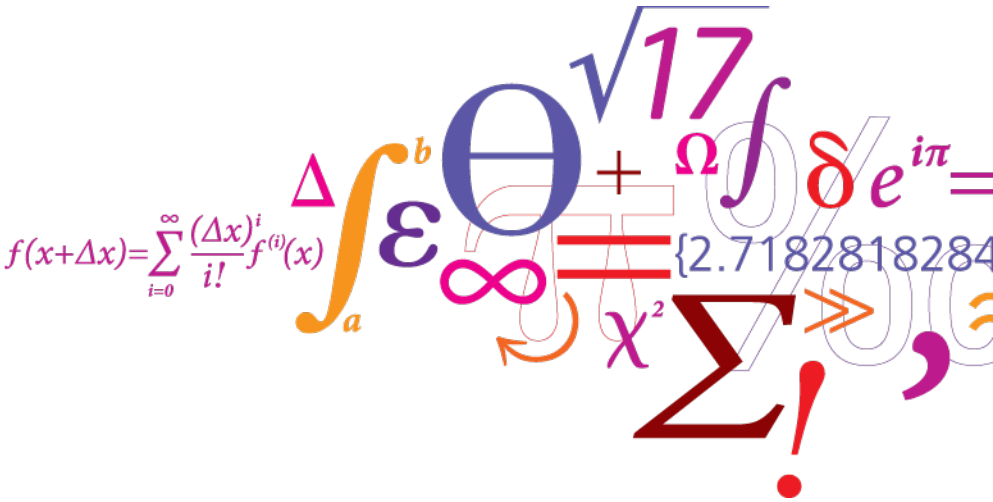
Mandatory Assignment 2022
Part A

31320 Introduction to Mandatory Assignment – Part A



DTU Electrical Engineering
Department of Electrical Engineering

Scope and goal of the assignment

Goal

- Solidify acquired knowledge by designing a fault-tolerant system.
- Have fun by applying learnt FDI/FTC algorithms on a real system.

Scope

- Questions cover most of the course material.
- Simulations and experiments.

Scope and goal of the assignment

The system to be studied is a three-mass vertical drive train.

- Drive trains are common in industry (machine tools, wind turbines etc.).
- Intuitive dynamics – motion transfer.
- Challenging control, estimation and diagnosis topics.

ECP M502a torsional system

- Three disks connected via a shaft.
- Three angular position encoders.
- One actuator at the bottom disk (BDCM).
- Control objective: positioning of top disk.

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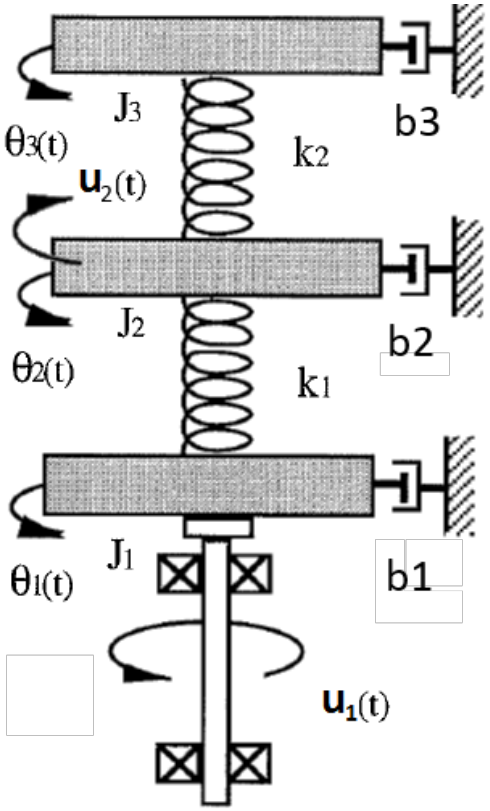


….but faults happen….

FTC objective: detect, evaluate and accommodate faults occurring on the ECP M02a.

Experiments

- Interface through Matlab/Simulink.
- Simple transfer of blocks from the simulator.
- ~1/2 hour of availability of the test rig per group.

Experiments

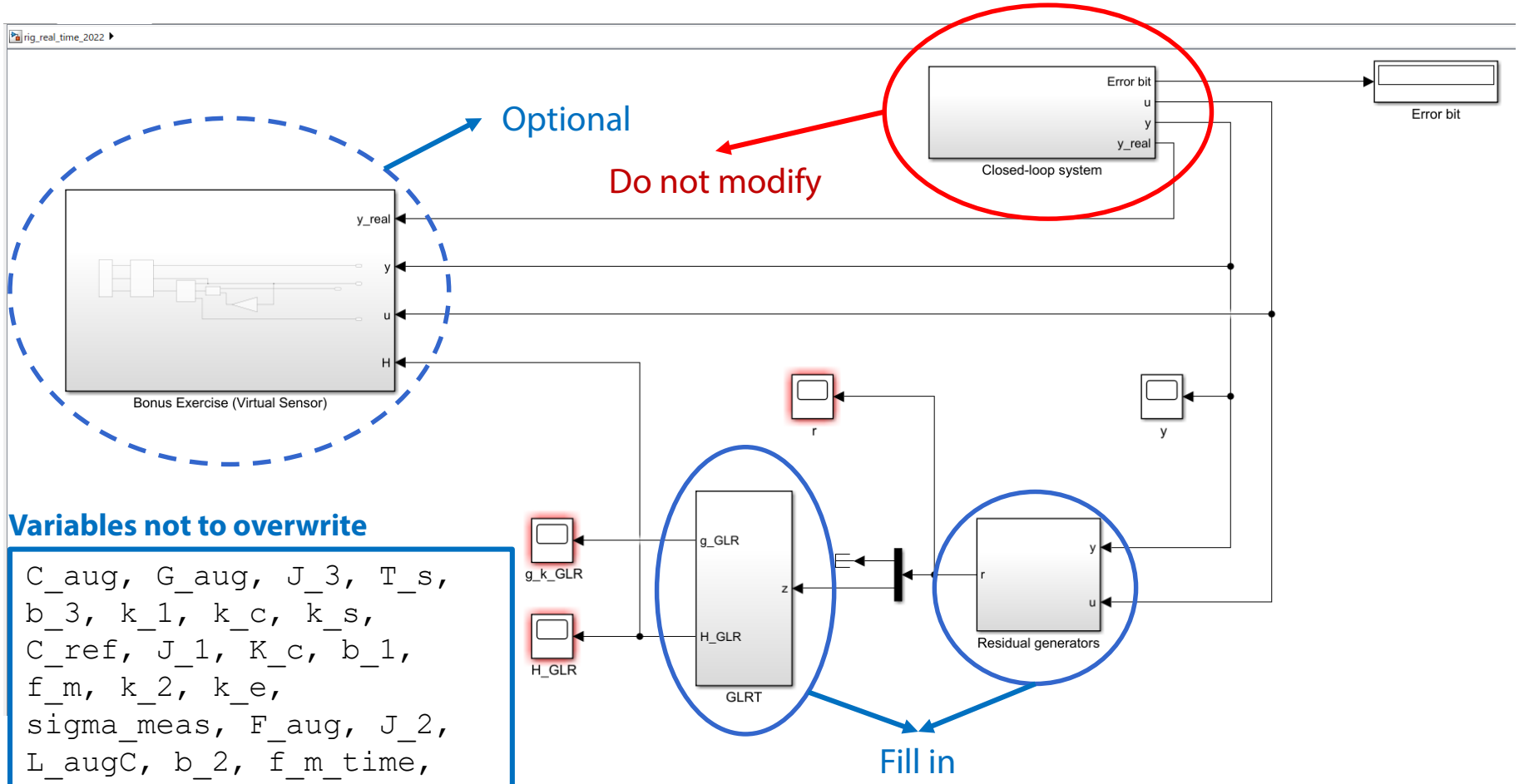
We give

- Simulink Model, state-feedback controller, observer.
- Initialization script
- Fault and noise emulation.

We ask for

- Residuals, GLR and virtual sensor blocks (last one is an optional)
- Testing of the residuals on the system and relevant plots in the report.
- No intervention in the control loop ☺
- Just bring your residuals/GLR blocks and the scripts/variables needed!

Experiments



Variables not to overwrite

```
C_aug, G_aug, J_3, T_s,
b_3, k_1, k_c, k_s,
C_ref, J_1, K_c, b_1,
f_m, k_2, k_e,
sigma_meas, F_aug, J_2,
L_augC, b_2, f_m_time,
k_atp, k_hw, w_0
```

Assignment logistics

- All results compiled in a single report (Max 20 pages).
- Quality of report heavily contributes to the evaluation.