**Lab 01 – System identification**

check the journal paper

1. Identify (a) the control goal, (b) the inputs and outputs, (c) the actuators and sensors, and (4) sampling rate of the system.
2. Perform system identification (using sine sweep) to derive a discrete-time model P(z). Please compare your model P(z) and TA's model $P_a(z)$ w.r.t. step response and frequency response.
3. Design, analyze, and verify (just simulation, no implementation yet) a controller to track a 400 Hz sine wave. You should apply the direct digital control design, i.e., using the discrete-time model you derive in 2 to design a discrete-time controller C(z) directly. Never use c2d command.
4. Hand in a written report that includes the discussion made on your results.

**Bonus:** Implement the controller C(z) you design in 3.

**Notation: DAVI**

- "Design" means that you probably use root locus approach or SISO tools on the plant model
- "Analyze" means that you will consider stability, transient response (rise time, peak time, overshoot, settling time for step response), steady state response (Bode plots of sensitivity function, and Complementary sensitivity function), and robust stability (phase and gain margins, vector gain margin, and closed loop complementary sensitivity w.r.t. uncertainty bound Wr)
- "Verify" means that you perform simulation on more accurate plant models (given by TA) to verify your design and compare to the results of analysis.
- "Implement" means that you realize the control and analyze the results and compare to analysis and verification.