Sensing, Computing, Actuating
Lecture 12 - Acoustic Transducers

This instruction exercise consists of three questions that show example questions related to the lecture on acoustic sensors and actuators. In preparation for the exam you should of course not only study these questions, but also the examples shown on the lecture slides.

Exercise 1: Acoustic sensors and actuators

(a) What is the difference between a direct and a complex sensor?

(b) What is the difference between an active and a passive sensor?

(c) Explain the operation of an electret microphone.

(d) Can a piezoelectric sensor be used to sense a static force?

(e) Explain how you can use a piezoelectric material to build a ultrasonic actuator. Add a drawing to your explanation in which you show where the electrical signal should be connected and where the mechanical (sound) signal will be generated.

(f) A piezoelectric material can be used to build transducers that transform signals between the mechanical and electrical domain. Pyroelectric materials can be used to bridge two other signal domain. Which signal domains are those?

(g) A pyroelectric sensor can be connected to a voltage follower or to a current-to-voltage follower. You want to use one of these signal processing circuits in an alarm system to detect a burglar. Which signal processing circuit would you use? (Explain your answer)