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Binary Systems Excercise

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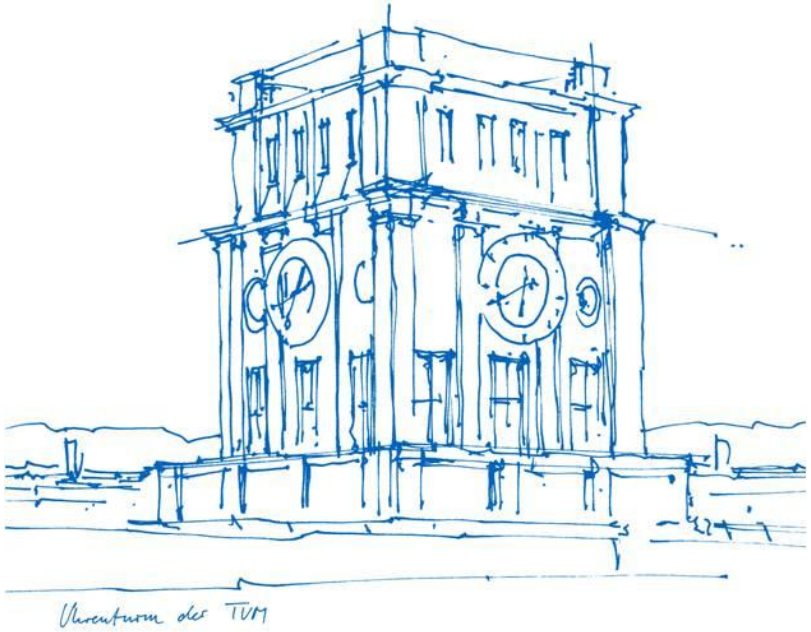

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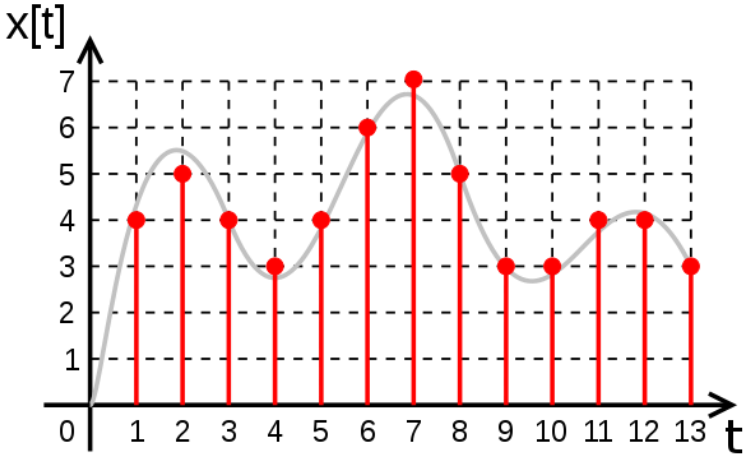
Excercise binary systems / analog-to-digital converter

You want to buy a new digital livestock scale for your cattle. Inside of this scale, an analog-to-digital converter translates the analog signal of the scale (weight of cow) into a digital signal (binary code). The measuring range is between 0 kg and 1.000 kg.



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Excercise binary systems / analog-to-digital converter

You want to buy a new digital livestock scale for your cattle. Inside of this scale, an analog-to-digital converter translates the analog signal of the scale (weight of cow) into a digital signal (binary code). The measuring range is between 0 kg and 1.000 kg.

a) How much is the weight difference between two possible display values of the scale, when you use a 6 bit or an 8 bit converter?

b) Cow „Berta“ from our research farm Veitshof is our object of interest (live weight: 650 kg). Which weight does each of the two different scales (6bit / 8 bit) show?

c) So what do you have to take into consideration when choosing an analog-digital-converter for your farm/IoT-projects?

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Solution

a)
6 bit: $2^6 = 64$ -> 1.000 kg/64 bit = 15,625 kg/bit;
8 bit: $2^8 = 256$ -> 1.000 kg/256 bit = 3,90625 kg/bit

b)
6 bit: x= 650 kg/(15,625 kg/bit) = 41,6 bit ~ 42 bit -> 42 bit = 656,3 kg display value;
8 bit: x= 650 kg/(3,90625 kg/bit) = 166,4 bit ~ 166 bit -> 166 bit = 648,4 kg display value

c)
In this case an analog-to-digital converter with a higher resolution is always beneficial. However for IoT projects sometimes price and the limitations of the sensor are also considerations, as well as the inbuilt a-d-converters of some hardware (e.g. raspberry/arduino input pins)