

BME 301

6-Signals and Systems

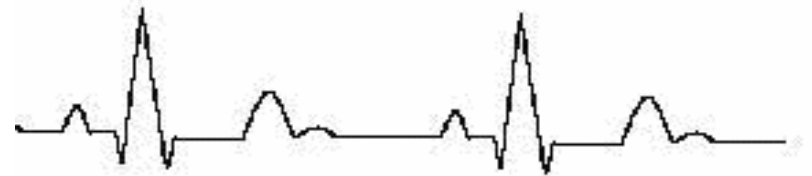
Homework

1. For the ECG signal following

- a. What is the minimum sampling rate for the following periodic signal?
- b. What would be a good sampling rate to choose to ensure that all of the necessary features were captured?

Period: 1 sec

Smallest detail: 0.0005 sec



- a. Smallest detail is 0.0005s. Let's assume that is $\frac{1}{2}$ the period of a sinusoid. So the period of the highest frequency is 0.001 sec and then it's frequency is then $1/0.001=1,000\text{Hz}$. Using the sampling theory the smallest sampling rate is 2000 s/s.
- b. If there is a higher frequency than 1k Hz, then let's sample at a higher rate so as not to miss this. So let choose 10x greater of 10,000s/s.

Homework

2. Describe the benefits of Digital Designs vs Analog Designs.

Digital designs are less impacted by noise than Analog Designs. More data can be carried using digital designs.

3. In the Design process what governs the design?
The Customer Needs drive everything.

4. What is the purpose of documentation during the design process?

To insure: that the design is of high quality since the documentation is reviewed by stakeholders, can be used to train newcomers, and can be used to document the system and develop customer documentation.

Homework

5. HONORS STUDENTS ADD THE FOLLOWING

For the typical human voice spectrum what would be the minimum sampling rate? Assuming data is transmitted using 10 bits/sec, how many levels are needed to converted the voice signal from analog to.

The typical maximum voice frequency is 4kHz.

Using Nyquist Rate $2 \times f_{\max} = 8000$ samples/sec.

If using 10 bits to capture each sample, then the number of levels is $2^{10} = 1024$ levels.