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author: Šimon Stupinský (xstupi00)
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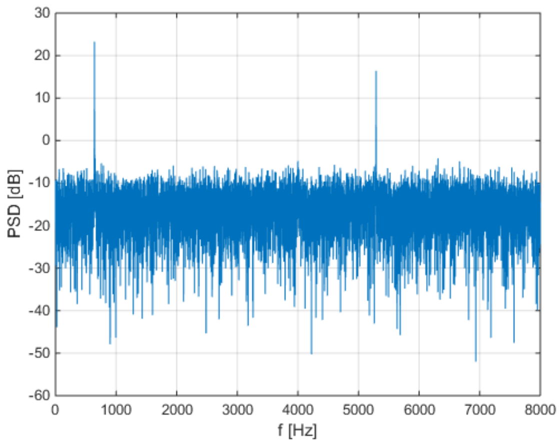
1. The signal was loaded by function *audioread.* Using this function were detected relevant properties of signal. The **sampling frequency** is **16 000 Hz**. With the use of function *length* was determined **length of signal,** which is **1 second**. Signal has **16 000 samples**.

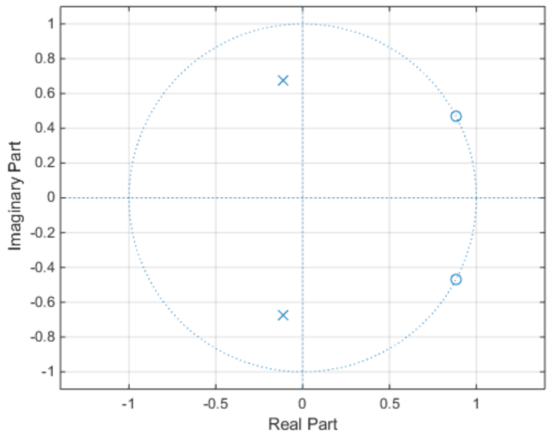
2. Calculation of the **signal spectrum** using a discrete **Fourier transform** was done by function *fft.* Frequency axis is in **Hz** and its extent is halfway through the sampling frequency, i.e. **8000 Hz. Spectral power density** was used for better display.



Picture 1: Signal spectrum by DFT

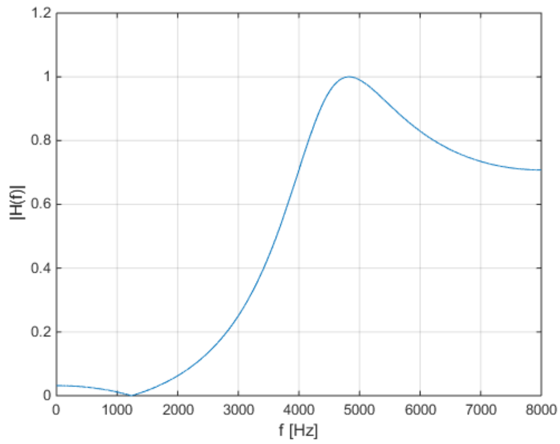
3. Maximum of signal spectrum is situated on the frequency **643 Hz**. To obtain this value was used function *max*. In the *Picture 1* we can see approximately the view that **maximum.**

4. With the filter from the specification was created a **graph with zeros and poles.** To render it's was use function *zplane.* It is a **stable filter**, because all poles are inside a unit circle. Function *istable* was used for this verification.



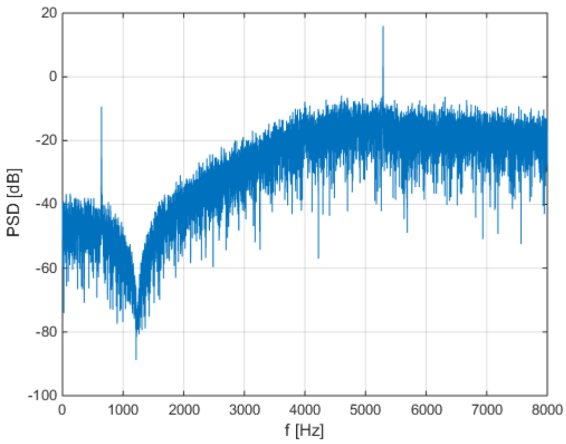
Picture 2: Unit circle with zeros and poles

5. To obtain the **frequency characteristics** of this filter was used function *freqz.* The plot of the **frequency characteristics** module can be seen on the picture. From this graph we can deduce that it is **high pass filter,** because it keeps **high frequencies**. The axis frequency is the same as for exercise 2.



Picture 3: Module of frequency characteristics

6. The signal was filtered by the filter from the specification, using the function *filter*. The next steps were the same as in the exercise 2.

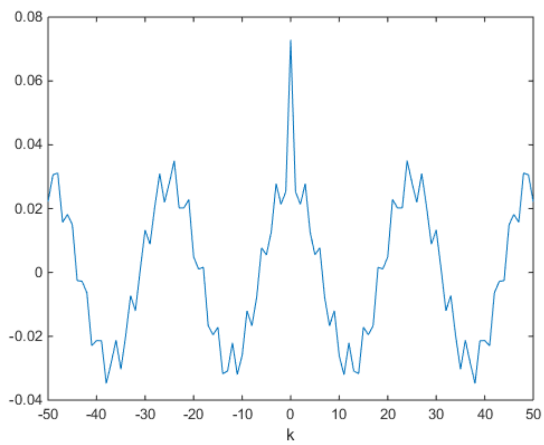


Picture 4: Spectrum of filtered signal by DFT

7. Maximum of filtered signal spectrum is situated on the frequency **5290 Hz.** The calculation procedure was as described in the exercise 3.

8. Using the function *repmat*, was created a signal 20ms of **square wave**. The new signal was generated at **4 kHz**, which means that **80** sequences. The originally signal was correlated with the newly formed, comparing the lengths of **20ms**. For **correlation** was used function *corrcoef*, which returns coefficients between two variables. In the our case, the variable was represented in the form of the signal, respectively the absolute value of the result of the discrete **Fourier Transform**, i.e. result the function *fft*. After comparing the whole signal, was found **coefficient of beginning** of 20ms **square wave**, which starting from time **3143 in samples**, what's the real time **0.196437 second**.

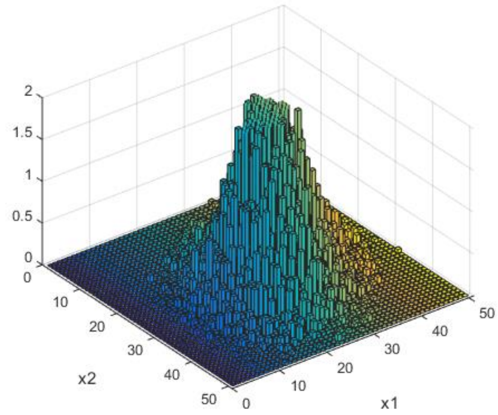
9. For computation **autocorrelation coefficients** was used **deflected estimate** with the use of functions *xcorr* with parameter *biased*. Coefficients were computed for *k from -50 to 50*.



Picture 5: Autocorrelation coefficients

10. On the basis of the calculations of exercise 9, we obtained the specific **autocorrelation coefficient R[10]**, who value is **-0.0260493.**

11. The following three exercises are based on the use of the *hist2opt*, which is part of the last phase study materials of the project. Calling the function *linescape* feature creates a **50-digit vector**, which represent individual intervals. We passed the **original signal** and examined the *n-th* and *(n+10)-th* specimens. Using the function *bar3* was rendered the probability space in 3D projection.



Picture 6: Joint probability density function

12. The *hist2opt* also validates the resulting interval whose value should be **1**. The value obtained is **0.99938**, which was created by addition all probabilities. Obtained result shows, that it is correct associated **density function of probability distribution**.

13. Value of autocorrelation coefficient **R[10] = -0.02604** slightly differs from value computed before, because it was just an estimation of R[10].