

LINEAR ALGEBRA

MATLAB HOMEWORK 3 (INVERSE PROBLEM)

Prof. Cheolsoo Park

HOMEWORK

- Please look into an 'inverse problem' and summarize its details including below
 - General idea of the **inverse problem** including **linear and nonlinear** inverse problems
 - Theory of a **linear inverse problem**
 - Example of the linear inverse problem
- Please prepare a report about the details above, considering
 - Minimum 2 pages
 - Font size 10
 - Double column
 - ***In English***
 - Include references
 - You can add some figures for a description, but not more than 3
- Plagiarism will be checked using 'CopyKiller', and a report over **20%** copy rate will be considered plagiarism, meaning '0' score

TOY EXPERIMENT

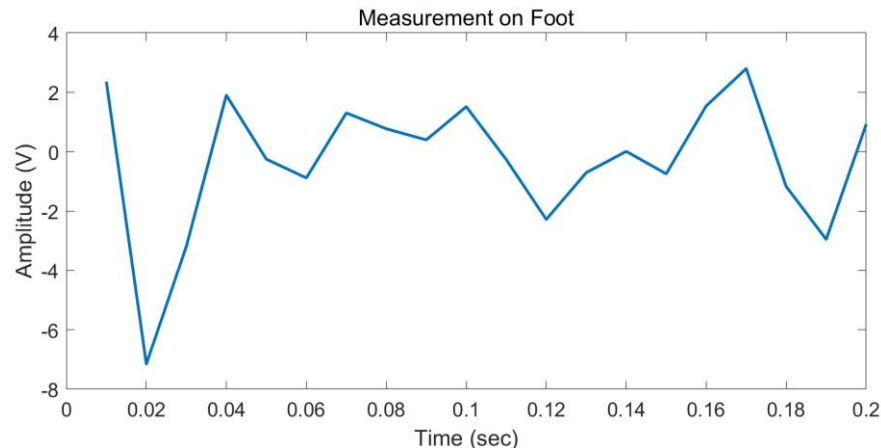
- For the body composition analysis, we send 20 sinusoidal signals into a person's hand (see the figure on the right), where the intensities of all sinusoids are '1' and their frequencies varies from 11Hz to 30Hz. In addition, the number of data points are 20 varying from 0.01s to 0.2s.

```
t=0.01:0.01:0.2;  
freq = 11:30;  
cos(2*pi*freq(i)*t)
```



TOY EXPERIMENT

- Then, we measure a signal on the other body part, foot, which is a composite signal of the transferred 20 sinusoids through the person's body. You can see the measured signal below and also in the provided file 'output.mat'.



- Consider the output as a linear combination of the 20 sinusoids with 'absorption rates' for the different frequency components, which is defined by the person's body components.
- With the 'linear inverse problem' approach, find the '**20 absorption rates**' of the person's body for the 20 frequency sinusoids.

TOY EXPERIMENT

- Find the **20 absorption rates** with implementing MATLAB code using the '**slu**' and '**slv**' functions from **your 'Homework 2' MATLAB code**. **You should use your own code!** In addition, please compare your results using the **MATLAB built-in function 'inv()'**.
- In the MATLAB code, you should add comments for every single line to explain your codes.
- In a separate report, explain how you estimate the absorption rates using the linear inverse problem method.
- **Submit a '.zip' file**, which includes all the MATLAB codes, data, and your report files.
- File name should include your student number and name like
'2020123456_홍길동_assign3.zip'
- You can write the ***report in Korean about this toy experiment.***
- But you ***must write the previous report about the 'investigation of a linear problem' in English*** as I have mentioned in the first slide.