Scientific Visualization Exercise 1

Problem 1

Problems with the visualisation:

- The y-scale starts at 50%. This leads to the visual impression, that the gain between the normal and sli version is greater than 2, which is wrong in all cases.
- The distance between the bottom line (50%) and 100% is as high as the distance between 100% and 150%.

Problem 2

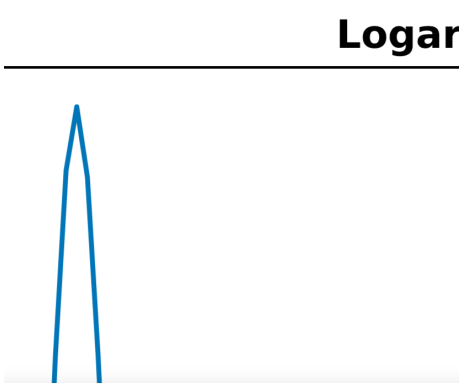
- CT:
  - One slice needs: 512 * 512 * 2 bytes = 524.288 bytes
  - The whole dataset needs 112 * 524288 bytes = 58.720.256 bytes
- 3D CFD:
  - 3 integer values containing the dimension of the data needs: 3 * 4 bytes
  - Each sample point needs:
    - 3 * 4 bytes for the values of 3 coordinates of type `float`
    - 3 * 8 bytes for the three components fo the velocity vector of type `double`
    - 8 bytes for the pressure of type `double`
  - There are 108 * 55 * 63 sample points

    So the dataset size is: 3 * 4 bytes + (108 * 55 * 63) * (3 * 4 bytes + 3 * 8 bytes + 8 bytes) = 16.465.692 bytes

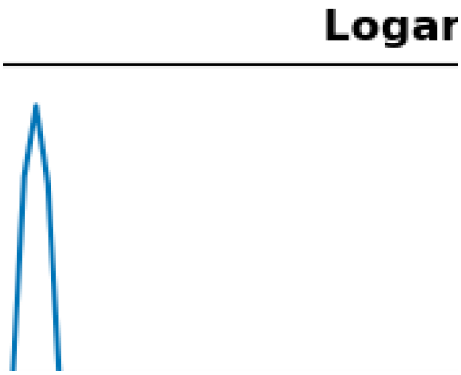
Problem 3

Problem 4

- source code **problem4.py**, visualisation stored in **problem4.pdf**
- Using bitmap files like PNG or JPEG is not a good idea for saving the visualization, because they do not scale well. These files should be always printed at the resolution, which they are originally stored. Trying to i.e. expand them through pixel replication or simple zoom-in can change the image, in which they are more badly visualized. The following 2 figures show the difference as well as the disadvantage of using bitmap files when we try to zoom in the figure of problem 4, one is saved in PNG, one is saved in PDF.



(a) Zoom-in image from image saved in PDF



(b) Zoom-in image from image saved in PNG

Figure 1: Zoom-in image of *Logarithmic scaling*

Problem 5

source code **problem5.py**, visualisation stored in **problem5.pdf**

Problem 6

source code **problem6.py**, visualisation stored in **problem6.pdf**