Optional homework for topic solved in Lecture 2:

(Energy, power, LTI system response to a signal, moving average filter)

Matlab I:

- Using *energy thresholding* create simple *voice activity detector*
  - Set the free parameters (threshold, length of moving average filter - MA) experimentally using a *development* signal in a file *DSVowels.wav*
  - Then record your own short *test* recording of speech (approx. 20s). It should contain several pauses a be recorded in a silent environment (VAD is based upon an assumption that the speech is louder than the noise). Using this recording, verify the functionality of your VAD.
  - Algorithm:
    - Subtract the magnitude shift of the signal (average value, *mean()*)
    - Compute the instantaneous power of the signal ($p[n] = s[n]^2$)
    - Smooth the power waveform using MA filter of length about L=1000
      - Impulse response of the MA: $h[n]=(1/L)\cdot(u[n]-u[n-L])$,
      - Use commands *conv()* or *filter()* to apply the filtering,
      - Note that: MA filtering introduces shift into the power waveform, specifically L/2 samples
    - Determine some suitable threshold. Where is the smoothed instantaneous power greater that the threshold, the speech signal is considered active.
    - Visualize the results (see figure for inspiration)
- Evaluation criteria
  - Functionality/runable + correctness of solution
  - Comments in code
  - Originality
  - Effective code (fast)