Previous Summary & New Framework

- Old method
- New Method

Old Method

- Literally Just Rules
- Too much rules, absolutely overfitting
- Even a little denoising filtering on the input signal could change the result a lot.
- The code is piled together, and not purely m file, horrible and even impossible to maintain and modify.

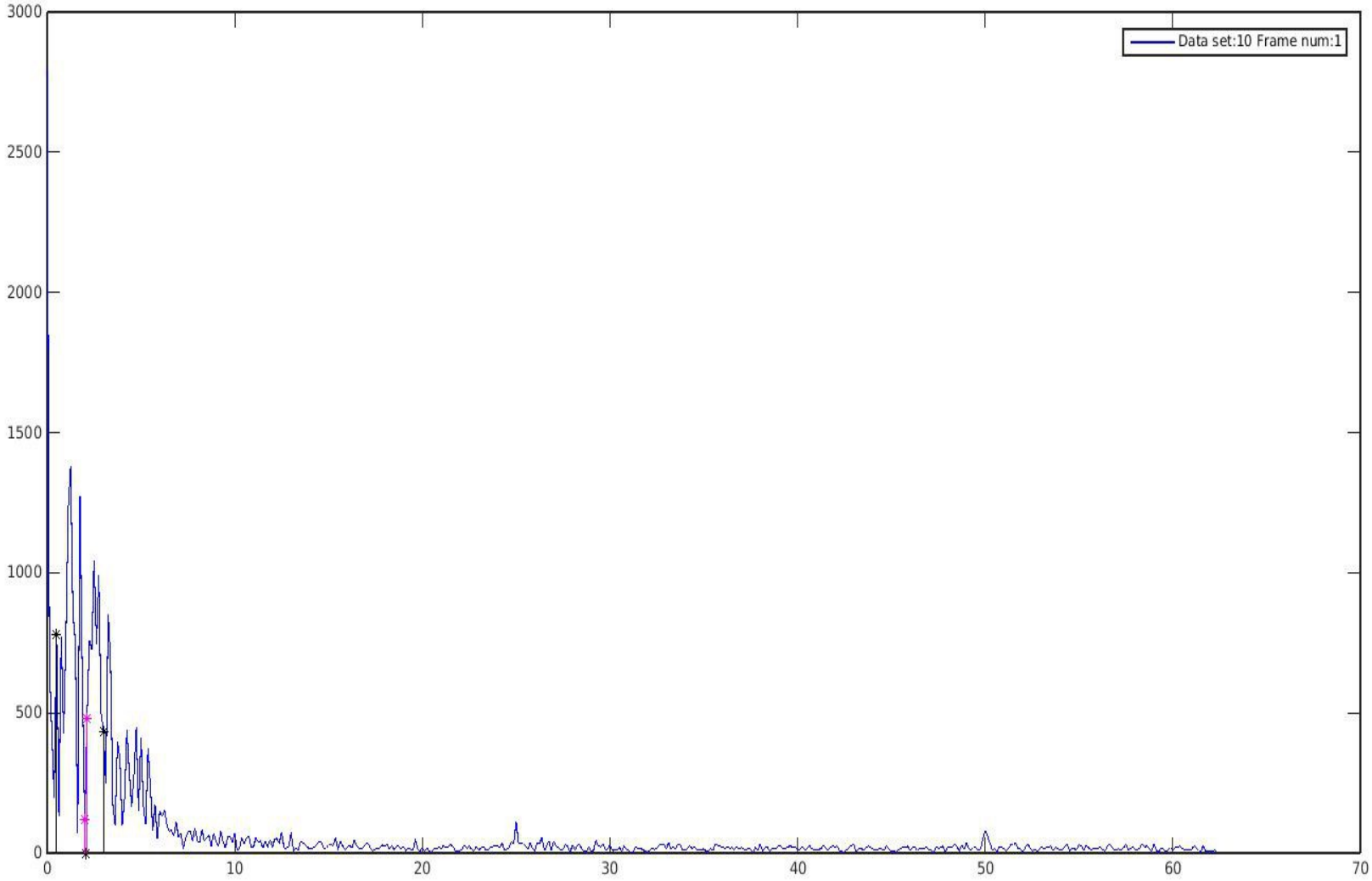
A lot of surveys, tries and failures.

- PVCoder (to improve frequency resolution)
- Upsample (same as above)
- Wavelet
- Miscellaneous ACC methods

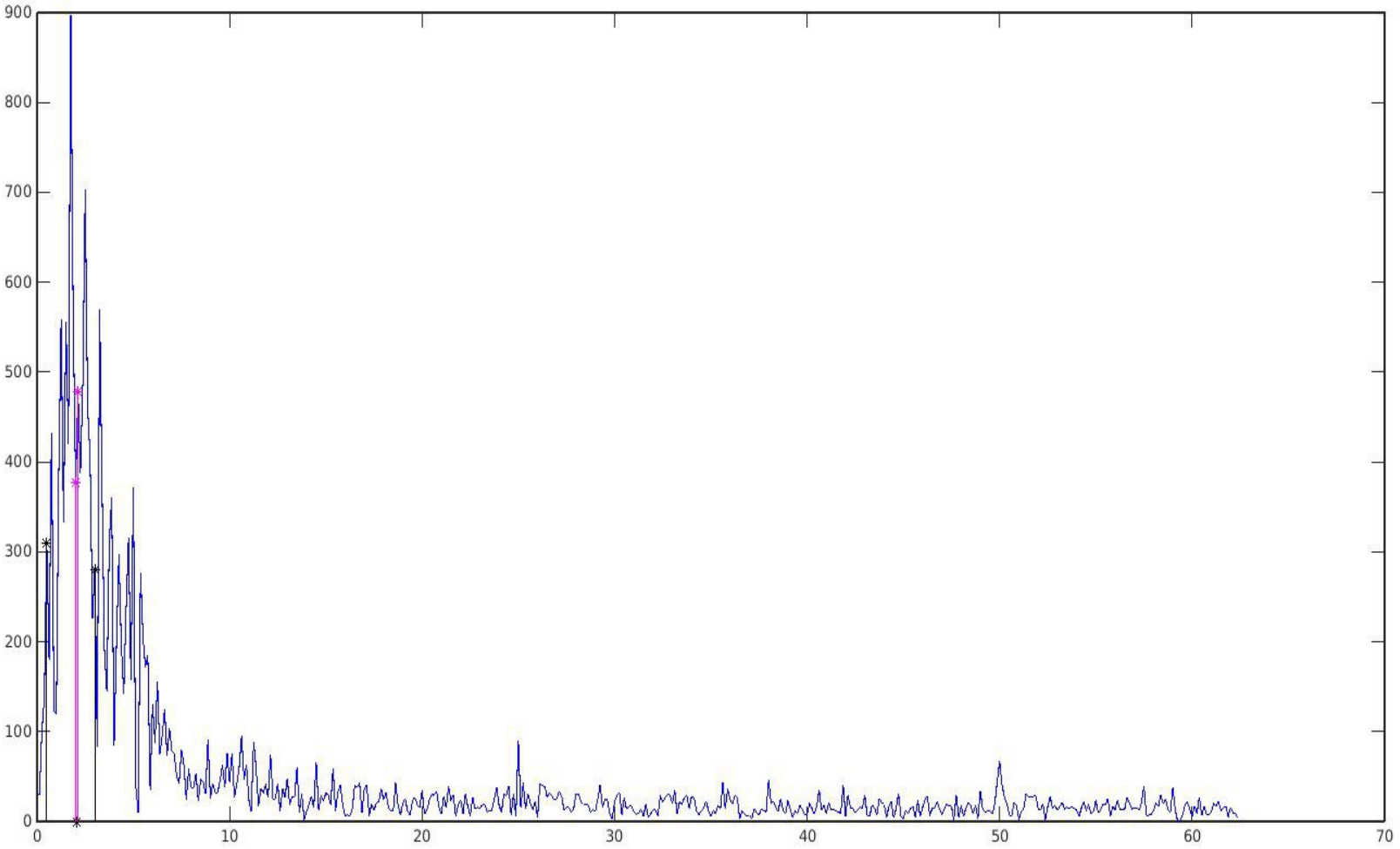
New Method(not perfect currently)

- Based on the wavelet transform
- I observe roughly 100 frames, the peak of hr won't be minimized, and if the hr don't have peak, it would get a new peak.

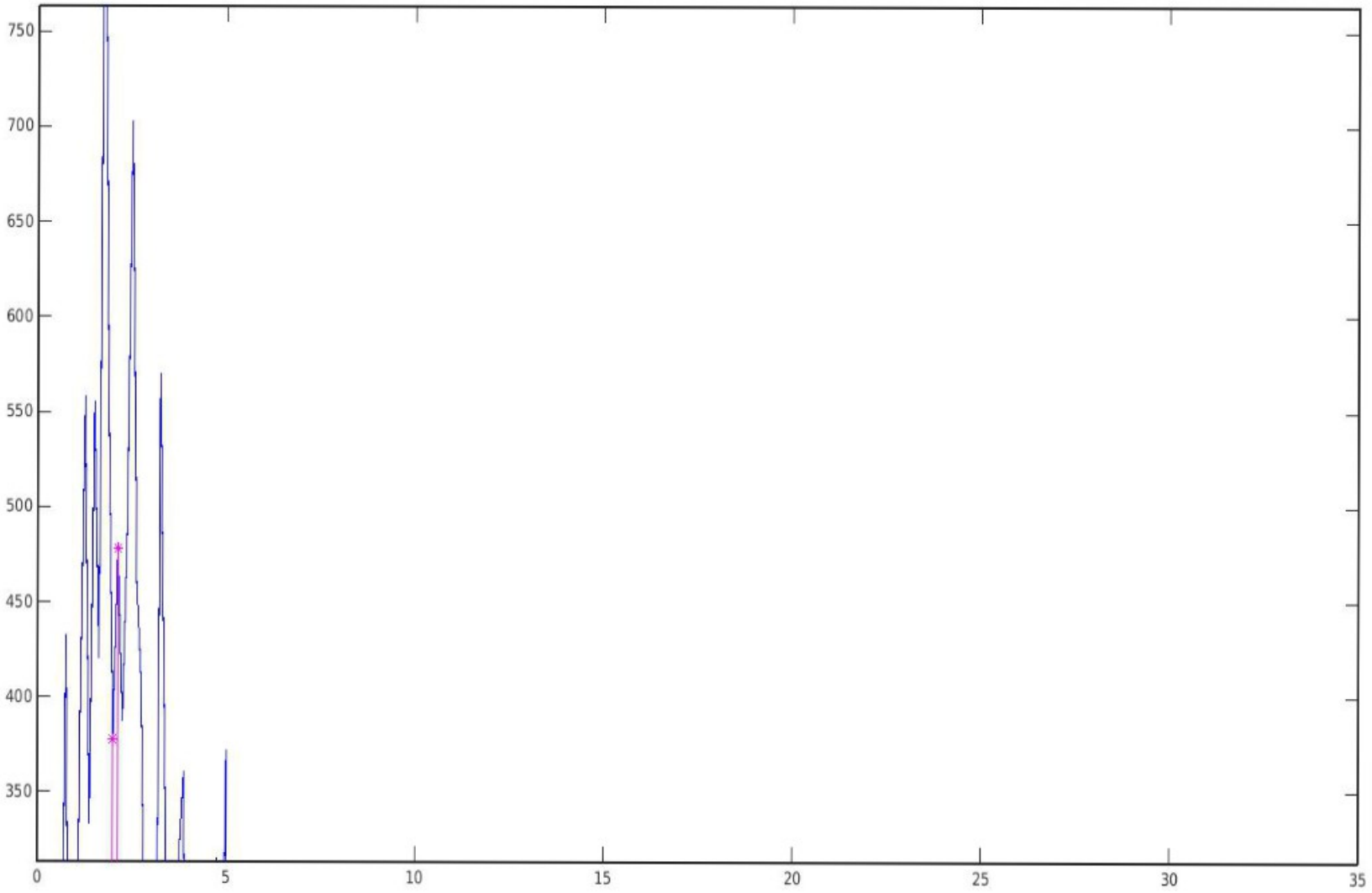
For Example before



For Example, after



For Example, after



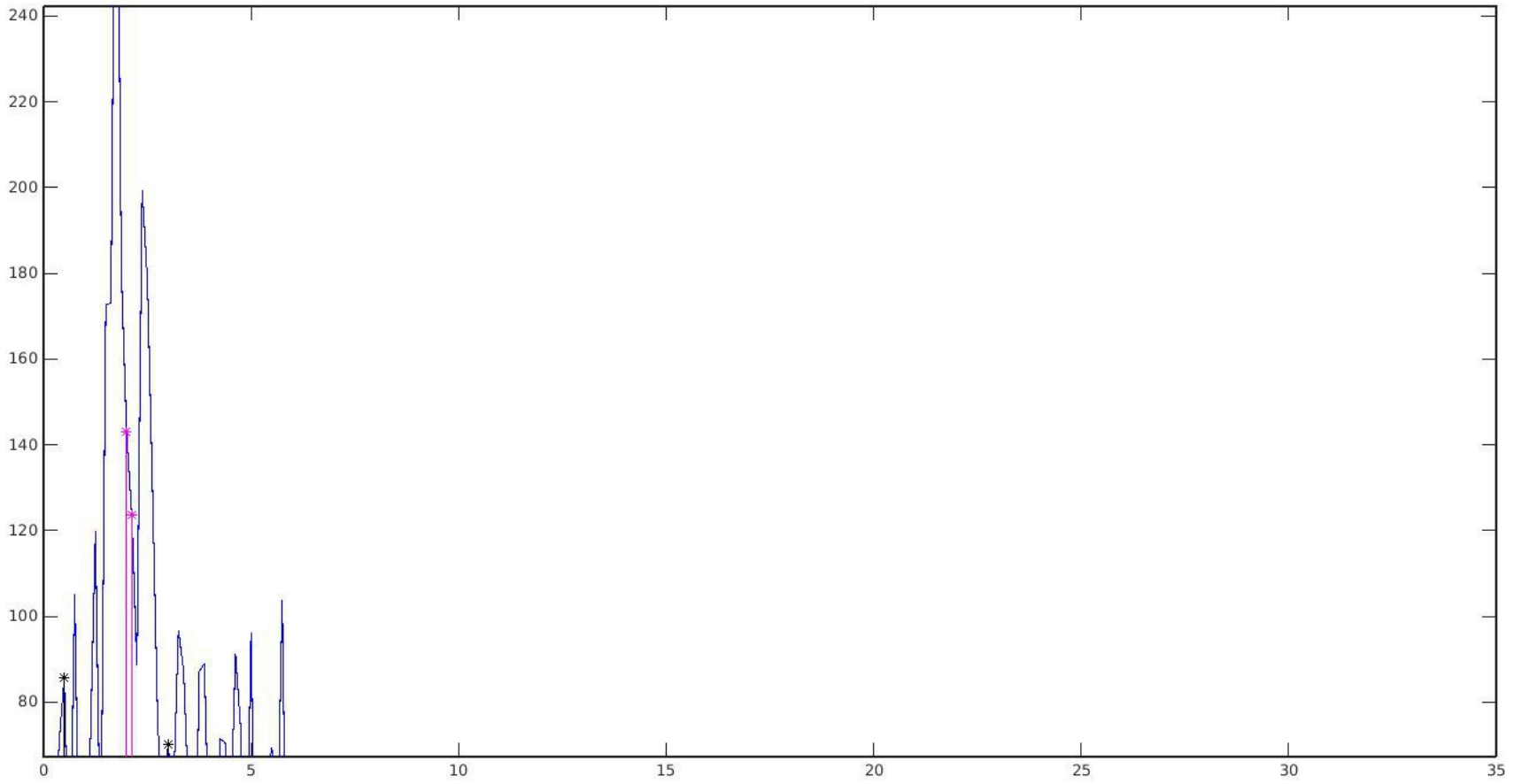
In detail

- Apply level 7 haar wavelet transform
- Set level 0 to all zeros (very low frequency)
- Threshold each level into mean(each level)*R
- Suppress MA!
- R is the parameter that needed to tweak.

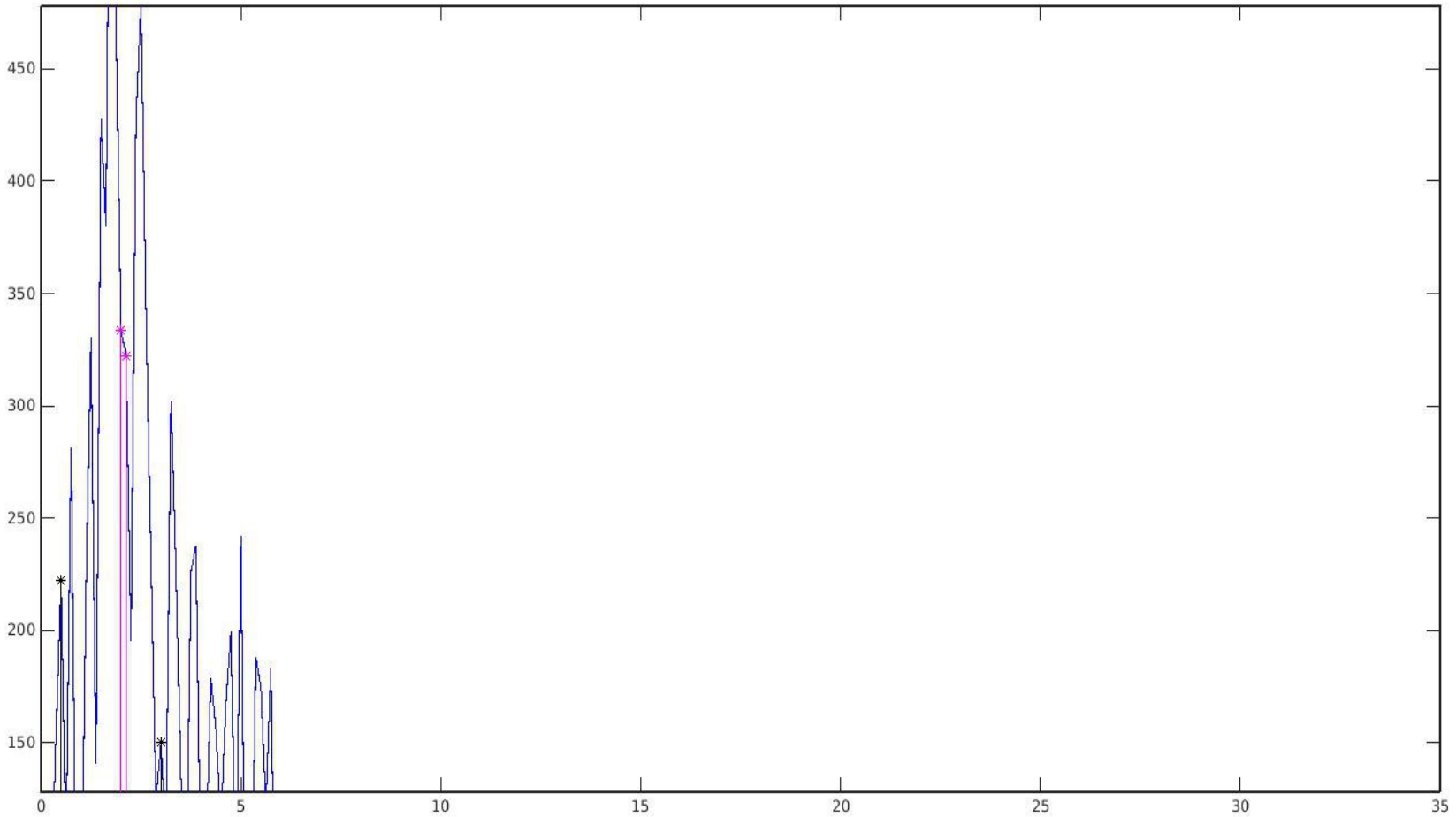
More

- When use different R, different frequency domain status could be observed
- Could observe the process that the small hr peak being generated!
- Examples Next

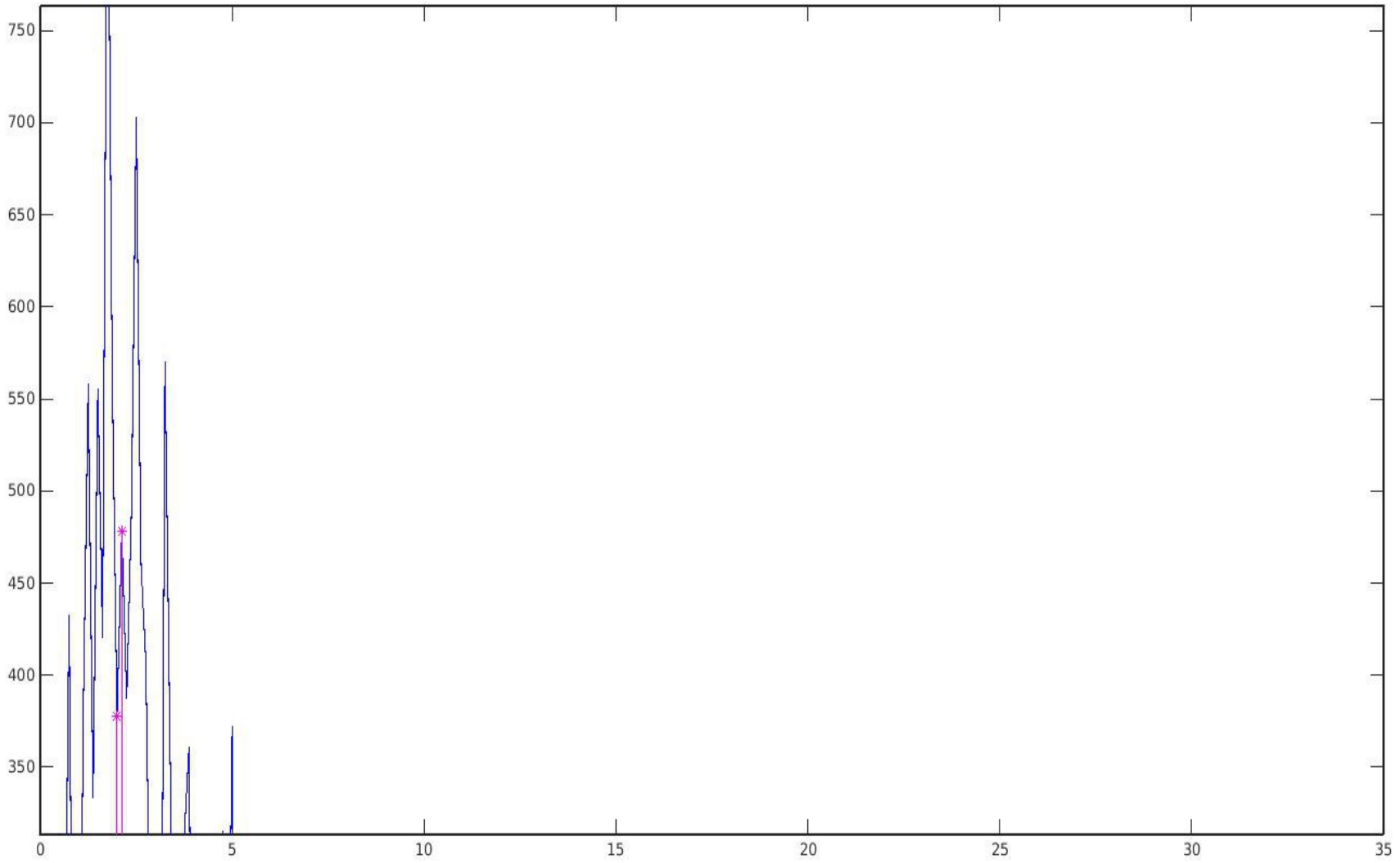
R = 0.3



R = 0.8



R = 1.5



How to pick that new but small Peak

- Apply different r
- Observe changes of peaks
- Peak the special one

Version One Already!

- Only Simple Rules
  - Magnitude Unit
    - Peak the larger one
  - Memory Unit
    - find the peaks that not so far from the previous estimation
    - Not find all peaks from 0.5 to 3.0
    - Simple rule: 0.8*current + 0.2* previous
  - Wavelet Unit
    - Find the Special peak as above
    - Have higher priority than the memory unit.

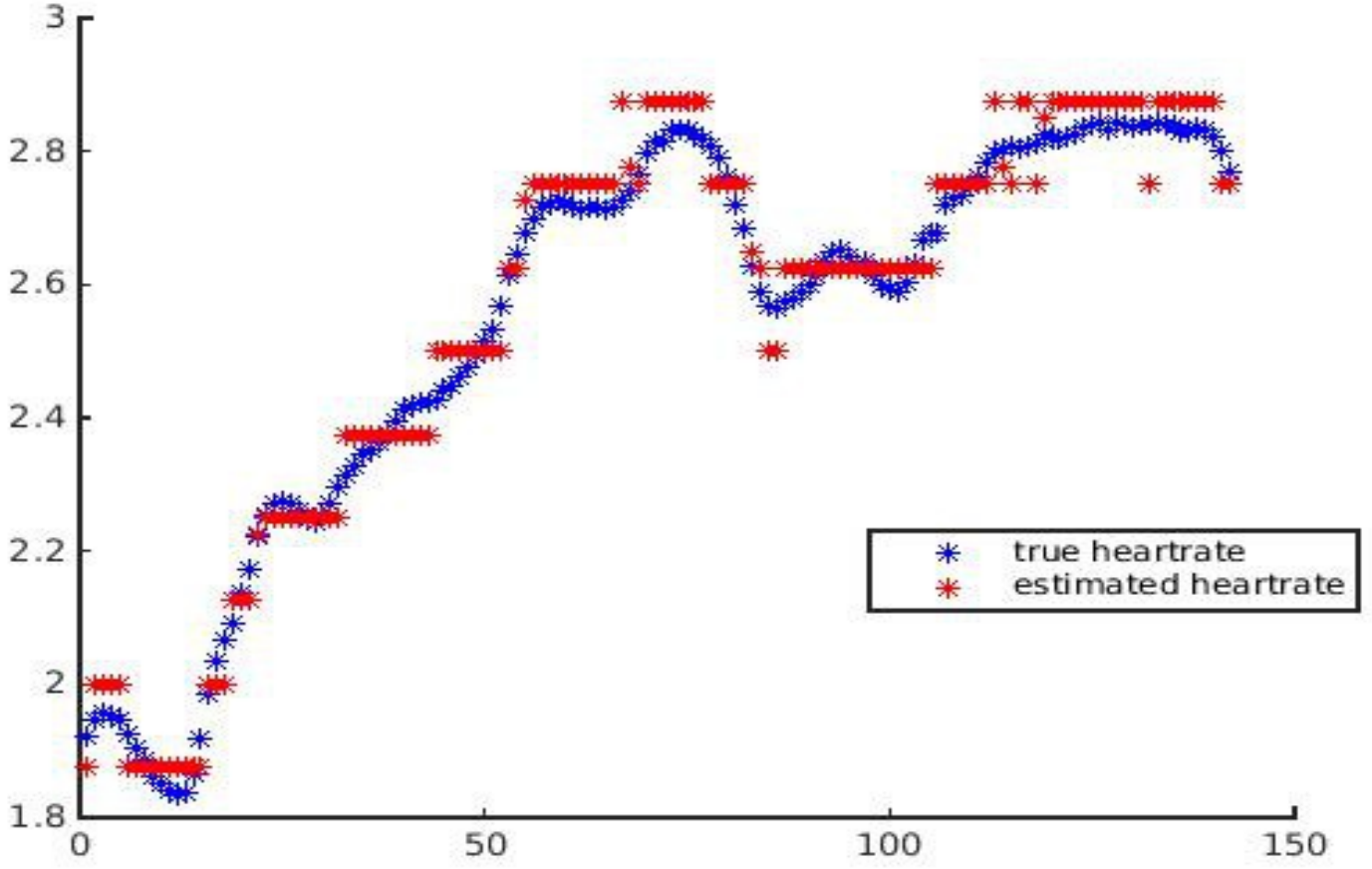
Version One Already!

- For the first peak
  - Magnitude Unit
  - Wavelet Unit
- For the next peak
  - Memory Unit
  - Magnitude Unit

Version One Already!

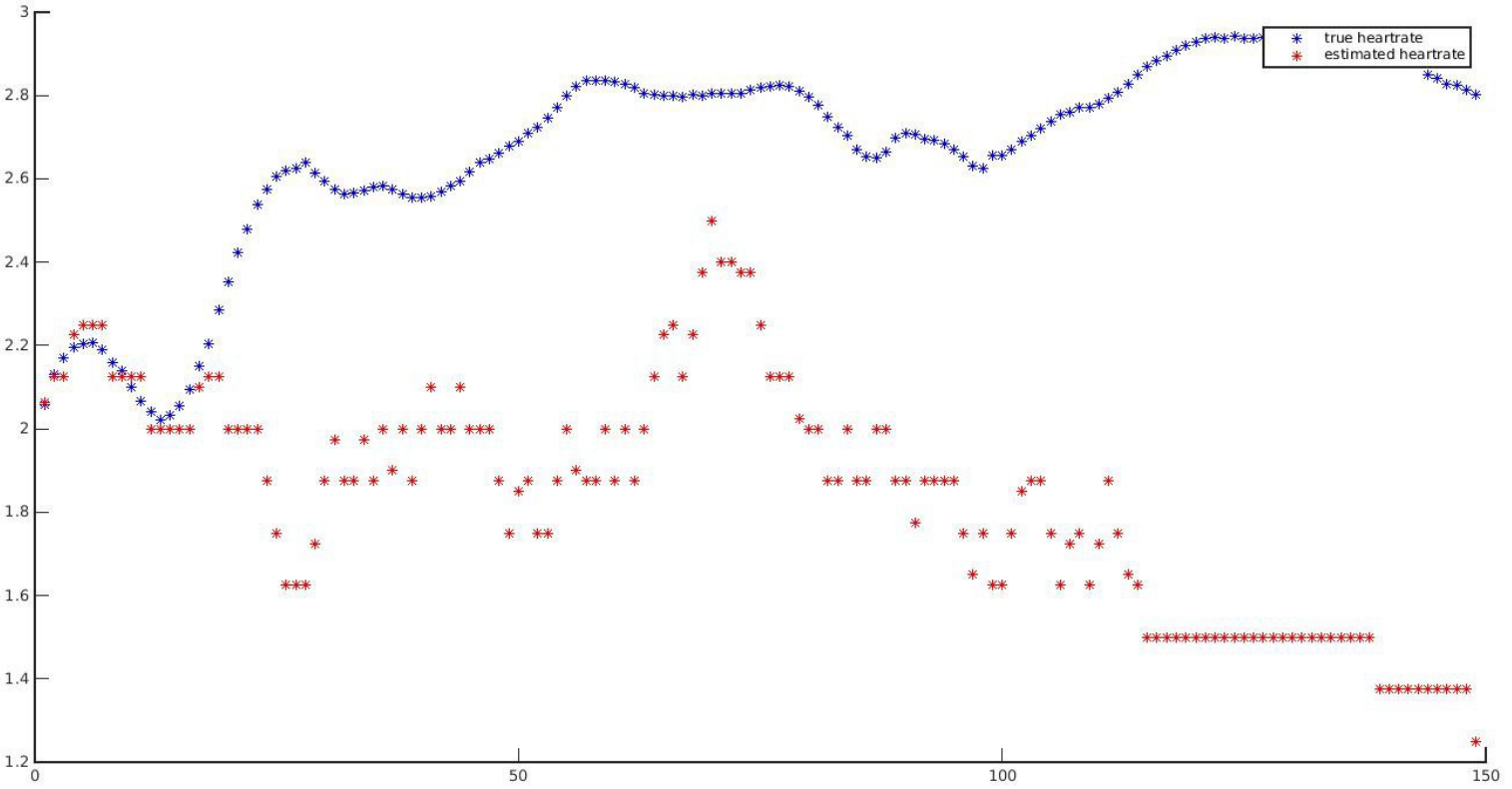
- The Code is very Clean and Modular
- Provide a lot of utilities for easy debug and test.

Result one



Error: 1.5% Dataset: 11

Result two (this one is bad)



Data Set: 10

Analysis --- not perfect but

- Though it goes wrong in dataset 10, but the first frame is very accurate which no way we could do before
- Still need more Rules or other information to help it !
- For the rest frames, I only use Mem & Mag Unit,
- should try Wavelet Unit as well.

Also Try other techniques

- ANC
  - Won't work at all
  - Some methods will totally ruin the ppg signal
  - other won't make any good changes
  - Maybe our PPG too dirty or totally different signal collection methods
- ICA
  - If ICA don't converge, it would hurt a lot
  - If ICA converge, hard to say it's good or not.

The End

Also Try other techniques

- Upsampling
  - Won't work
- Pvcoder
  - Already written
  - maybe would work, haven't integrated into this method
- Improve old method rules
  - It's hard
  - But we should see the result of old method is not bad, it could be our baseline and provide some inspirations on rules

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