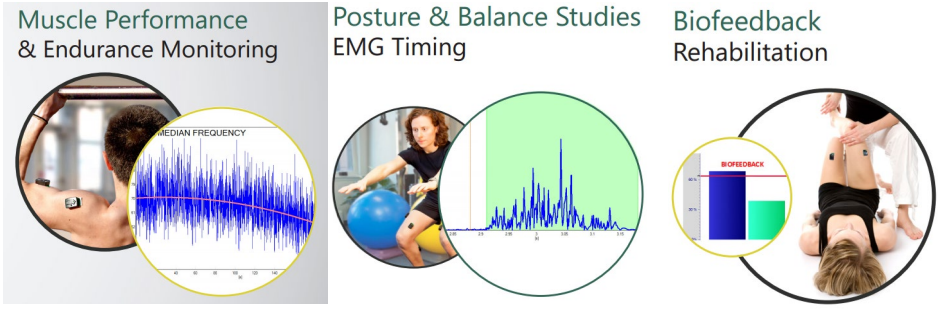
Delsys-Based sEMG Signal Processing and Muscle Performance Evaluation

real time sEMG data collect

signal processing

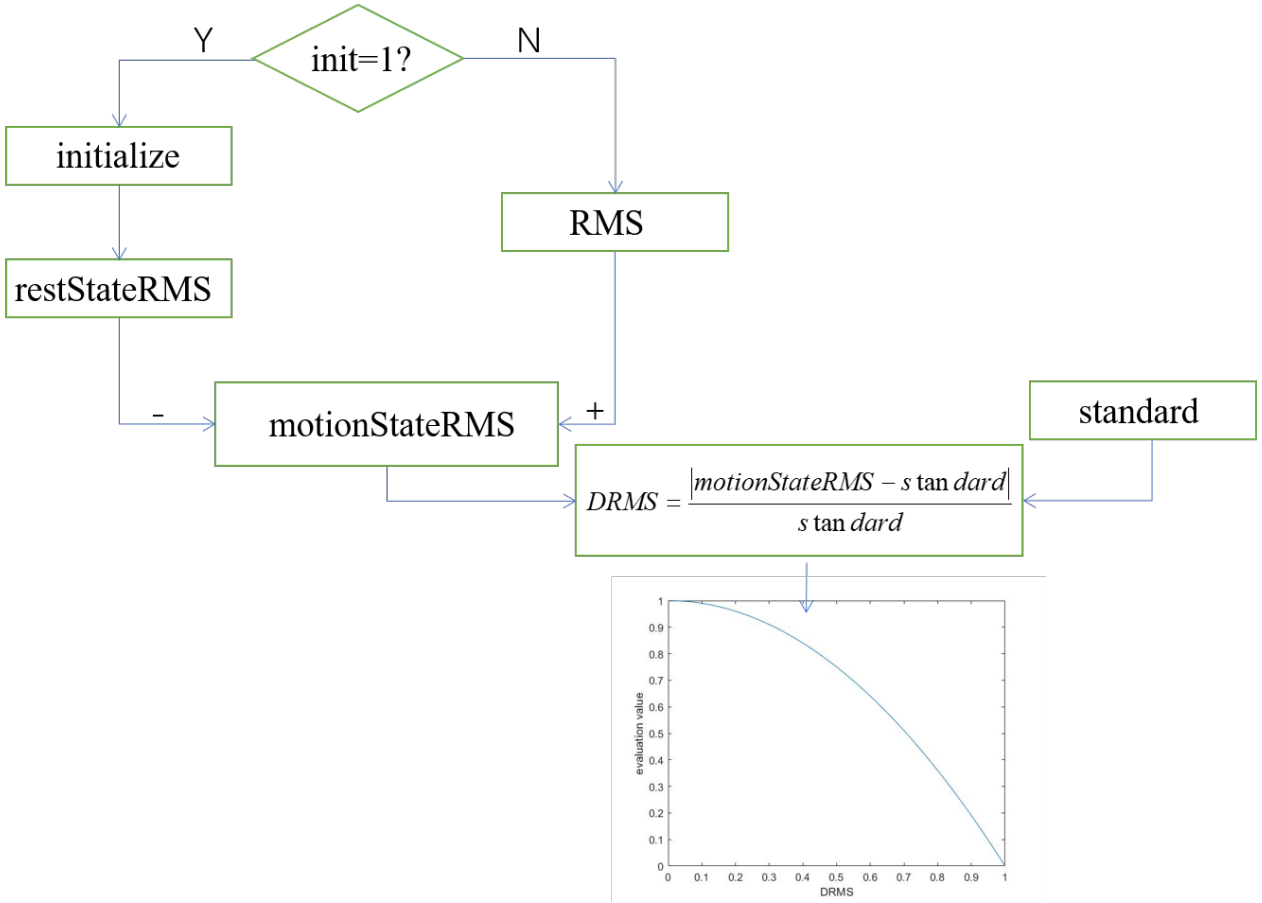
Delsys Trigno Wireless System is a high-performing device to detect surface EMG signal, the electrical activity produced by skeletal muscles. According to surface EMG signal, we can evaluate muscle performance, like muscle force and muscle fatigue.



feature extraction

1.acquire sEMG data from the device. The manufacture provides sample code to transmit data to 3rd party software. I revised the display pattern and removed IMU data transmission.
2.raw sEMG signal is weak, instable and random. I adopted RLS adaptive filter to remove 50Hz and 100Hz noises.
3.extracte Root Mean Square and Mean Power Frequency of sEMG signal.
4.develop strategies to evaluate muscle performance and decide muscle fatigue during yoga exercise. I finished the program, however it can't realize the function perfectly.

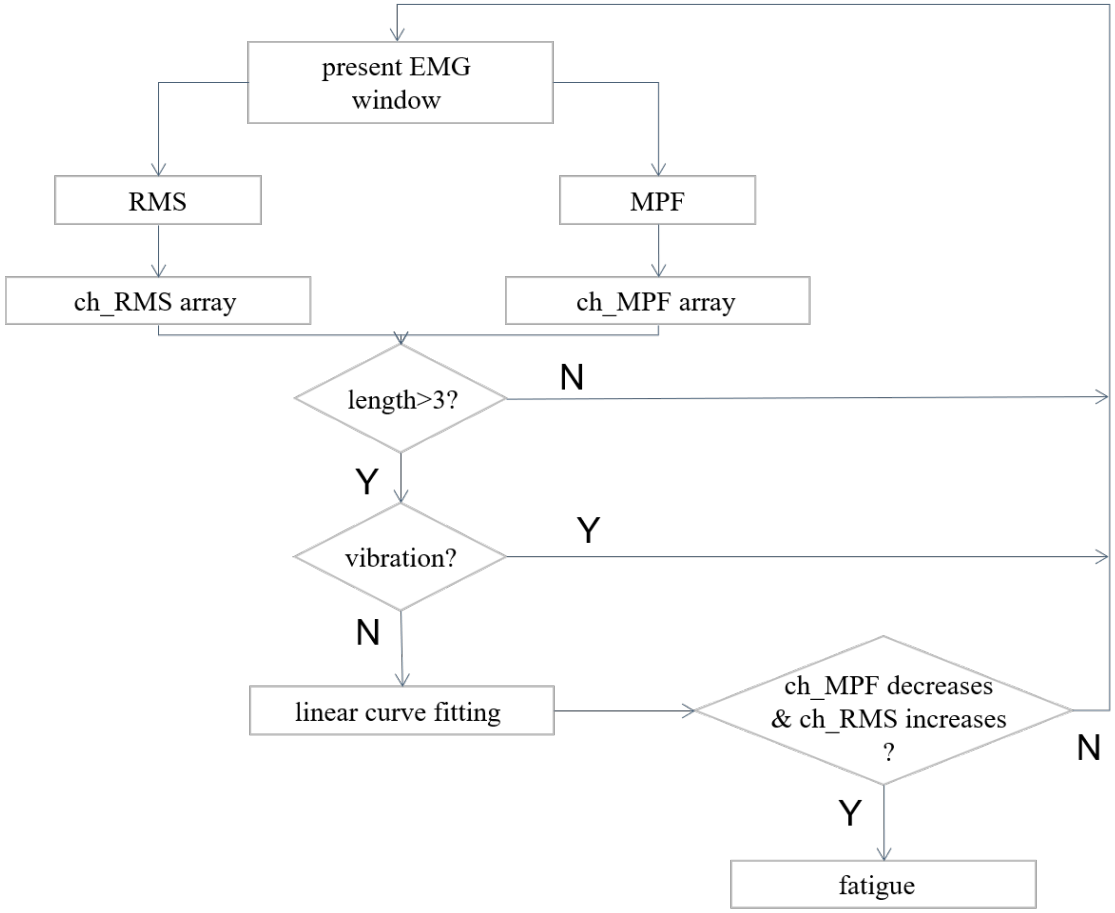
Muscle Force Evaluation Strategies



The strategy aims to give a feedback to yoga student, which evaluates each action with muscle force. There is a positive correlation between Root Mean Square values of sEMG signal and muscle force.

- init is the parameter to decide whether to save a section of sEMG signal of rest state muscle as reference.
- motionStateRMS = RMS − restStateRMS, larger motionStateRMS means larger muscle force.
- DRMS is a value to judge the performance of subjects doing yoga.

Muscle Fatigue Evaluation Strategies



The feature of muscle fatigue are increase in amplitude and make the transition from high frequency spectrum to low frequency spectrum. Based on this point, the strategy calculates and records Root Mean Square and Mean Power Frequency, and detects muscle fatigue with their tendency.

- ch_RMS array is the array to save Root Mean Square values.
- ch_MPF array is the array to save Mean Power Frequency values.
- vibration decides whether the data has a tendency to increase or decrease.
- linear curve fitting returns the coefficients for polynomial of degree 1.