

A Real Time Karaoke Scoring System Based on Pitch Detection

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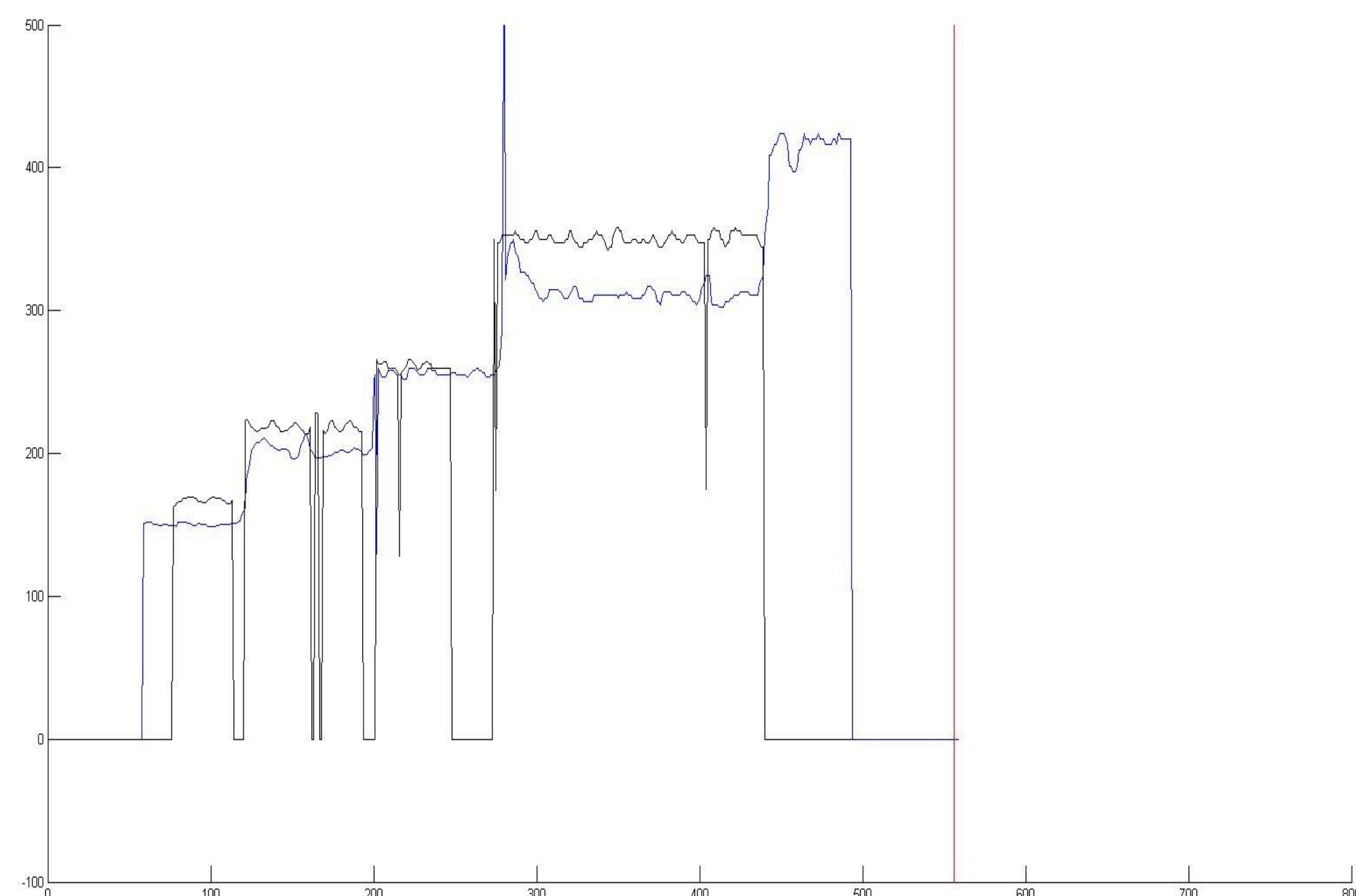
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Introduction:

Currently the Karaoke scoring systems are based on different criteria. For example some are based on tempo, some are even based on loudness of the singer. In this scoring system, I mainly use the pitch precision as the scoring criteria. The pitch detection is using YIN algorithm, which is a pretty accurate one detecting single pitch.

Highlights of this System:

1. Pitch Criteria is more intuitive and reasonable.
2. Pitch detection is quite accurate.
3. Real-time and graphic pitch contour comparing makes users easy to play with this system.



YIN Algorithm:

1. Use **autocorrelation** to find raw fundamental frequency
2. Use **Difference Function**
3. Calculate **Cumulative mean normalize difference function**
4. Make an **Absolute threshold**
5. Use **Parabolic Interpolation**
6. Find **Best Local Estimate**.

Version	Gross Error %
Step 1	10.0
Step 2	1.95
Step 3	1.69
Step 4	0.78
Step 5	0.77
Step 6	0.50

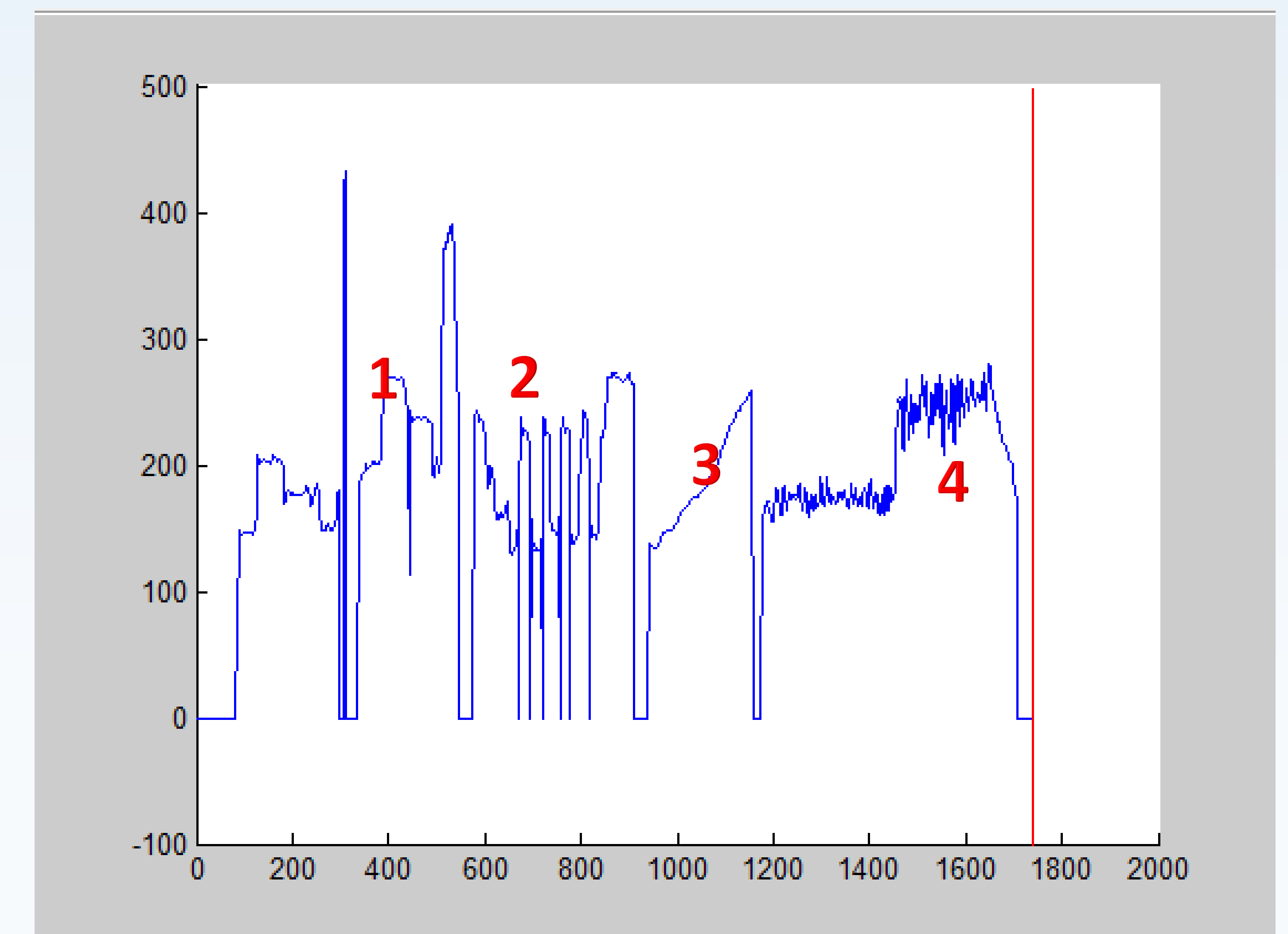
Put YIN in Real-Time:

In this scoring system only first 4 steps are used and they are coded in real time using Matlab 2012b.

Since the users are possible to hear feedback when they sing. So the time latency needs to be short . A few difference of the offline YIN and the real-time YIN are presented.

Parameter	Offline	Real time
Frame Length	Whole song	50ms
Frame Number	1	Total/50ms
Hop Size	10ms	10ms
Window Size	46.4ms	25ms
Depth	0.1	0.1
Sampling Rate	44100Hz	44100Hz

Testing of Different Kinds of Pitch Pattern in Real Time:



1. Random pitch pattern
2. Pitch sudden change pattern
3. Continuous pitch changing pattern
4. Vibrato pitch changing pattern