**Assignment 3**

**Revisited: Fundamental Frequency Detection/Pitch Tracking**

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QA.3

For block size 1024, time resolution is block size/sample rate i.e., 1024samples/44100Hz =0.023 seconds and frequency resolution is 43Hz. With the constraint of keeping the block size and sampling rate constant, one way to improve the frequency resolution would be zero padding. Zero padding increases the number of points thus we obtain a denser frequency grid when applying the Fourier transform.

QE.1 Plots

1. Block size 1024, hop size 512
   1. FFT MAX: Estimated F0 and error

Chart, histogram

Description automatically generatedChart

Description automatically generated

Discussion:  discuss the possible causes for the deviation

* 1. HPS: Estimated F0 and error

Chart

Description automatically generatedChart, histogram

Description automatically generated

Discussion: Why does the HPS method fail with this signal?

1. Block size 2048, hop size 512
   1. Estimated f0 and error: FFT MAX

Chart

Description automatically generatedChart, histogram

Description automatically generated

QE.2 Discussion: Do you see any improvement in performance?

QE.3: Average performance metrics for ﻿FFT Max on the development set

rmsAvg: ﻿2547.40

pfp: 60.56

pfn: 0.37

QE.4 Average performance metrics for ﻿HPS on the development set

rmsAvg: ﻿2838.68

pfp: 91.99

pfn: 4.63

QE.6 Performance metrics for all three methods ACF, HPS and ACF with two values of threshold on the development set

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Method | Threshold | RMS Error | False Positives | False Negatives |
| ACF | -40 | **1081.8644241** | **17.45598431** | **17.45598431** |
| HPS | -40 | **2464.86286599** | **15.16192301** | **15.16192301** |
| MaxFFT | -40 | **2155.03230113** | **15.50675059** | **15.50675059** |
| ACF | -20 | **3398.32177431** | **0.13888889** | **0.13888889** |
| HPS | -20 | **3828.87696329** | **0.13888889** | **0.13888889** |
| MaxFFT | -20 | **3728.3769315** | **0.13888889** | **0.13888889** |