Annotated Bibliography

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References

[1] Anil Rai and Buket D Barkana. Analysis of three pitch-shifting algorithms for different musical instruments. In *2019 IEEE Long Island Systems, Applications and Technology Conference (LISAT)*, pages 1–6. IEEE, 2019.

This paper analyzes several widely used pitch-shifting algorithms and includes the underlying mathematical formulas for each algorithm. It was published by the IEEE organization, a prestigious organization that rigorously peer reviews their papers. The methodology section is especially useful because it describes how each algorithm modifies frequency components to change pitch. The authors evaluate the algorithms using measures such as tonality, spectral flatness, and zero-crossing rate, which capture important qualities of sound. Spectral flatness, in particular, will be relevant for my project because it reflects how "clean" or noisy a processed signal sounds. The paper also cites a wide range of pitch-shifting techniques, making it a helpful resource for comparing algorithm choices and understanding how they affect sound quality and processing latency.

[2] Bowen Tang and Kiyofumi Tanaka. An efficient real-time pitch correction system via field-programmable gate array. In *Proceedings of the 2024 6th International Conference on Image, Video and Signal Processing*, pages 147–154, 2024.

This paper presents a novel method for implementing a low-latency, real-time pitch correction system on Field-Programmable Gate Arrays. Published in the ACM Digital Library as part of the International Conference on Image, Video and Signal Processing, the paper was subjected to formal peer review, making it a credible scholarly source. The authors propose a hardware-efficient signal processing pipeline that operates in the time domain, avoiding the floating-point limitations and high computational cost associated with FFT-based methods. The method includes a ring-buffer-based design that supports continuous analysis and pitch modification of incoming audio streams. Results indicate that their approach achieves accuracy comparable to more conventional techniques while reducing computational cost. This paper is highly relevant to understanding real-time audio processing and provides

useful references to FFT-based methods, pitch-detection algorithms, and time-scaling techniques, which helps establish a basis for comparing latency and computational complexity.

[3] Ruohua Zhou, Joshua D Reiss, Marco Mattavelli, and Giorgio Zoia. A computationally efficient method for polyphonic pitch estimation. *EURASIP Journal on Advances in Signal Processing*, 2009(1):729494, 2009.

This research paper outlines a new method for estimating polyphonic pitches. It is published in the open-access peer reviwed Journel on Advanced Signal Processing. At the heart of the process is the constant-Q Fast Resonator Time-Frequency Image (RTFI) analysis, which is essentially a function that is able to track the time-frequency characteristics of the input signal. The paper formally breaks down the method into two main processes: time-frequency analysis and post-process phases. Section 3.2 further breaks down the steps into 5 core components, most notably: using RTFI to calculate the time-frequency energy spectrum, calculating the harmonic components and computing pitch candidates and removing noise. The paper includes additional citations, all of which use different methods for estimating polyphonic pitches, which may be good for comparing methods and better understanding the problem as a whole.