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REVIEWER'S REPORT

Manuscript No.: IJAR-50492 Date: 04-03-2025

Title: Advance DSP – Geortzel Algorithm Implementation

Recommendation:
Accept as it is……**YES……**
Accept after minor revision……
Accept after major revision ……
Do not accept (*Reasons below*) ……

Rating	Excel.	Good	Fair	Poor
Originality	√			
Techn. Quality		√		
Clarity		√		
Significance			√	

Reviewer's Name: Mir Tanveer

Reviewer's Decision about Paper: **Recommended for Publication.**

Comments (*Use additional pages, if required*)
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Reviewer's Comment / Report

Summary:
The paper presents a detailed discussion on the implementation of the Goertzel algorithm for detecting specific frequency components in a signal. It highlights the efficiency of the algorithm compared to the Fast Fourier Transform (FFT), especially in applications requiring the detection of a limited set of frequencies. The document covers the theoretical foundations, mathematical equations, and practical implementations of the algorithm, particularly in Dual-Tone Multi-Frequency (DTMF) decoding. Additionally, the tasks outlined for C implementation and optimization add to the practical relevance of the study.

Strengths:

1. **Clear Explanation of the Algorithm:** The paper provides a thorough introduction to the Goertzel algorithm, its operational principles, and its computational efficiency. The differentiation between the processing and evaluation phases is well articulated.
2. **Relevance in DSP Applications:** The discussion on real-world applications, such as DTMF decoding and its use in embedded systems, strengthens the practical significance of the paper.

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3. **Mathematical Formulation:** The inclusion of key equations, such as the difference equation and magnitude calculations, supports the theoretical understanding of the algorithm. The breakdown of each equation enhances clarity.
4. **Structured Approach to Implementation:** The tasks outlined in the implementation section provide a structured methodology for applying the Goertzel algorithm in C. The step-by-step explanation of detecting DTMF digits and optimizing performance ensures practical applicability.
5. **Emphasis on Computational Efficiency:** The discussion on how the Goertzel algorithm minimizes computational overhead compared to FFT is well presented. The focus on optimizing performance using intrinsics and compiler optimizations is particularly relevant for real-time applications.

Technical Accuracy:
The mathematical formulations and explanations appear accurate. The derivation of frequency detection equations and final state calculations is well justified with clear notations. The alternate difference equation and magnitude calculations further strengthen the technical depth of the paper.

Clarity and Readability:
The document is well-organized, with a logical flow from the introduction to equations and implementation tasks. The technical terminologies are appropriately used, making the content accessible to readers with a background in digital signal processing.

Conclusion:
The paper successfully presents an in-depth study of the Goertzel algorithm, highlighting its importance in DSP applications, particularly for frequency detection. The balance between theoretical concepts and practical implementation enhances its value for researchers and engineers in signal processing. The structured approach to implementing and optimizing the algorithm adds to its applicability in real-world scenarios.