Patent Search

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Abstract:

The proposed invention introduces a novel Hybrid Numerical and Analytical Method for Solving Linear Systems, which revolutionizes computational mathematics by synergizing the strengths of numerical efficiency with analytical precision. This hybrid approach strategically integrates numerical algorithms and analytical procedures to provide accurate and efficient solutions to linear systems, overcoming the limitations of traditional methods. By adaptively transitioning between numerical approximation and analytical derivation, the method ensures robustness across diverse problem settings, from well-conditioned systems to those with irregularities. Offering increased computational efficiency and deeper insights into problem structures, the hybrid method holds promise for various applications across engineering, physics, economics, and beyond. Its versatility and adaptability make it a powerful tool for addressing complex, real-world problems and driving innovation in computational mathematics.

Complete Specification

Description:The proposed system belongs to the field of computational mathematics and numerical analysis. It combines numerical techniques with analytical methods to solve linear systems efficiently and accurately. By integrating the strengths of both approaches, this hybrid method aims to overcome the limitations of traditional numerical methods, such as computational errors and instability, while leveraging the analytical framework to provide deeper insights into the problem structure. This innovation holds promise for various applications across engineering, physics, economics, and other fields reliant on solving large-scale linear systems. Its potential impact extends to optimization problems, control systems, and simulations where fast and reliable solutions are essential. Through synergizing numerical precision with analytical rigor, this hybrid approach represents a significant advancement in the quest for robust solutions to complex linear systems.

Background of the proposed invention:

The proposed invention of a Hybrid Numerical and Analytical Method for Solving Linear Systems stems from the rich history of mathematical problem-solving techniques that have evolved over centuries. Linear systems, consisting of equations with linear relationships between variables, are fundamental in various scientific and engineering disciplines. The need to solve such systems accurately and efficiently has been a driving force behind the development of numerous computational methods.

In the realm of numerical analysis, methods like Gaussian elimination, Jacobi iteration, and Gauss-Seidel iteration have long been employed to solve linear systems. These techniques rely on iterative processes or direct matrix manipulations to approximate solutions. While effective in many cases, numerical methods often encounter challenges such as numerical instability, round-off errors, and computational complexity, particularly with large-scale systems.

Conversely, analytical methods offer a different approach, leveraging algebraic properties and mathematical principles to derive exact solutions whenever possible. Techniques like Cramer's Rule, matrix inversion, and eigenvalue decomposition provide analytical insights into linear systems, enabling precise solutions without the need

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