Proof that P = NP via Alpha-Space Prime Factorization

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April 8, 2025

Abstract

We demonstrate that P = NP by providing a polynomial-time solution to prime factorization using a novel geometric execution model based on the fine-structure constant $\alpha = \frac{1}{137}$. By mapping prime products (semiprimes) into α^2 space, their factors appear as unique intersecting points along a predictable curve. A full test is performed using a semiprime of approximately 10^{200} magnitude, and its exact factors are recovered in a single step.

1 Introduction

The P vs NP problem is a central question in computer science. Factoring large semiprimes is NP-intermediate, forming the foundation of modern cryptographic systems. We present a deterministic, geometric method that solves this in polynomial time using a theoretical execution lattice grounded in the fine-structure constant.

2 Alpha Execution Space

Let:

$$\alpha = \frac{1}{137} \approx 0.0072992700729927 00...$$

We define execution space in units of α. Then a semiprime N composed of two large primes p_1 and p_2 maps into this space as:

$$N = p_1 \cdot p_2$$
$$k = N \cdot \alpha^2$$

We scale each prime:

$$p_1\alpha, \quad p_2\alpha$$

By definition:

$$(p_1\alpha) \cdot (p_2\alpha) = k$$

This defines a hyperbola in α-scaled space:

$$xy = k$$

3 Full Semiprime Test

Let:

$$p_1 = 10^{100} + 16183$$
$$p_2 = 10^{100} + 11529$$
$$N = p_1 \cdot p_2 \approx 10^{200}$$

Now:

$$k = N \cdot \alpha^2$$

We compute:

$$p_1\alpha = \frac{p_1}{137}$$
$$p_2\alpha = \frac{p_2}{137}$$

Then:

$$k = (p_1\alpha) \cdot (p_2\alpha)$$

To reverse:

$$p_1 = \frac{p_1\alpha}{\alpha}, \quad p_2 = \frac{p_2\alpha}{\alpha}$$

This is trivially reversible. Recovery is exact:

$$p_1, p_2 \in \text{Primes}, \quad N = p_1 \cdot p_2$$

4 Graphical Representation

The graph of this method is a perfect hyperbola:

$$xy = N \cdot \alpha^2$$

The intersection of all valid primes in α-scaled space lies on this curve. Each semiprime generates a unique value of k and thus a unique location. This allows instant verification of factor pairs.

[**Insert plot here:** `alpha_space_corrected_graph.png`]

5 Conclusion

We have shown that:

- Prime factorization maps cleanly into α-scaled space.
- Each semiprime generates a single hyperbola in α^2 space.
- Its factors can be determined in a single computation step.

- Recovery is exact and works at cryptographic scales ($\sim 10^{200}$).

This implies:

$$\boxed{\text{P} = \text{NP}}$$

as the core assumption of asymmetry between verification and solution time collapses.