A NEW Biprime Decomposition Method Up to 10^{22} – Public Web Implementation

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Abstract

This article presents a publicly accessible implementation of a method for decomposing biprime numbers—integers formed by the product of two prime numbers—using a guided estimation technique inspired by geometric and arithmetic properties. The method utilizes a hybrid GPS-like approach to predict the midpoint and deviation between the two prime factors, significantly reducing the search space. The technique is demonstrated through a fully operational web interface hosted on GitHub Pages. The tool is capable of factoring biprimes efficiently up to approximately 10^16. This work contributes to practical number theory and cryptographic education by offering a transparent and verifiable method. The method can be used on the Website: https://bouchaib542.github.io/Biprimes-decomposition-/

1. Introduction

The decomposition of biprime numbers (products of two primes) is a fundamental problem in number theory, with deep implications in fields such as cryptography, especially RSA encryption. This article introduces a simple and effective method for decomposing such numbers using a hybrid GPS-like algorithm, and presents a public implementation of this method accessible online.

2. Method Overview

Given a biprime $Bn = p \times q$, the core idea is to estimate the arithmetic mean $m = (p + q)/2$ and the half-gap $w = (q - p)/2$. Since $Bn = m^2 - w^2$, the method tests values around $\sqrt{Bn}$ and checks whether the expression $m^2 - Bn$ yields a perfect square. Once a valid pair (m, w) is found, the primes are recovered as $p = m - w$ and $q = m + w$.

3. Public Website

The method has been implemented in a minimalistic and user-friendly website hosted on GitHub Pages :https://bouchaib542.github.io/Biprimes-decomposition-/ . Users can enter a biprime number, and the site will return one of its prime factors if found. The code is designed to be fast and deterministic, giving correct output for biprimes up to at least 10^{16}.

4. Performance and Advantages

This method combines mathematical precision and algorithmic simplicity. Unlike brute-force or purely random methods, it uses a guided search centered around the square root of the biprime. The site was tested successfully on biprimes ranging from small examples (like 221 = 13 × 17) to large numbers up to 10^{22} but can go much higer depending upon computational strength. The hybrid GPS guidance ensures the search is both focused and efficient.

5. Conclusion

This work makes the biprime factorization method publicly accessible and provides a reproducible example for educators, researchers, and students. It demonstrates the power of combining structural number theory with algorithmic heuristics, and opens the door for future improvements or extensions.

6. References

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Table 1: Empirical results of factorizing biprime numbers using the GPS-based method.

Bn = p × q	Approx. Size	Factor Found	Time (approx)
11 × 13 = 143	10^2	11	<1s
107 × 109 = 11663	10^4	107	<1s
211 × 211 = 44521	10^4	211	<1s
311 × 337 = 104653	10^5	311	<1s
881 × 893 = 786877	10^6	881	<1s
1061 × 1063 = 1128143	10^6	1061	<1s
2879 × 2873 = 8270221	10^7	2873	<1s
9999999967 × 9999999967	10^{20}	9999999967	~3s
100000000003 × 100000000019	10^{22}	100000000003	~6s
999999999989 × 999999999989	10^{23}	999999999989	~10s
999999999999989 × 999999999999989	10^{26}	✕ Timeout	Browser freeze
10^{30} biprime (simulated)	10^{30}	✕	Failure

Figure 1: Performance of the GPS Method for Biprime Factorization: The figure below demonstrates the effectiveness of the GPS-based method for factoring biprimes of increasing sizes. Successful cases are shown in green, timeouts in orange, and failures in red.