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Embedded-System Applications and Constraints of Coprime-Product-Based Prime Generation

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ABSTRACT:
This approach extrapolates primes from existing ones via differences or sums of coprime products. The paper focuses on developing computer programming code to generate these extrapolated primes using different coprime product partitions of prime-powered sets. By working with products and differences of coprime products of prime powers, one can construct integers whose factorizations are partially controlled, which is useful for building structured moduli or trapdoor composites in advanced cryptographic designs. these extrapolated primes can then feed into key-generation routines for RSA-like or DH-style protocols, effectively enriching the pool of usable large primes. Also, focused to some applications and limitations of this algorithm for Embedded systems.

KEY WORDS: Prime number theorem, primorial prime, coprime, Absolute difference.

I.INTRODUCTION

The generation of prime numbers plays vital role in computation stage appearing during various cryptographic setups. This paper shows a simple way to substantially reduce the value of hidden constants to provide much more efficient prime generation algorithms with using of following method. From the References [1],[2], the main result as follows. "The proposed method partitions a finite set P= $\{p_1^n, p_2^n, p_3^n, \dots \dots . . p_n^n\}$ (where primes are raised to power n≥1) into non-overlapping, non-empty subsets A and B such that products ∏A and ∏B are coprime. New prime value $p_x = |\prod_{n\in A} n \pm \prod_{n\in B} n| < p_{n+1}^2$ are generated if p_x is prime or 1, and p_x <N (a specified bound)."

Example: For initial primes P={2,3,5,7,11,13,17,19} (under 20) and N=1000, partitions like A={2}, B={3} yield |2±3|=1,5|2±3|=1,5 (valid). Larger ones like A={3,5}, B={2} give |15±2|=13,17 (primes). The code outputs new primes like 1,5,7,11,... up to bound, filtering valid p_x.

II.LIMITATIONS AND EXTENSIONS

Exhaustive partitioning grows exponentially (O(2n), suitable for small |P|; optimize by limiting subset sizes or using heuristics from partition-based prime generation. For cryptography or research (aligning with number theory interests), integrate Miller-Rabin for large primes and test coprimality rigorously. Extend to higher powers n>1 or dynamic N.

III.APPLICATIONS IN EMBEDDED SYSTEMS

- Lightweight key generation:
  On constrained devices (microcontrollers, IoT nodes), the method can generate additional candidate primes from a small pre-loaded prime-power set, reducing the need to store large prime tables or fetch them over the network.
- On-device prime enrichment for ECC/RSA:
  Embedded implementations of RSA-like or elliptic-curve-based schemes often rely on a limited pool of large primes; extrapolated primes can extend that pool locally, enabling more flexible key-pair generation or threshold-crypto setups without external servers.
- Structured moduli for side-channel-resistant designs:
  By controlling how prime-power products are partitioned and combined, one can craft moduli with

desired factorization patterns, which is useful in side-channel-resistant exponentiation and masked implementations on embedded CPUs.

- Resource-aware prime sampling:
  Instead of scanning large intervals for primes, the coprime-product partition approach samples integers that are algebraically tied to known primes; this can reduce the expected number of primality tests on memory- and power-constrained devices.

IV.LIMITATIONS IN EMBEDDED SYSTEMS

- Computational overhead of products and tests:
  Computing products ∏A and ∏B over prime powers, then performing primality tests on their sums/differences, can be expensive on 8- or 16-bit microcontrollers with limited ALU and no hardware multiplication.
- Memory footprint for prime-power sets:
  Storing even a modest prime-power set P = { $p_i^{n_i}$} and intermediate products may strain the small RAM/ROM of many embedded platforms, especially if exponents $n_i$are large.
- Unpredictable output and coverage:
  The method does not guarantee dense coverage of the prime sequence; some intervals may remain "gaps," so embedded protocols still need fallbacks (e.g., standard sieves or pre-computed primes) for reliable key-material supply.
- Side-channel leakage risk:
  Variable-time partitioning and product-computation paths can introduce timing or power-analysis vulnerabilities unless carefully hardened, which is non-trivial on resource-limited embedded targets.
- Limited benefit vs. ECC-optimized curves:
  For many embedded applications, pre-defined ECC curves with known secure primes are already optimized for small key size and fast arithmetic; an extrapolation scheme adds complexity without clear security gain unless tightly integrated into a novel protocol.

Now we can go apply computer programming coding for extrapolated Prime number generation:

From Reference [1], Now I have to propose one of the programming coding to above method to generate extrapolated primes less than 1000 with using of finite set of Primes {2 ,3, 5, 7}.

```
//Lets first get the prime numbers between 1 & 1000
ulong startNumber = 1000;
ulong endNumber = 2000;
var primeNumbers = GetPrimeNumbers(startNumber, endNumber);

Console.WriteLine($"Prime Numbers between {startNumber} & {endNumber} are: {string.Join(" ", primeNumbers)} \n");

var nextPrimeNumber = NextPrimeNumber(endNumber);
var nextPrimeNumberSquare = nextPrimeNumber * nextPrimeNumber;

Console.WriteLine($"Square of next prime number {nextPrimeNumber} is {nextPrimeNumber * nextPrimeNumber}\n\n");

for (int i = 2; i < primeNumbers.Count()-1; i++)
```

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```
{
   var subsetA = primeNumbers[..i];
   var subsetB = primeNumbers[i..];
    for (ulong p1 = 1; p1 < 6 ; p1++)
   {
      var sumofSubSetA = subsetA.Aggregate(p1, (a, x) => (a * x));
      var sumofSubSetB = subsetB.Aggregate(p1, (a, x) => (a * x));
      var sum = sumofSubSetA + sumofSubSetB;
      var diff = sumofSubSetA > sumofSubSetB ? sumofSubSetA - sumofSubSetB : sumofSubSetB -
sumofSubSetA;
      Console.WriteLine($"Subset A: {string.Join(" ", subsetA)} \nsum of product of subsetA with exp {p1}:
{sumofSubSetA}");
      Console.WriteLine($"Subset B: {string.Join(" ", subsetB)} \nsum of product of subsetB with exp {p1}:
{sumofSubSetB} \n");
      if (sum < nextPrimeNumberSquare)
      {
         Console.WriteLine($"{sum} <= {nextPrimeNumberSquare}\n");
         //Console.WriteLine($"Subset A: ({string.Join(" * ", subsetA)}) + Subset B: ({string.Join(" * ", subsetB)})
<= {nextPrimeNumberSquare}\n");
         Console.WriteLine($"Sum {sum} is Prime? {IsPrimeNumber(sum)}\n\n");
      }
      if (diff < nextPrimeNumberSquare)
      {
         Console.WriteLine($"{diff} <= {nextPrimeNumberSquare}\n");
         //Console.WriteLine($"Subset A: ({string.Join(" * ", subsetA)}) - Subset B: ({string.Join(" * ", subsetB)})
<= {nextPrimeNumberSquare}\n");
         Console.WriteLine($"Diff {diff} is Prime? {IsPrimeNumber(diff)}\n\n");
      }
   }
}
static List<ulong> GetPrimeNumbers(ulong start, ulong end)
{
   var primeNumbers = new List<ulong>();
   for (ulong i = start; i <= end; i++)
   {
      bool prime = IsPrimeNumber(i);
      if (prime)
      {
```

```
            primeNumbers.Add(i);
        }
    }
    return primeNumbers;
}
static bool IsPrimeNumber(ulong n)
{
    if (n <= 1)
        return false;
    // Check if n=2 or n=3
    if (n == 2 || n == 3)
        return true;
    // Check whether n is divisible by 2 or 3
    if (n % 2 == 0 || n % 3 == 0)
        return false;
    // Check from 5 to square root of n
    // Iterate i by (i+6)
    for (ulong i = 5; i <= Math.Sqrt(n); i = i + 6)
        if (n % i == 0 || n % (i + 2) == 0)
            return false;
    return true;
}
zstatic ulong NextPrimeNumber(ulong n)
{
    ulong prime = n;
    bool found = false;
    while (!found)
    {
        prime++;
        if (IsPrimeNumber(prime))
            found = true;
    }
    return prime;
}
```

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Output: Above program coding has following output

Prime Numbers between 1 & 1000 are: 2 3 5 7 11 13 17 19 23 29 31 37 41 43 47 53 59 61 67 71 73 79 83 89 97 101 103 107 109 113 127 131 137 139 149 151 157 163 167 173 179 181 191 193 197 199 211 223 227 229 233 239 241 251 257 263 269 271 277 281 283 293 307 311 313 317 331 337 347 349 353 359 367 373 379 383 389 397 401 409 419 421 431 433 439 443 449 457 461 463 467 479 487 491 499 503 509 521 523 541 547 557 563 569 571 577 587 593 599 601 607 613 617 619 631 641 643 647 653 659 661 673 677 683 691 701 709 719 727 733 739 743 751 757 761 769 773 787 797 809 811 821 823 827 829 839 853 857 859 863 877 881 883 887 907 911 919 929 937 941 947 953 967 971 977 983 991 997

Subset A: 2 3

sum of product of subset A with exp 1: 6

Subset B: 5 7 11 13 17 19 23 29 31 37 41 43 47 53 59 61 67 71 73 79 83 89 97 101 103 107 109 113 127 131 137 139 149 151 157 163 167 173 179 181 191 193 197 199 211 223 227 229 233 239 241 251 257 263 269 271 277 281 283 293 307 311 313 317 331 337 347 349 353 359 367 373 379 383 389 397 401 409 419 421 431 433 439 443 449 457 461 463 467 479 487 491 499 503 509 521 523 541 547 557 563 569 571 577 587 593 599 601 607 613 617 619 631 641 643 647 653 659 661 673 677 683 691 701 709 719 727 733 739 743 751 757 761 769 773 787 797 809 811 821 823 827 829 839 853 857 859 863 877 881 883 887 907 911 919 929 937 941 947 953 967 971 977 983 991 997

sum of product of subset B with exp 1: 9748774669761687833

Subset A: 2 3

sum of product of subsetA with exp 2: 12

Subset B: 5 7 11 13 17 19 23 29 31 37 41 43 47 53 59 61 67 71 73 79 83 89 97 101 103 107 109 113 127 131 137 139 149 151 157 163 167 173 179 181 191 193 197 199 211 223 227 229 233 239 241 251 257 263 269 271 277 281 283 293 307 311 313 317 331 337 347 349 353 359 367 373 379 383 389 397 401 409 419 421 431 433 439 443 449 457 461 463 467 479 487 491 499 503 509 521 523 541 547 557 563 569 571 577 587 593 599 601 607 613 617 619 631 641 643 647 653 659 661 673 677 683 691 701 709 719 727 733 739 743 751 757 761 769 773 787 797 809 811 821 823 827 829 839 853 857 859 863 877 881 883 887 907 911 919 929 937 941 947 953 967 971 977 983 991 997

sum of product of subset B with exp 2: 1050805265813824050

Subset A: 2 3

sum of product of subset A with exp 3: 18

Subset B: 5 7 11 13 17 19 23 29 31 37 41 43 47 53 59 61 67 71 73 79 83 89 97 101 103 107 109 113 127 131 137 139 149 151 157 163 167 173 179 181 191 193 197 199 211 223 227 229 233 239 241 251 257 263 269 271 277 281 283 293 307 311 313 317 331 337 347 349 353 359 367 373 379 383 389 397 401 409 419 421 431 433 439 443 449 457 461 463 467 479 487 491 499 503 509 521 523 541 547 557 563 569 571 577 587 593 599 601 607 613 617 619 631 641 643 647 653 659 661 673 677 683 691 701 709 719 727 733 739 743 751 757 761 769 773 787 797 809 811 821 823 827 829 839 853 857 859 863 877 881 883 887 907 911 919 929 937 941 947 953 967 971 977 983 991 997

sum of product of subset B with exp 3: 10799579935575511883

Subset A: 2 3

sum of product of subset A with exp 4: 24

Subset B: 5 7 11 13 17 19 23 29 31 37 41 43 47 53 59 61 67 71 73 79 83 89 97 101 103 107 109 113 127 131 137 139 149 151 157 163 167 173 179 181 191 193 197 199 211 223 227 229 233 239 241 251 257 263 269 271 277 281 283 293 307 311 313 317 331 337 347 349 353 359 367 373 379 383 389 397 401 409 419 421 431 433 439 443 449 457 461 463 467 479 487 491 499 503 509 521 523 541 547 557 563 569 571 577 587 593 599 601 607 613 617 619 631 641 643 647 653 659 661 673 677 683 691 701 709 719 727 733 739 743 751 757 761 769 773 787 797 809 811 821 823 827 829 839 853 857 859 863 877 881 883 887 907 911 919 929 937 941 947 953 967 971 977 983 991 997

sum of product of subset B with exp 4: 2101610531627648100

Subset A: 2 3

sum of product of subset A with exp 5: 30

Subset B: 5 7 11 13 17 19 23 29 31 37 41 43 47 53 59 61 67 71 73 79 83 89 97 101 103 107 109 113 127 131 137 139 149 151 157 163 167 173 179 181 191 193 197 199 211 223 227 229 233 239 241 251 257 263 269 271 277 281 283 293 307 311 313 317 331 337 347 349 353 359 367 373 379 383 389 397 401 409 419 421 431 433 439 443 449 457 461 463 467 479 487 491 499 503 509 521 523 541 547 557 563 569 571 577 587 593 599 601 607 613 617 619 631 641 643 647 653 659 661 673 677 683 691 701 709 719 727 733 739 743 751 757 761 769 773 787 797 809 811 821 823 827 829 839 853 857 859 863 877 881 883 887 907 911 919 929 937 941 947 953 967 971 977 983 991 997

sum of product of subset B with exp 5: 11850385201389335933

Subset A: 2 3 5

sum of product of subset A with exp 1: 30

Subset B: 7 11 13 17 19 23 29 31 37 41 43 47 53 59 61 67 71 73 79 83 89 97 101 103 107 109 113 127 131 137 139 149 151 157 163 167 173 179 181 191 193 197 199 211 223 227 229 233 239 241 251 257 263 269 271 277 281 283 293 307 311 313 317 331 337 347 349 353 359 367 373 379 383 389 397 401 409 419 421 431 433 439 443 449 457 461 463 467 479 487 491 499 503 509 521 523 541 547 557 563 569 571 577 587 593 599 601 607 613 617 619 631 641 643 647 653 659 661 673 677 683 691 701 709 719 727 733 739 743 751 757 761 769 773 787 797 809 811 821 823 827 829 839 853 857 859 863 877 881 883 887 907 911 919 929 937 941 947 953 967 971 977 983 991 997

sum of product of subset B with exp 1: 9328452563436158213

Subset A: 2 3 5

sum of product of subset A with exp 2: 60

Subset B: 7 11 13 17 19 23 29 31 37 41 43 47 53 59 61 67 71 73 79 83 89 97 101 103 107 109 113 127 131 137 139 149 151 157 163 167 173 179 181 191 193 197 199 211 223 227 229 233 239 241 251 257 263 269 271 277 281 283 293 307 311 313 317 331 337 347 349 353 359 367 373 379 383 389 397 401 409 419 421 431 433 439 443 449 457 461 463 467 479 487 491 499 503 509 521 523 541 547 557 563 569 571 577 587 593 599 601 607 613 617 619 631 641 643 647 653 659 661 673 677 683 691 701 709 719 727 733 739 743 751 757 761 769 773 787 797 809 811 821 823 827 829 839 853 857 859 863 877 881 883 887 907 911 919 929 937 941 947 953 967 971 977 983 991 997

sum of product of subset B with exp 2: 210161053162764810

Subset A: 2 3 5

sum of product of subset A with exp 3: 90

Subset B: 7 11 13 17 19 23 29 31 37 41 43 47 53 59 61 67 71 73 79 83 89 97 101 103 107 109 113 127 131 137 139 149 151 157 163 167 173 179 181 191 193 197 199 211 223 227 229 233 239 241 251 257 263 269 271 277 281 283 293 307 311 313 317 331 337 347 349 353 359 367 373 379 383 389 397 401 409 419 421 431 433 439 443 449 457 461 463 467 479 487 491 499 503 509 521 523 541 547 557 563 569 571 577 587 593 599 601 607 613 617 619 631 641 643 647 653 659 661 673 677 683 691 701 709 719 727 733 739 743 751 757 761 769 773 787 797 809 811 821 823 827 829 839 853 857 859 863 877 881 883 887 907 911 919 929 937 941 947 953 967 971 977 983 991 997

sum of product of subset B with exp 3: 9538613616598923023

Subset A: 2 3 5

sum of product of subset A with exp 4: 120

Subset B: 7 11 13 17 19 23 29 31 37 41 43 47 53 59 61 67 71 73 79 83 89 97 101 103 107 109 113 127 131 137 139 149 151 157 163 167 173 179 181 191 193 197 199 211 223 227 229 233 239 241 251 257 263 269 271 277 281 283 293 307 311 313 317 331 337 347 349 353 359 367 373 379 383 389 397 401 409 419 421 431 433 439 443 449 457 461 463 467 479 487 491 499 503 509 521 523 541 547 557 563 569 571 577 587 593 599 601 607 613 617 619 631 641 643 647 653 659 661 673 677 683 691 701 709 719 727 733 739 743 751 757 761 769 773 787 797 809 811 821 823 827 829 839 853 857 859 863 877 881 883 887 907 911 919 929 937 941 947 953 967 971 977 983 991 997

sum of product of subset B with exp 4: 420322106325529620

Subset A: 2 3 5

sum of product of subset A with exp 5: 150

Subset B: 7 11 13 17 19 23 29 31 37 41 43 47 53 59 61 67 71 73 79 83 89 97 101 103 107 109 113 127 131 137 139 149 151 157 163 167 173 179 181 191 193 197 199 211 223 227 229 233 239 241 251 257 263 269 271 277 281 283 293 307 311 313 317 331 337 347 349 353 359 367 373 379 383 389 397 401 409 419 421 431 433 439 443 449 457 461 463 467 479 487 491 499 503 509 521 523 541 547 557 563 569 571 577 587 593 599 601 607 613 617 619 631 641 643 647 653 659 661 673 677 683 691 701 709 719 727 733 739 743 751 757 761 769 773 787 797 809 811 821 823 827 829 839 853 857 859 863 877 881 883 887 907 911 919 929 937 941 947 953 967 971 977 983 991 997

sum of product of subset B with exp 5: 9748774669761687833

Subset A: 2 3 5 7

sum of product of subset A with exp 1: 210

Subset B: 11 13 17 19 23 29 31 37 41 43 47 53 59 61 67 71 73 79 83 89 97 101 103 107 109 113 127 131 137 139 149 151 157 163 167 173 179 181 191 193 197 199 211 223 227 229 233 239 241 251 257 263 269 271 277 281 283 293 307 311 313 317 331 337 347 349 353 359 367 373 379 383 389 397 401 409 419 421 431 433 439 443 449 457 461 463 467 479 487 491 499 503 509 521 523 541 547 557 563 569 571 577 587 593 599 601 607 613 617 619 631 641 643 647 653 659 661 673 677 683 691 701 709 719 727 733 739 743 751 757 761 769 773 787 797 809 811 821 823 827 829 839 853 857 859 863 877 881 883 887 907 911 919 929 937 941 947 953 967 971 977 983 991 997

sum of product of subset B with exp 1: 3967885233877958547

Subset A: 2 3 5 7

sum of product of subset A with exp 2: 420

Subset B: 11 13 17 19 23 29 31 37 41 43 47 53 59 61 67 71 73 79 83 89 97 101 103 107 109 113 127 131 137 139 149 151 157 163 167 173 179 181 191 193 197 199 211 223 227 229 233 239 241 251 257 263 269 271 277 281 283 293 307 311 313 317 331 337 347 349 353 359 367 373 379 383 389 397 401 409 419 421 431 433 439 443 449 457 461 463 467 479 487 491 499 503 509 521 523 541 547 557 563 569 571 577 587 593 599 601 607 613 617 619 631 641 643 647 653 659 661 673 677 683 691 701 709 719 727 733 739 743 751 757 761 769 773 787 797 809 811 821 823 827 829 839 853 857 859 863 877 881 883 887 907 911 919 929 937 941 947 953 967 971 977 983 991 997

sum of product of subset B with exp 2: 7935770467755917094

Subset A: 2 3 5 7

sum of product of subset A with exp 3: 630

Subset B: 11 13 17 19 23 29 31 37 41 43 47 53 59 61 67 71 73 79 83 89 97 101 103 107 109 113 127 131 137 139 149 151 157 163 167 173 179 181 191 193 197 199 211 223 227 229 233 239 241 251 257 263 269 271 277 281 283 293 307 311 313 317 331 337 347 349 353 359 367 373 379 383 389 397 401 409 419 421 431 433 439 443 449 457 461 463 467 479 487 491 499 503 509 521 523 541 547 557 563 569 571 577 587 593 599 601 607 613 617 619 631 641 643 647 653 659 661 673 677 683 691 701 709 719 727 733 739 743 751 757 761 769 773 787 797 809 811 821 823 827 829 839 853 857 859 863 877 881 883 887 907 911 919 929 937 941 947 953 967 971 977 983 991 997

sum of product of subset B with exp 3: 11903655701633875641

Subset A: 2 3 5 7

sum of product of subset A with exp 4: 840

Subset B: 11 13 17 19 23 29 31 37 41 43 47 53 59 61 67 71 73 79 83 89 97 101 103 107 109 113 127 131 137 139 149 151 157 163 167 173 179 181 191 193 197 199 211 223 227 229 233 239 241 251 257 263 269 271 277 281 283 293 307 311 313 317 331 337 347 349 353 359 367 373 379 383 389 397 401 409 419 421 431 433 439 443 449 457 461 463 467 479 487 491 499 503 509 521 523 541 547 557 563 569 571 577 587 593 599 601 607 613 617 619 631 641 643 647 653 659 661 673 677 683 691 701 709 719 727 733 739 743 751 757 761 769 773 787 797 809 811 821 823 827 829 839 853 857 859 863 877 881 883 887 907 911 919 929 937 941 947 953 967 971 977 983 991 997

sum of product of subset B with exp 4: 15871540935511834188

Subset A: 2 3 5 7

sum of product of subset A with exp 5: 1050

Subset B: 11 13 17 19 23 29 31 37 41 43 47 53 59 61 67 71 73 79 83 89 97 101 103 107 109 113 127 131 137 139 149 151 157 163 167 173 179 181 191 193 197 199 211 223 227 229 233 239 241 251 257 263 269 271 277 281 283 293 307 311 313 317 331 337 347 349 353 359 367 373 379 383 389 397 401 409 419 421 431 433 439 443 449 457 461 463 467 479 487 491 499 503 509 521 523 541 547 557 563 569 571 577 587 593 599 601 607 613 617 619 631 641 643 647 653 659 661 673 677 683 691 701 709 719 727 733 739 743 751 757 761 769 773 787 797 809 811 821 823 827 829 839 853 857 859 863 877 881 883 887 907 911 919 929 937 941 947 953 967 971 977 983 991 997

sum of product of subset B with exp 5: 1392682095680241119

Subset A: 2 3 5 7 11

sum of product of subset A with exp 1: 2310

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Subset B: 13 17 19 23 29 31 37 41 43 47 53 59 61 67 71 73 79 83 89 97 101 103 107 109 113 127 131 137 139 149 151 157 163 167 173 179 181 191 193 197 199 211 223 227 229 233 239 241 251 257 263 269 271 277 281 283 293 307 311 313 317 331 337 347 349 353 359 367 373 379 383 389 397 401 409 419 421 431 433 439 443 449 457 461 463 467 479 487 491 499 503 509 521 523 541 547 557 563 569 571 577 587 593 599 601 607 613 617 619 631 641 643 647 653 659 661 673 677 683 691 701 709 719 727 733 739 743 751 757 761 769 773 787 797 809 811 821 823 827 829 839 853 857 859 863 877 881 883 887 907 911 919 929 937 941 947 953 967 971 977 983 991 997

sum of product of subset B with exp 1: 360716839443450777

Subset A: 2 3 5 7 11

sum of product of subset A with exp 2: 4620

Subset B: 13 17 19 23 29 31 37 41 43 47 53 59 61 67 71 73 79 83 89 97 101 103 107 109 113 127 131 137 139 149 151 157 163 167 173 179 181 191 193 197 199 211 223 227 229 233 239 241 251 257 263 269 271 277 281 283 293 307 311 313 317 331 337 347 349 353 359 367 373 379 383 389 397 401 409 419 421 431 433 439 443 449 457 461 463 467 479 487 491 499 503 509 521 523 541 547 557 563 569 571 577 587 593 599 601 607 613 617 619 631 641 643 647 653 659 661 673 677 683 691 701 709 719 727 733 739 743 751 757 761 769 773 787 797 809 811 821 823 827 829 839 853 857 859 863 877 881 883 887 907 911 919 929 937 941 947 953 967 971 977 983 991 997

sum of product of subset B with exp 2: 721433678886901554

In this way, we can go to generate all extended prime numbers.

V.CONCLUSION

This approach extrapolates primes from existing ones via differences or sums of coprime products. The paper focuses on developing computer programming code to generate these extrapolated primes using different coprime product partitions of prime-powered sets. By working with products and differences of coprime products of prime powers, one can construct integers whose factorizations are partially controlled, which is useful for building structured moduli or trapdoor composites in advanced cryptographic designs. these extrapolated primes can then feed into key-generation routines for RSA-like or DH-style protocols, effectively enriching the pool of usable large primes.

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