Proposal of demonstration

of the Goldbach's conjecture

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The Goldbach's conjecture is the unproven mathematic assertion which states : All whole even number greater than 2 can be written as the sum of two prime numbers. It was formulated in 1742 by Christian Goldbach, it is one of the oldest unsolved problem of the theorie of number and mathematics.

1 Préambule

We will agree to say that at the time of writing, Goldbach's conjecture is not proven, that it is verified for all even integers less than. $8,875.10^{30}$ And that we don't know why some primes, decompose the even integers in sum of two primes.

2 Implementation of the tools

To prove the conjecture, and compute a decomposition, I need a tool that allows me to describe the integers. For that I propose to extend the representation of the integers in prime factors, by introducing all the prime numbers eligible to the decomposition. $p_n < n$

$$n \rightarrow \begin{pmatrix} (n)mod(2) = \cdots \\ (n)mod(3) = \cdots \\ (n)mod(5) = \cdots \\ (n)mod(7) = \cdots \\ \cdots \\ (n)mod(p_n) = \cdots \end{pmatrix} = Signature_n[]$$

Then from now on, I will only consider the result vector.

$$Sgn_n = []$$

2.1 Minimalist analysis

I can say that the signature or the result vector is unique. Proof : *the result vector or signature extends or encompasses the prime factor decomposition of integers.*

I can say that if there is no zero in the signature then n is a prime number. Proof :*A prime number is divisible by 1 and itself so if there is no zero in the signature n.*

2.2 Proposed proof of the Goldbach conjecture

An even integer >2 is a composite number and any composite number has a prime factor less than or equal to its square root. Proof : *Any compound integer can be represented in the form of a rectangle or a square and thus has a prime number less than or equal to its square root as a factor. I can also be satisfied with the absence of zero in the signature at the level of factors $<\sqrt{n}$, since every compound number has a factor $<\sqrt{n}$.*

Now, if there is an even integer which is not decomposable into the sum of two primes, it implies that in the signature of this number, I have all the primes as values, which are present at the level of the factors inferior to the root, (I need a zero at a given moment) and it is not possible, because "it doesn't fit into signature".

2.2.1 Numerical example $\sqrt{n} = 32, \cdots$

So I have in the signature of $2n$ the following modulos

$$Sgn_{2n} = \begin{pmatrix} (2n)mod(2) = \ 0 \\ (2n)mod(3) = \cdots \\ (2n)mod(5) = \cdots \\ (2n)mod(7) = \cdots \\ (2n)mod(11) = \cdots \\ (2n)mod(13) = \cdots \\ (2n)mod(17) = \cdots \\ (2n)mod(19) = \cdots \\ (2n)mod(23) = \cdots \\ (2n)mod(29) = \cdots \\ (2n)mod(31) = \cdots \end{pmatrix}$$

Then I assigned to the signature of the even number the following values, $\{0, 1, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31\}$ It is useless to add that the value cannot be superior to the value of the modulo consider or of the row, that the cardinal of the 2 matrices are different, and that the absent number prime will decompose the even integer into the sum of two primes, if it doesn't factor it $2n$, of course.

2.3 Particular case

To decompose the particular cases, I will use the underlying notion at the origin of the demonstration, or I make them fit into the general case, there are small even integers like :

$$6 = 3 + 3 = 5 + 1 \quad , \quad 18 = 13 + 5 = 17 + 1 \quad , \quad 38 = 31 + 7 = 37 + 1$$

which are not decomposable with prime numbers $< \sqrt{2n}$ but which can be decomposed. Because each element of the $2n$ signature can be decomposed into a sum,

$$Sgn_{2n} = \begin{pmatrix} (2n)mod(2) = \quad 0 \; = \; 1 + 1 \\ (2n)mod(3) = \cdots = a_3 + b_3 \\ (2n)mod(5) = \cdots = a_5 + b_5 \\ (2n)mod(7) = \cdots = a_7 + b_7 \\ \cdots \end{pmatrix}$$

and to this decomposition or to its two signatures, I could associate two integers,

$$Sgn_a[] = n_a \quad , \quad Sgn_b[] = n_b$$

and if there is no zero present in $Sgn_a[]Sgn_b[]$, then these integers will be prime, this method of decomposition is always possible whatever the value of the modulos of $2n$, and allows to justify the others solutions which decomposes $2n$ in sum. We can also to simplify and consider these cases as an exception , since they are related to the fact that these numbers are very small, or have a very small square root.

$$\sqrt{2 \cdot 3} = 2, \cdots \quad \sqrt{2 \cdot 3^2}, = 4, \cdots \quad \sqrt{2 \cdot 19} = 6, \cdots$$

2.4 Corollary

2.4.1 Modular arithmetics

To compute $(n)mod(p \cdot q)$ I compute n from its signature which allows me to represent the integers as a sum and to extract a part of the structure to calculate the modulo.

$$n = \underbrace{\underbrace{\underbrace{\underbrace{\underbrace{1 \cdot \begin{bmatrix} 0 \\ 1 \end{bmatrix}}_{(n)mod(2)} + 2 \cdot \begin{bmatrix} 0 \\ 1 \\ 2 \end{bmatrix}}_{(n)mod(3)} + 2 \cdot 3 \cdot \begin{bmatrix} 0 \\ 1 \\ 2 \\ 3 \\ 4 \end{bmatrix}}_{(n)mod(5)} + 2 \cdot 3 \cdot 5 \cdot \begin{bmatrix} 0 \\ 1 \\ 2 \\ 3 \\ 4 \\ 5 \\ 6 \end{bmatrix}}_{(n)mod(7)} + 2 \cdot 3 \cdot 5 \cdot 7 \cdot \begin{bmatrix} 0 \\ 1 \\ 2 \\ \cdots \\ 8 \\ 9 \\ 10 \end{bmatrix}}_{\cdots(11)} + \cdots$$

Then put $p \cdot q$ into factors

$$n = \underbrace{1 \cdot \begin{bmatrix} 0 \\ 1 \end{bmatrix} + 2 \cdot \begin{bmatrix} 0 \\ 1 \\ 2 \end{bmatrix} + 2 \cdot 3 \cdot \begin{bmatrix} 0 \\ 1 \\ 2 \\ 3 \\ 4 \end{bmatrix}}_{(n)mod(p \cdot q)} + \underbrace{(p \cdot q).(\cdots)}_{(n)mod(p \cdot q)=0}$$

2.4.2 There is an infinite number of twin primes.

The quantity of elements present in the signature is decorrelated, from the difference between 2 twin primes, triplets, ... because

$$(p_a)mod(2 \cdot 3 \cdot 5 \cdot 7 \cdots) = p_b$$

with the primoriel $\prod p \ll p_a$.

2.4.3 Legendre's conjecture

There exists a prime between n^2 and $(n+1)^2$ for all integers $n \geq 1$ since $2n = p_a + p_b$ with $p_b < \sqrt{2n}$ then

$$(n+1)^2 \pm \{0,1\} - p_b = p_a \qquad p_a > n^2, p_b < \sqrt{(n+1)^2}$$

2.4.4 $\pi(n)$

From the signature of n I calculate the quantity of combination without zero, all the difficulty lies in the upper limit of the product, which remains to establish.

$$Sgn_n = \begin{pmatrix} (n)mod(2) & \in & \{0,1\} \\ (n)mod(3) & \in & \{0,1,2\} \\ (n)mod(5) & \in & \{0,1,2,3,4\} \\ (n)mod(7) & \in & \{0,1,2,3,4,5,6\} \\ \cdots & & \\ (n)mod(p_n) & \in & \{0,1,2,\cdots,p_{(n-1)}\} \\ \cdots & & \end{pmatrix} \pi(n) = \prod_{p=2}^{p=\cdots} (p-1)$$

2.5 Conclusion

If you don't admit that the conjecture is proven, you can already say that you know why some primes decompose or not the even integers.Because between us it's a big piece.

Thanks for your attention.

Références

[1] Conjecture de Goldbach.

[2] Conjecture de Legendre.

[3] Conjecture des nombres premiers jumeaux, triplés, quadruplés .

[4] distribution asymptotique des nombres premiers

[5] Un concept très personnel (le dénominateur commun de forme)