ADVANCED PROOF THE RIEMANN HYPOTHESIS

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In the proof of the correctness of the Riemann hypothesis held strong Godel's incompleteness theorem. In keeping with the ideas of Polya and Hadamard's mathematical inventions, we decided to go beyond the modern achievements of the Gauss law of prime numbers and Riemann transformations in the complex numbers, knowing that at equipotent prime natural numbers will be sufficient mathematical transformations in real numbers. In simple numbers on the top left corner of the incidence matrix blocks are of the frame. When they move, a jump of the prime rate. Capacity of a number of prime numbers can be controlled by a frame, and they will be more reliable digits. In the column $i = 1$ there is only one non-trivial zero on $j = (0, \infty)$. By the implicit Gaussian «normal» distribution $z_{1j} = 1 - \exp(-10{,}11900(P_j - 2)^2)$, where P_j – a number of prime numbers with the order-rank j. On the critical line of the formula for prime numbers $z_{2j} = \frac{1}{2} - 0{,}707107\cos\left(\frac{\pi P_j}{2} - 0{,}78540\right) = \frac{1}{2} - 0{,}707107\cos\left(\frac{\pi}{2}P_j - \frac{\pi}{4}\right)$. By «the famous Riemann hypothesis is that the real part of the root is always exactly equal to 1/2» is obtained – the vibration frequency of a series of prime numbers is equal $\pi/2$, and the shift of the wave – $\pi/4$. Montgomery and Dyson gave the average frequency of occurrences of zeros. But it turns out, it is different and functionally related to the number of spaces $\pi = 3{,}14159...$ In 1972, Montgomery showed oscillatory nature of the arrangement of zeros on the critical line. We saw that they (and 1) really varies.

Keywords: prime numbers, the full range, critical line, the equation

While working on the proof of the correctness of the Riemann hypothesis held *strong Godel's incompleteness theorem*: «The logical completeness (or incompleteness) of any system of axioms cannot be proved within this system. For its proof or refutation of the required additional axioms (strengthening of the system)».

In keeping with the ideas of mathematicians Polya and Hadamar about mathematical inventions, we decided to go beyond the modern achievements of the Gauss law of prime numbers and Riemann transformations in the complex numbers, realizing that at equipotent prime natural numbers will be sufficient mathematical transformations in real numbers.

Full range, methods and data. Prime number – this is a natural number $N = \{0, 1, 2, 3, 4, 5, 6, ...\}$ with a natural divider 1 (division by himself – is redundantly).

Of prime numbers $P = \{0, 1, 2, 3, 4, 5, 7, ...\}$ «ladder of Gauss-Riemann» separated «step» increase with the parameter of ***prime numbers*** $p_j = P_{j+1} - P_j$, where $j = 0, 1, 2, 3, 4, ...$ – is the rank order. Rejection of the system with base $e = 2{,}71828...$ led to the translation of the binary system. Understand that mathematics, fascinated by the factorization of prime numbers, forget about the benefits of the decomposition of numbers.

Table 1 shows the conversion of 500 prime numbers from decimal to binary. The decomposition of primes is known by the simple rules on the discharge rank $i = 0, 1, 2, 3, 4, ...$

Table 1

Parameters of the total number of 500 prime numbers in binary

Options			Prime number in binary															Increase in the binary system								
The order of the rank j	Prime number P_j	Growth p_j	Envelope		Discharge-the rank of the number i_j^P of binary systems													Envelope		Discharge-the rank i_j^P of a binary						
			border P'_j	discharge $i^P_{j\max}$	12	11	10	9	8	7	6	5	4	3	2	1	0	border p'_j	discharge $i^P_{j\max}$	6	5	4	3	2	1	0
					Part of the prime number $P_{ij} = 2^\wedge(i_j^P - 1)$												2^{-1}			Part of the increase						2^{-1}
					2048	1024	512	256	128	64	32	16	8	4	2	1				32	16	8	4	2	1	
0	0	1	1	1												1	½	1	1						1	½
1	1	1	1	1		Trivial zeros										**1**	½	1	1	Trivial zeros					1	½
2	2	1	2	2											**1**	0	½	1	1						1	½
3	3	2	2	2											1	**1**	½	2	2					1	**0**	½
4	5	2	4	3										1	**0**	**1**	½	2	2					**1**	0	½
5	7	4	4	3										**1**	**1**	**1**	½	4	3				**1**	0	**0**	½
6	11	2	8	4									**1**	0	1	**1**	½	2	2					**1**	0	½
7	13	4	8	4									1	**1**	**0**	**1**	½	4	3				**1**	0	**0**	½
8	17	2	16	5								1	0	0	**0**	**1**	½	2	2					**1**	0	½
9	19	4	16	5								1	0	0	**1**	**1**	½	4	3				**1**	0	**0**	½
10	23	6	16	5								1	0	1	**1**	**1**	½	4	3				1	**1**	0	½

Table 1 shows the symmetrical geometric patterns, but their analysis we did not. It is seen that any prime number before itself has a ratio of 1/2. But it is a sum of terms is not included. Complex mathematical expressions, the parameters of the series has the form:

$$i_j = (1, m);\quad j = (0, n);\quad m = 6;\quad n = 500;$$

$$P_{j+1} = P_j + p_j,\quad p_j = P_{j+1} - P_j;\quad P_j = P'_j + P''_j;$$

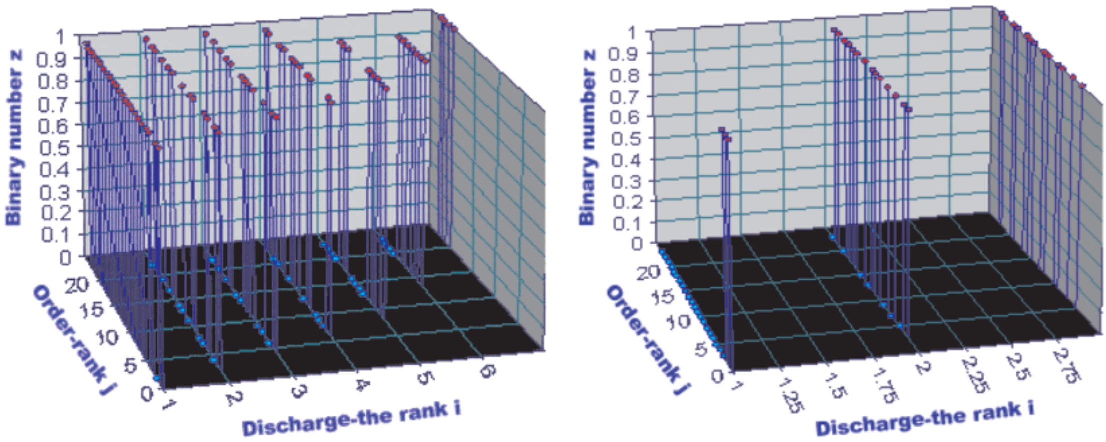
$$P'_j = 2^{i_{j\max}-1};\quad P''_j = \sum_{i_j=1}^{i_{j\max}-1} \xi_{ij} 2^{i_j-1};\quad \xi_{ij} = 0 \vee 1;$$

$$p_j = p'_j + p''_j;\quad p'_j = 2^{i_{j\max}-1};$$

$$p''_j = \sum_{i_j=1}^{i_{j\max}-1} \xi_{ij} 2^{i_j-1};\quad \xi_{ij} = 0 \vee 1. \qquad (1)$$

Mathematical «landscape». In the film «De Code» (19.07; 26.07 and 02.08.2011) showed a three-dimensional picture of the Riemann zeta function. All pay attention to the nontrivial zeros on the critical line. They are already counted several trillion.

Alignment of the binary system is infinitely high «mountain» transforms into ledges of identical height, equal to unity. Fig. 1 shows the landscape of the 24 first prime numbers.



Prime numbers at the beginning of the distribution

Of prime numbers at the beginning of the distribution

Fig. 1. Mathematical «landscape» binary distribution of the 24 first prime numbers

Benchmarks. They are on the upper left corner blocks of prime numbers. It was during the transition to them occurs a jump increase in prime. Therefore, power series of prime numbers is quite possible to manage with the help of a benchmarks, they will be safer decimal digits.

From table 1, we write the nodal values N_R (tab. 2) and other parameters of benchmarks.

Table 2

Asymptotic benchmarks a number of 500 primes

i	1	2	3	4	5	6	7	8	9	10	11	12
j	0	2	4	6	8	13	20	33	56	99	174	311
P_{ij}	0	2	5	11	17	37	67	131	257	521	1031	2053
N_R	1	2	4	8	16	32	64	128	256	512	1024	2048
$P_{ij} - N_R$	-1	0	1	3	1	5	3	3	1	9	7	5

Influence of prime numbers. At $i = 0$ there is $z_0 = 1/2$.

And in the column $i = 1$ (fig. 2) there is only one nontrivial zero throughout $j = (0, n)$, i.e. before $j = (0, \infty)$. By implicitly given us the law of Gauss «normal» distribution have

$$z_{1j} = 1 - \exp(-10{,}11900(P_j - 2)^2). \qquad (2)$$

Then the prime number 2 is a critical and noncritical series begins with 3.

On the critical line is the formula

$$z_{2j} = 1/2 - 0{,}707107\cos\left(\frac{\pi P_j}{2} - 0{,}78540\right) = \frac{1}{2} - 0{,}707107\cos\left(\frac{\pi}{2}P_j - \frac{\pi}{4}\right). \quad (3)$$

Completed (fig. 3) evidence of «the famous Riemann hypothesis about that the real part of the root is always exactly equal to 1/2». The frequency of oscillation is equal π/2, and the shift – π/4.

What does it mean 0,707107 – we do not know. Then obtained (fig. 4) model

$$z_{3j} = \frac{1}{2} - 0{,}707107\cos\left(\frac{\pi}{4}P_j - \frac{\pi}{2}\right). \quad (4)$$

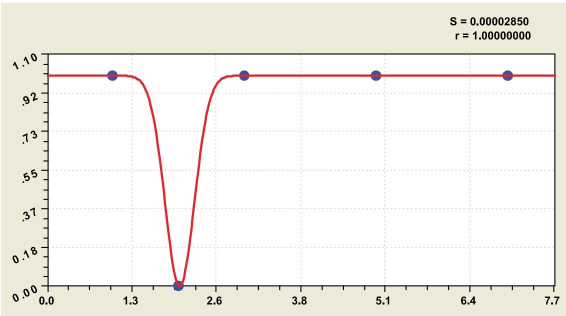


Fig. 2. Schedule of the (5):
S – dispersion; *r* – correlation coefficient

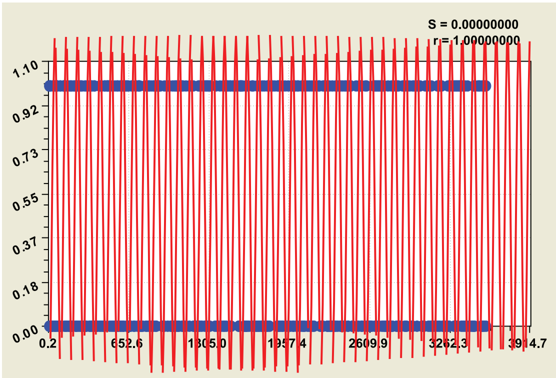
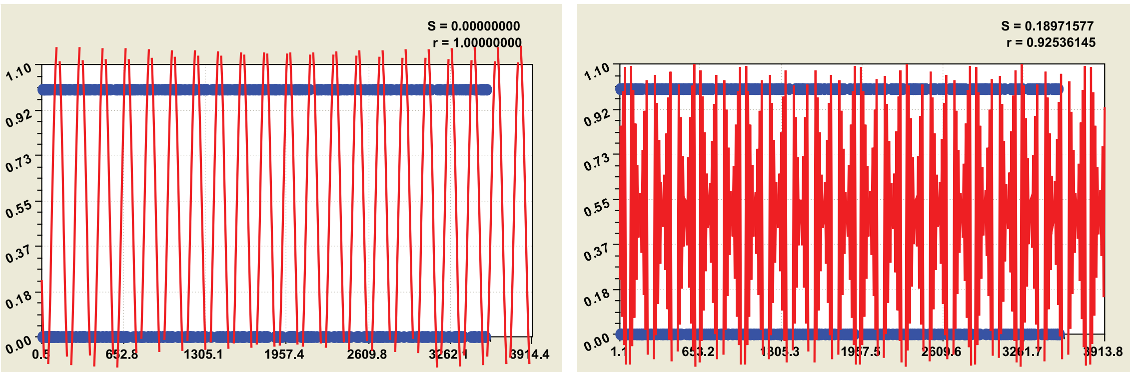


Fig. 3. Schedule of the (3) the distribution of the binary number



The statistical model (4) for the third rank

The statistical model (5) at the fourth digit

Fig. 4. Graphs of the distribution of the binary components of prime numbers

Montgomery and Dyson applied statistical physical methods of the analysis of distributions with respect to a number of primes and determined the average frequency of occurrences of zeros.

From the remains of up to 0,25 for the fourth level was obtained (fig. 4) model

$$z_{4j} = \frac{1}{2} - 0{,}648348\cos\left(\frac{\pi}{8}P_j - \frac{\pi}{2}\right). \quad (5)$$

For the fifth and sixth digits (fig. 5) were obtained regularities:

$$z_{5j} = \frac{1}{2} - 0{,}643132\cos\left(\frac{\pi}{16}P_j - \frac{\pi}{2}\right); \quad (6)$$

$$z_{6j} = \frac{1}{2} - 0{,}638209\cos\left(\frac{\pi}{32}P_j - \frac{\pi}{2}\right). \quad (7)$$

It is noticeable that with increasing level binary system balances (absolute error) increases. This can be seen in the graphs to reduce the correlation coefficient. In 1972 Montgomery proved nature of the distribution of the zeros on the critical line. From formulas (6) and other shows that they (and 1) is indeed fluctuate. We explain the desire of prime numbers, as well as convert them to binary 0 and 1, diverge from each other because of the power produced in the progression $P'_j = 2^{i_{j\max}-1}$. A nontrivial zeros of scatter in the plane (i, j) in laws (3) for summand P''_j at $\xi_{ij} = 0 \vee 1$.

For the seventh and eighth categories (fig. 6) formulas of a similar design are received:

$$z_{7j} = \frac{1}{2} - 0,633145 \cos\left(\frac{\pi}{64} P_j - \frac{\pi}{2}\right); \quad (11)$$

$$z_{8j} = \frac{1}{2} - 0,636929 \cos\left(\frac{\pi}{128} P_j - \frac{\pi}{2}\right). \quad (12)$$

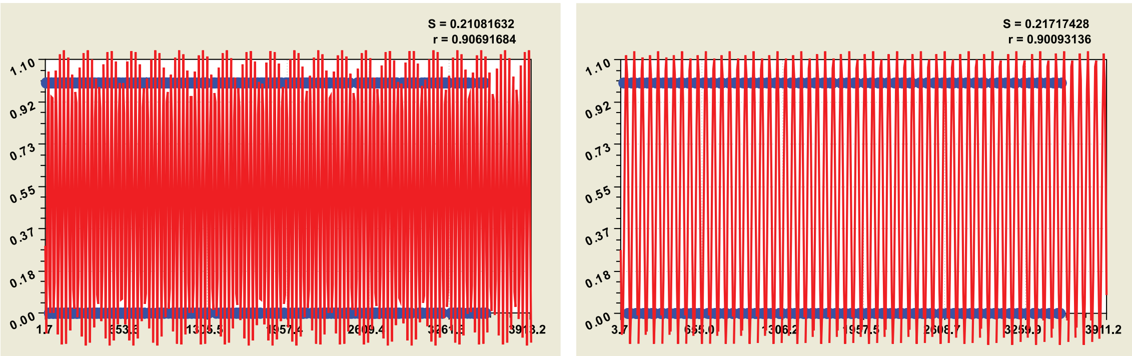
For the ninth and tenth digits have produced similar pattern:

$$z_{9j} = \frac{1}{2} - 0,638599 \cos\left(\frac{\pi}{256} P_j - \frac{\pi}{2}\right); \quad (13)$$

$$z_{10j} = \frac{1}{2} - 0,636726 \cos\left(\frac{\pi}{512} P_j - \frac{\pi}{2}\right). \quad (14)$$

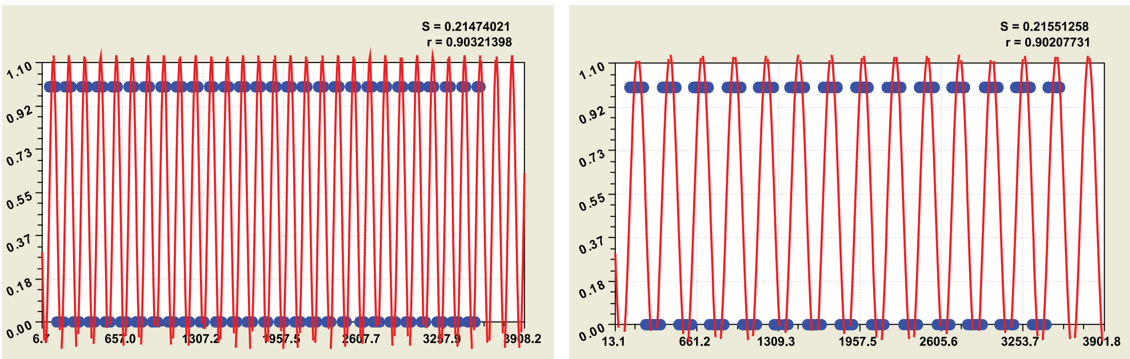
For the 11-th digit similarly has been received the formula (with the $z_{12j} = 1$)

$$z_{11j} = \frac{1}{2} - 0,633526 \cos\left(\frac{\pi}{1024} P_j - \frac{\pi}{2}\right). \quad (15)$$



The statistical model (6) at the fifth discharge　The statistical model (7) at the sixth discharge

Fig. 5. Graphs of the distribution of the binary components of prime numbers



The statistical model (11) for the seventh digit　The statistical model (12) for the eighth digit

Fig. 6. Graphs of the distribution of the binary components of prime numbers

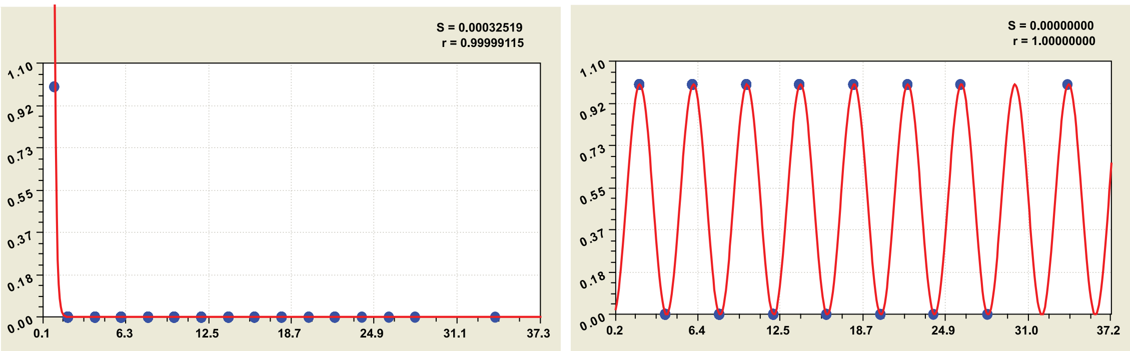
Effect of growth in charges. Bernhard Riemann in 1859, according to the analysis of the zeta function asserted that the zeros are on the same line. Now believe it as critical line crosses the mathematical landscape of the zeta function.

For 1 and 2 categories (fig. 7) on unbroken trivial zeros of the verticals are:

– the law of the Laplace (in physics – Mandelbrot);

$$z_{1j} = 1348,7836 \exp(-7,20702\, p_j); \quad (16)$$

$$z_{2j} = \frac{1}{2} - \frac{1}{2} \cos\left(\frac{\pi p_j}{2}\right). \quad (17)$$



Statistical model (16) at the first category Functional model (17) on a critical line

Fig. 7. Schedules of distribution of binary number at components of a gain of simple numbers

The critical line $i_j^p = 2$ has received the unequivocal formula, and without wave shift.

Conclusions

The famous Riemann hypothesis is proved. For this was accomplished the transformation of a number of prime numbers from decimal notation to binary. We obtain four new criteria. There were geometric patterns. Became visible «on the floor» non-trivial zeros and appeared units «on the ceiling» of the distribution of 0 and 1 instead of abrupt «hills» of zeta-function.

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