Applying the New Primer on Prime Numbers

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Abstract: - We have a new model for understanding the behavior of prime numbers that considers the increments as sums of second derivatives. We use the perfectly alternating double-threaded helix prime number growth structure that dominated the first 500 prime numbers after a modulo 6 operation. The multiples of 6 influence the two threads in a 3-D manner. Electromagnetic reversal patterns between the threads and the thread bonds indicate a coordinated 3-D multi-physics growth rate of the prime numbers. The harmonic patterns of a newly mapped 10-step model are also introduced. This new concept is presented as a framework to help apply approaches to understanding and solving our hardest multi-physics and Millennium problems. The last sections of this paper suggest how to apply, adapt, or correlate this framework to with WSEAS research. An exciting electromagnetic multidirectional vector model is the result of applying this framework by forcing a 90-degree molecular bond concept.

Key-Words: - Prime Numbers, Double Helix, Riemann Hypothesis, Second Derivative, Millennium Problems

1 Introduction

What if we have been looking at the Prime Numbers incorrectly? We are convinced that the prime numbers are sums of squares because common sense dictates that the prime numbers must describe some geometric or physical property, especially of an elliptical incompressible nature. But…what if the Prime Number increments are sums of second derivatives from a 3D flow over a distinct physical model over time? The proposed concept is a flow through the center of a cylindrical model that senses the acceleration and electromagnetic fields. If that were the case, we would have a flexible model that could take us on to understanding the strengths and the shortfalls of the Riemann Hypothesis, if not also on to understanding three other Millennium problems: Yang-Mills, Navier-Stokes, and Birch and Swinnerton-Dyer.

This paper presents that flexible model and key structure. The structure is based on the continually and perfectly alternating non-zero sequence of "2-4-2-4-2-4…" resulting from a modulo 6 operation on the consecutive prime number increments. The sequence stands true for all the increments of prime numbers 5 and greater from the sample set of the first 500 prime numbers.

The almost viral influence of the multiples of 6 on the double-threaded structure (2-thread and 4-thread) was previously shown to have a general cause and effect rate of five elliptical coil-like steps per 360-degrees [1]. Recent analysis of hundreds of thousands of possible palindrome sequences revealed that the prime number growth structure is not driven by single cause and effect actions but by sequences reversing, overlapping, connecting, and rotating at 90-degress [2].

We will start with some of those previously presented sequences just to briefly introduce the reader to the overwhelming amount of synchronized patterns. We will then present the only two models with significant harmonic cylinder features. The patterns in the 10-step single cylinder and the 5-step two cylinder models lead us to consider the flexibility of the key double threaded structure.

Lastly, we briefly associate the double-threaded model to recent research done in the areas of number theory, electron mass, and cryptanalysis. A significant concept of electromagnetic perpendicular base relationships is applied using a 90-degree advance with a 12-step model. The result from this forced sine and cosine relationship is converging vectors that give convincing evidence of an Euler equation driving the behavior of the prime numbers.

But before we start reviewing patterns, we need to introduce our concept for understanding the patterns – the second derivatives of x^2, $2y^2$, and z^3. We need to consider the elements as sums of the resulting values from their second derivative values (2, 4, and 6*z*). The function "*z*" controls the amplitude of the multiples of 6, with the term 6*z* being applied over the 2-4 structure in a 3-D manner. Now we are ready to see the second derivative influence of the function z^3 on the perfectly repeating 2-4 double threaded structure starting with the prime number gap between 5 and 7, and continuing in coil continuous coil-like manner.

2 The Double Threaded Patterns

Table 1 shows the first 22 of the 164 coils that represent the double-thread pattern in the sample set. The patterns are alphanumerically labeled so the reader can quickly see the overwhelming amount of tail-to-tail string reversals. The linear sequence is from left to right with the "4 to 2" bond looping back to the next row. The linear patterns clearly rotate and reverse in a general 5-coil cyclic frequency.

Table 1 Influence patterns of 6*z* on first 22 coils.

#		2	2 to 4 Bond					4	4 to 2 Bond				
1	A1	2						4					
2	A2	2						4					
3	A3	2						4	G1	6			
4	A4	2			6			4					D1
5	A5	2						4		6	6	C4	D2
6		2			6		A5	4					D3
7		2			6		A4	4			6	C2	D4
8		8	G1		C4		A3	4					D5
9		2					A2	4					
10		2					A1	4					D5
11	B1	14						4	C1		6		D4
12	B2	2						10	C2	T1			D3
13	B3	2		6	6			4	C3	6	6		D2
14	B4	2		F1	F2			10	C4				D1
15	B5	2						4	C5				
16		2		12	12			4					
17	B5	2		B1	B2			4	C5			6	D2
18	B4	2						10	C4	6	6	6	G1
19	B3	2			6			4	C3	F1	F2		
20	B2	2	E1		C4			10	C2				
21	B1	14	E2					4	C1				
22		2	E3					4					

3 Two Models with Harmonic Results

Only the cross-torque 10-step single cylinder model and the 5-step double cylinder model provide convincing harmonic patterns at the cylinder level. Fig. 1 contains the structural concept for these two cylinder models. The corresponding 2-4 thread items on the 10-step model have opposite torque at the same level of the single cylinder (Fig. 1a). The corresponding thread items on the 5-step model act as if they go between the internal and external ends of a stator winding (Fig. 1b).

After examining several thousand patterns from multiple cycle-step models, we can confidently state that the 3, 4, 6, 7, 8, and 9 cycle step models yield trivial patterns in comparison to these two models. This research has led us to consider a general flow model of behavior for the prime numbers (Fig. 1c). We will also see later (in the table containing the total data set) that over 95% of the bonds have their own 90-degree mapping to adjacent thread sequence values. Later, a whole different vector behavior is seen when we force the double-threaded framework into an electromagnetic sine-cosine model.

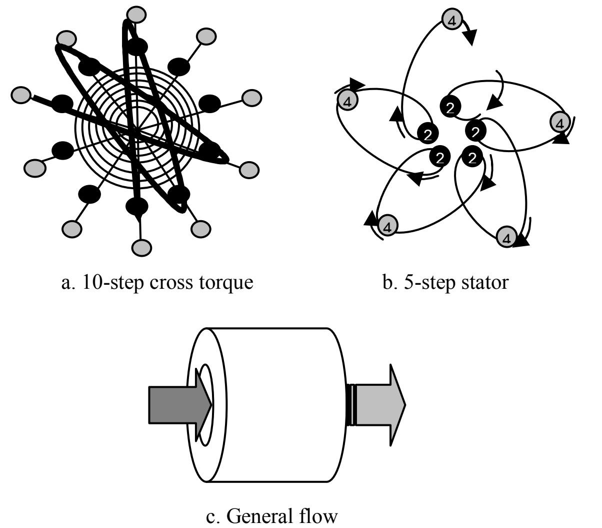

Fig. 1. Flow through the 5-step and 10-step models.

3.1 Ten-Step Single Cylinder Model

Our first glance at the resulting patterns for the ten-step single cylinder cross-torque model in Table 2 may make us walk away in frustration from the blob of data. A more detailed and methodical inspection yields clear results in the column format for each vertical rod of the front and back 180 degree sections.

The black-shaded cells mark the center of a harmonic, or palindrome, sequence. The light-grey shaded cells reveal the rest of the pattern centered on the black cells. The dark-grey shaded cells are the overlapping light-grey sections of harmonic sequences.

These harmonic patterns are occurring at the same time the sequential reversal patterns just presented in our previous section; coil numbers 1 to 21 are blackened as a visual reminder.

The model alternates between 2-thread elements and 4-thread elements while going across the row of coils. Coils 1 to 5 in the first row show the alternating 2-4 sequence between front and back 180-degree sections. The second 180-degrees of the 2-thread are the second 5 elements in the second row, on the back 180-degree side of the model.

An overlapping sums concept helps us understand the significance of strings such as the first rod in the front 180-degree section. Proceeding down in the column we have 0-2-0-0-0-0-0-2-0 (from 16 to 56) overlapping and summing with 0-1-1-0-0-0-0-0-1-1-0 (from 36 to 86). And, we also have 0-1-2-2-1-0 (from 86 to 111) summing with 0-1-0-0-0-0-0-0-1-0 (from 91 to 136). This is one possible explanation for large gaps in the increments of the prime numbers as single sum points of overlapping sequences of harmonic motion [3].

This concept is also seen in the 3rd front 180-degree column from 23 down to 66. We could have a series of 2-1-1-0-1-1-2 overlapping at the 1 before the final 2 with a 0-1-1-1-0 pattern that creates the sum multiple of 3 in coil 51. We could go on at length, especially with only single multiples of 6 involved.

Table 2 Harmonic 6*z* function rods in 10-step model.

Coil	Front 180						Back 180					
1	2	0	0	0	0	0	4	0	0	0	0	0
6	4	0	0	0	0	0	2	0	0	1	0	0
11	2	2	0	0	0	0	4	0	1	0	1	0
16	4	0	0	1	0	1	2	0	0	0	0	0
21	2	2	0	2	0	1	4	0	0	1	0	0
26	4	0	1	1	0	0	2	1	1	0	0	1
31	2	0	1	1	0	0	4	0	0	0	1	1
36	4	0	1	0	0	1	2	0	0	0	0	1
41	2	1	1	1	1	2	4	1	0	0	0	1
46	4	1	0	1	0	0	2	0	0	0	2	0
51	2	2	0	3	1	1	4	0	0	0	1	0
56	4	0	0	1	1	1	2	2	1	0	0	0
61	2	0	0	1	0	1	4	0	0	3	1	1
66	4	0	1	0	0	0	2	1	0	0	0	0
71	2	0	1	2	0	1	4	5	1	0	0	0
76	4	1	0	0	0	0	2	0	0	0	1	1
81	2	1	2	0	0	3	4	0	0	0	1	0
86	4	0	1	1	0	1	2	0	0	0	1	0
91	2	1	2	0	0	0	4	2	0	0	1	2
96	4	3	0	0	1	1	2	0	1	0	1	0
101	2	2	0	0	0	0	4	1	0	1	2	0
106	4	1	0	2	0	2	2	0	1	1	0	1
111	2	0	1	0	0	2	4	0	0	3	0	0
116	4	0	0	0	1	0	2	0	2	1	4	1
121	2	0	0	1	2	0	4	3	2	0	1	0
126	4	0	0	0	1	1	2	1	0	1	0	0
131	2	1	2	0	0	2	4	0	1	0	2	0
136	4	0	1	1	0	4	2	1	1	1	2	0
141	2	0	1	2	1	3	4	1	0	0	0	1
146	4	2	0	0	0	3	2	0	4	0	1	1
151	2	0	0	0	0	0	4	0	4	0	0	1
156	4	2	2	2	0	0	2	0	0	3	1	0
161	2	0	1	0	0	0	4	3	1	0	1	--

Certainly determining the exact sequences is far beyond the single processing power of this author, but it does suggest a solid approach for further decoding the exact differential equations that drive the prime number growth.

3.2 Five-Step Double Cylinder Model

We express the impact of the 6*z* function in terms of *z* for the next two tables because it will help us see more clearly the significant high points in the sequences. Table 3 "displays dark shaded vertical sections with white text, which are clearly reversal patterns. The medium grey shaded cells with black text are also reversal patterns, that when they are adjacent to a dark grey vertical pattern are also partially overlapping with some darker shaded cells" [4].

Table 3 Patterns for *z* in the 5-step cylinder rods.

Cylinder Shells										
Coil	2 – Thread Rods					4 – Thread Rods				
1	0	0	0	0	0	0	0	0	0	0
6	0	0	6	0	0	0	0	0	0	0
11	12	0	0	0	0	0	6	0	6	0
16	0	0	0	0	0	0	0	6	0	6
21	12	0	12	0	6	0	0	6	0	0
26	6	6	0	0	6	0	6	6	0	0
31	0	6	6	0	0	0	0	0	6	6
36	0	0	0	0	6	0	6	0	0	6
41	6	6	6	6	12	6	0	0	0	6
46	0	0	0	12	0	6	0	6	0	0
51	12	0	18	6	6	0	0	0	6	0
56	12	6	0	0	0	0	0	6	6	6
61	0	0	6	0	6	0	0	18	6	6
66	6	0	0	0	0	0	6	0	0	0
71	0	6	12	0	6	30	6	0	0	0
76	0	0	0	6	6	6	0	0	0	0
81	6	12	0	0	18	0	0	0	6	0
86	0	0	0	6	0	0	6	6	0	6
91	6	12	0	0	0	12	0	0	6	12
96	0	6	0	6	0	18	0	0	6	6
101	12	0	0	0	0	6	0	6	12	0
106	0	6	6	0	6	6	0	12	0	12
111	0	6	0	0	12	0	0	18	0	0
116	0	12	6	24	6	0	0	0	6	0
121	0	0	6	12	0	18	12	0	6	0
126	6	0	6	0	0	0	0	0	6	6
131	6	12	0	0	12	0	6	0	12	0
136	6	6	6	12	0	0	6	6	0	24
141	0	6	12	6	18	6	0	0	0	6
146	0	24	0	6	6	12	0	0	0	18
151	0	0	0	0	0	0	24	0	0	6
156	0	0	18	6	0	12	12	12	0	0
161	0	6	0	0	0	18	6	0	6	--

In this model we allow the perfectly alternating 2 and 4 thread elements to form two separate cylinders. The concept here is that there may be two radii, r_1 and r_2, one for each of the ends of the elliptical coils. This is a significant concept to consider if we want to use a polar coordinate form of prime numbers to solve problems of acceleration in fluid or electrical flows. This model gives us the overwhelming vertical reversals, inter-thread common patterns, and overlapping palindromes.

Insertions (or overlapping sums) placed in otherwise perfectly harmonic sequences help explain the tight bonding strength and incompressibility of the prime numbers. One very solid example is the long string at coils 56 to 73, with the string of "12-6-0-0-0-0-0-6-0-6-6-0-0-0-0-0-6-12." The extra 6 in the middle is almost an off-harmonic insertion. It gives us the impression of an off-beat stroke that prevents a clean harmonic breakdown of the key sequence.

3.3 90-Degree Bond-Thread Behavior

Table 4, which spans the next two pages, contains all the "*z*" increments for the first 500 prime numbers, with items before 5 removed.

For over 95% of the nonzero bond elements, there just happens to be corresponding thread elements transposed at 90-degrees. Our clearest example is at the 4-to-2 bond on coil 94, where the unique sequence of "12-6-6-18" is also on the immediately adjacent 2-thread (coils 85 to 94) with zeros inserted. Fortunately, we can map this pattern to the threads if we take the liberty to insert zeros into the bonds at no charge, since the insertion of a zero on a bond merely represents a zero increment in the prime numbers. We cannot do this with the six values on the threads because a zero value on a thread really is an increment of either 2 or 4.

Table 4 Influence of 6z on first 500 prime gaps.

Coil	2	2 to 4 Bond					Mapping	4	4 to 2 Bond					Mapping
1	0	0	0	0	0	0		0	0	0	0	0	0	
2	0	0	0	0	0	0		0	0	0	0	0	0	
3	0	0	0	0	0	0		0	0	0	0	0	6	2:4-8
4	0	0	0	0	0	6	2:4-8	0	0	0	0	0	0	
5	0	0	0	0	0	0		0	0	0	6	0	6	4:10-14
6	0	0	0	6	0	0	2:6-10	0	0	0	0	0	0	
7	0	6	0	0	0	0	4:8-12	0	0	0	0	0	6	4:8-12
8	6	0	0	0	0	0		0	0	0	0	0	0	
9	0	0	0	0	0	0		0	0	0	0	0	0	
10	0	0	0	0	0	0		0	0	0	0	0	0	
11	12	0	0	0	0	0		0	0	0	6	0	0	2:6-10
12	0	0	0	0	0	0		6	0	0	0	0	0	
13	0	6	0	0	0	6	4:14-18	0	6	0	0	0	6	4:14-18
14	0	0	0	0	0	0		6	0	0	0	0	0	
15	0	0	0	0	0	0		0	0	0	0	0	0	
16	0	0	12	0	12	0	2:10-22	0	0	0	0	0	0	
17	0	0	0	0	0	0		0	0	0	0	6	0	4:13-17
18	0	0	0	0	0	0	2:14-18	6	6	0	6	0	6	4:18-23
19	0	0	0	0	6	0	4:15-19	0	0	0	0	0	0	
20	0	0	0	0	0	0		6	0	0	0	0	0	
21	12	0	0	0	0	0		0	0	0	0	0	0	
22	0	0	0	0	0	0		0	0	0	0	0	0	
23	12	6	0	0	0	0	4:23-26	6	0	0	0	0	0	
24	0	0	0	0	0	0		0	0	0	6	0	0	4:21-24
25	6	0	0	6	6	0	4:25-29	0	0	0	6	0	0	4:21-25
26	6	0	0	0	0	0		0	0	0	0	0	0	
27	6	0	0	0	0	0		6	0	0	0	0	0	
28	0	0	0	0	0	0		6	0	0	0	0	0	
29	0	0	0	0	0	6	4:30-34	0	0	0	0	0	6	4:30-34
30	6	0	0	0	0	0		0	0	0	0	0	0	
31	0	0	0	0	0	0		0	0	12	0	0	0	**bond reversal**
32	6	0	0	0	0	0		0	0	0	0	0	0	
33	6	0	0	0	0	0		0	6	12	0	0	0	2:33-37
34	0	0	0	18	6	0	T-sums	6	0	6	6	0	0	2:31-34
35	0	0	0	0	0	6	2:36-40	6	6	6	0	0	0	2:36-40
36	0	0	0	0	6	6	2:37-41	0	0	0	0	0	0	
37	0	0	0	0	0	12		6	0	0	0	0	0	
38	0	0	0	0	0	0		0	0	6	0	6	0	4:35-38
39	0	0	0	0	0	12		0	0	0	6	0	0	4:36-39
40	6	0	0	0	0	0		6	0	0	0	0	0	
41	6	0	0	0	0	0		6	0	0	0	0	0	
42	6	0	0	6	6	0	4:38-42, 43-47; 2:41-42, 43-44	0	0	0	0	0	0	
43	6	0	0	6	0	0	4:43-45	0	0	0	0	0	0	
44	6	0	0	0	0	0		0	0	0	0	0	0	
45	12	0	0	0	0	0		6	12	0	0	0	0	2:45-48
46	0	0	0	0	0	0		6	0	0	0	0	0	
47	0	0	0	0	0	0		0	0	0	0	0	0	
48	0	0	0	0	0	0		6	0	0	0	0	0	
49	12	0	0	0	0	0	**bond flip 2:37-39**	0	0	0	0	0	0	
50	0	0	0	0	0	0		0	0	0	0	0	0	
51	12	0	0	0	0	0		0	0	0	0	0	0	
52	0	0	0	0	0	0		0	0	0	0	0	0	
53	18	0	0	0	0	0		0	0	0	0	0	0	
54	6	0	0	0	0	0		6	0	0	0	0	0	
55	6	0	0	0	0	0		0	0	6	6	0	0	4:48-54, 55-59
56	12	0	0	0	0	0		0	0	0	6	6	0	4:56-59
57	6	0	6	12	0	0	2:56-57	0	0	0	0	0	6	4:58-63
58	0	0	0	0	0	0		6	0	0	0	0	0	
59	0	0	0	0	0	6	2:59-64	6	0	0	0	0	0	
60	0	0	0	0	0	0		6	0	0	0	0	0	
61	0	6	18	0	0	0	4:61-64	0	0	0	0	0	0	
62	0	0	0	0	0	0		0	6	6	0	0	0	4:59-62
63	6	0	6	6	0	0	2:64-68, 4:59-62	18	0	0	0	0	0	**10 step repeat**
64	0	0	0	0	0	0		6	0	0	0	0	0	
65	6	0	0	0	0	0		6	6	0	6	0	0	4:65-69
66	6	0	0	12	0	0	T-sums	0	0	6	6	0	0	2:64-67
67	0	0	6	12	0	0	2:67-73	6	0	0	18	0	0	**5-step rev**
68	0	0	0	0	0	0		0	0	0	0	0	6	2:68-73
69	0	0	0	0	6	0	2:66-69	0	0	0	0	0	0	
70	0	0	0	0	0	0		0	0	0	0	0	12	**flip on 2:72-76**
71	0	6	0	0	0	0	2:66-71	30	6	0	0	0	6	4:72-76
72	6	0	0	18	0	0	**5-step rev**	6	0	0	0	0	0	
73	12	0	0	0	0	0		0	0	0	0	0	0	
74	0	0	0	0	0	0		0	0	0	6	0	0	4:74-78
75	6	0	0	0	0	0		0	0	0	0	0	0	
76	0	6	0	12	0	0	2:73-76	6	0	0	0	0	0	
77	0	0	0	0	0	0		0	0	0	0	0	0	
78	0	0	0	0	0	0		0	0	6	12	12	0	T-sums
79	6	12	0	6	0	0	2:73-78	0	0	0	0	6	0	4:79-75
80	6	0	0	0	0	0		0	0	0	0	0	0	
81	6	0	0	0	0	0		0	0	0	0	0	0	
82	12	0	0	0	0	0		0	0	0	6	0	0	4:82-86
83	0	0	0	0	0	0		0	0	6	0	0	0	4:83-86
84	0	0	0	0	0	6	4:80-84	6	0	0	0	0	0	
85	18	0	0	0	6	0	2:86-90	0	0	0	0	0	0	
86	0	0	0	24	0	0	"T" sum, 2:83-89	0	0	0	0	0	0	

Coil	2	2 to 4 Bond					Mapping	4	4 to 2 Bond					Mapping
87	0	0	0	0	0	0		6	0	12	0	0	0	step 5, 2:92
88	0	0	0	0	0	0		6	0	0	0	0	0	
89	6	6	6	6	18	6	"U"4:84-89 and 2:84-89	0	0	0	0	0	0	
90	0	12	0	0	0	0	4:91-93	6	12	0	0	0	0	4:91-93
91	6	0	0	0	0	0		12	0	0	0	0	0	
92	12	0	0	0	0	6	2:93-97	0	0	0	0	0	0	
93	0	0	0	0	0	0		0	0	0	0	0	0	
94	0	0	0	0	0	0		6	12	6	6	18	0	2:85-94
95	0	0	0	0	0	0		12	0	0	0	0	0	
96	0	0	0	0	0	0		18	0	0	0	0	6	2:93-97
97	6	0	0	0	0	6	2:93-97	0	0	0	0	0	0	
98	0	0	0	0	0	0		0	0	0	0	0	0	
99	6	0	0	0	6	0	2:94-98	6	0	0	0	0	0	
100	0	0	0	0	0	0		6	0	0	0	0	0	
101	12	0	0	0	0	0		6	0	6	12	0	0	4:102-105, 2:98-103
102	0	0	0	0	0	0		0	0	0	0	0	0	
103	0	0	0	0	0	0		6	0	0	12	0	0	2:100-103
104	0	0	0	0	0	0		12	0	0	0	0	0	
105	0	0	0	6	0	0	2:105-107	0	0	0	0	0	0	
106	0	0	0	0	0	0		6	0	0	0	0	0	
107	6	0	18	24	0	0	sum, 4:107-117	0	0	0	0	0	6	2:103-107
108	6	0	0	0	0	0		12	0	0	0	0	0	
109	0	0	0	0	0	0		0	0	0	0	0	0	
110	6	0	0	0	0	0		12	0	0	0	0	0	
111	0	0	0	0	0	0		0	0	0	0	0	0	
112	6	0	6	0	6	0	2:109-112	0	0	0	12	0	0	4:112-109
113	0	0	0	0	0	0		18	0	0	0	0	6	4:114-119
114	0	0	0	6	0	0	2:114-111	0	0	0	0	0	6	4:115-119
115	12	0	0	0	0	6	4:115-119	0	0	0	0	0	0	
116	0	0	0	0	6	0	4:116-120	0	0	6	12	6	6	4:116-120, 2:110-116
117	12	0	0	0	0	0		0	6	12	0	0	0	2:118-117
118	6	0	0	6	0	0	4:118-120	0	0	0	0	0	0	
119	24	18	0	0	0	0	4:113-118	6	0	0	0	0	0	
120	6	0	0	0	0	0		0	0	6	0	0	0	4:120-116
121	0	0	0	0	6	0	4:116-120	18	12	0	0	0	0	4:122-123
122	0	0	0	0	0	0		12	0	0	0	0	0	
123	6	0	0	0	0	0		0	0	0	0	0	12	2:124-125
124	12	0	0	0	0	0		6	0	0	0	0	0	
125	0	0	0	0	0	0		0	0	0	0	0	0	
126	6	6	0	6	0	0	2:126-130	0	0	0	0	0	0	
127	0	0	0	0	0	0		0	0	6	0	0	0	4:123-127
128	6	0	0	0	0	0		0	0	0	0	0	0	
129	0	0	0	6	0	0	2:129-131	6	0	0	0	0	0	
130	0	0	0	0	0	0		6	0	0	0	0	0	
131	6	0	0	0	0	0		0	0	0	0	0	0	
132	12	0	0	0	0	0		6	0	12	0	0	0	4:133-136, 2:133-132 or 134-135
133	0	0	6	0	0	0	4:131-133	0	0	0	0	0	0	
134	0	0	0	0	0	0		12	0	0	0	0	0	
135	12	0	0	0	0	0		0	0	0	6	0	0	4:135-137
136	6	0	6	0	0	0	4:136-137 or 2:136	0	0	0	18	0	0	"T" sum, 4:133-137
137	6	0	0	0	0	0		6	6	6	0	0	0	4:137-139, or 2:137-138
138	6	0	0	0	0	0		6	12	0	0	0	0	2:139-141
139	12	0	0	0	0	0		0	0	0	6	6	0	4:135-139
140	0	0	0	0	0	0		24	0	0	0	0	0	**Flip on 2:147-151**
141	0	0	0	0	0	0		6	0	0	0	0	0	
142	6	0	0	0	0	0		0	0	0	0	0	0	
143	12	0	0	0	0	0		0	0	0	0	0	0	
144	6	12	0	0	6	12	2:139-143	0	6	0	0	0	0	4:141-144
145	18	0	0	0	0	0	**5-step Repeat**	6	0	0	0	0	0	
146	0	0	0	0	0	0		12	0	0	0	0	0	

Coil	2	2 to 4 Bond					Mapping	4	4 to 2 Bond					Mapping
147	24	0	0	0	0	0	**Flip from 4:136-140**	0	0	0	0	0	0	
148	0	0	0	12	6	0	4:148-144	0	0	0	12	6	0	4:148-144
149	6	0	0	0	0	0		0	0	0	0	0	0	
150	6	0	0	0	0	0		18	0	0	0	0	0	**5-step Repeat**
151	0	0	0	0	0	0		0	0	0	0	0	0	
152	0	0	0	12	0	0	2-24 from 146-147	24	0	0	0	0	0	
153	0	6	6	0	6	0	2:149-153 and 4:153-155	0	6	0	0	0	0	2:150-154
154	0	0	0	12	0	0	Rotation from 10 steps 2:144	0	0	0	12	0	0	Rotation from 10 steps 2:144
155	0	0	0	0	0	0		6	0	0	0	0	0	
156	0	0	0	0	0	0	**3-step repeat**	12	0	0	0	0	0	
157	0	0	0	0	0	0		12	6	0	0	0	0	2:150-157
158	18	0	0	0	0	0		12	0	0	0	0	0	
159	6	0	0	0	0	0		0	0	0	0	0	0	**3-step repeat**
160	0	0	0	0	0	0		0	0	0	0	0	0	
161	0	0	0	0	0	0		18	0	0	0	0	0	
162	6	12	0	0	0	6	Future set? 2:162-?	6	0	0	0	0	0	
163	0	0	0	0	0	0		0	0	0	6	0	0	2:160-164
164	0	0	0	6	0	0	2:160-164	6	0	0	0	0	0	
165	0	0	0	12	0	0	Future Set??	--	0	0	0	0	0	

4 Relation to Millennium Problems

What if we are dealing with the polar coordinate sums from second derivatives of the polynomials that have been considered throughout the years of research done by the most brilliant minds? It is that thought that makes us contemplate the connection of this approach to the Millennium Problems.

How much common ground can we gain in the Millennium Problems if we focus on flow dynamics, acceleration, radiation, or wave forms driven by a second derivative model of the prime number increments? The general second partial derivate equations of spring harmonics and gravity may give us a clue on ways to apply the model [5]. The 5-step model gives us a physical model of wrapping a flattened spring or coil around a core. The 10-step model gives us a physical model that places a core pole into a flattened spring and uses the pole to twist the spring at a rate of 10 coil steps per 360 degrees.

We may be hindering our progress with the Riemann Hypothesis by insisting on a single threaded approach. However, if we use our 2 and 4 thread model, we could tie our concept to the Riemann Hypothesis with our core 2-4 ratio of ½ placed on the complex plane. Allowing only a distinct line fulfillment of the zeta may be similar to the averaging the behavior across the coils. This would make our 2-4 structure the similar to the ½ portion of the key equation "$s = ½ + it$" [6]. From our perspective "½ = *s* – *it*", where our 6*z* function equtes to the "*it*" and without the 6*z* influence we only have the "½" resulting from the constant double thread. Allowing the prime number solution to be driven from the double threaded model could be the supplemental definition that we need.

As we consider the possible influence of this prime number model in its 3-D over time properties, we ponder another question: What if the "*z*" function in this model opens a whole new dimension? That dimension might correlate to the "four-dimensional space-time" properties of the Yang-Mills problem [7]. It might just be worth investigating this concept as we think of prime numbers as incompressible acceleration fields associated with Bohr's atomic theories.

How could we apply this model to the fluid expansion dynamics in the Navier-Stokes problem? The answer may be allowing the coil threads to be rotated or twisted at a rate determined by an exterior force or fluid viscosity. The main concept that might influence further research is that the velocity vector in the key equation "makes sense only if $u(x, t)$ is twice differentiable in x" [8].

Finally, what is the potential impact of this model on the Birch and Swinnerton-Dyer conjecture? The key components in this conjecture are that "C is an elliptic curve over Q" and that the search is for "an affine model for the curve in Weierstrass form C: $y^2 = x^3 + ax + b$" [9]. We can immediately see that in another form, $y^2 - (x^3 + ax + b) = 0$, this can directly correlate to what we have seen with our model. This involves substituting y^2 with an elliptical object (our x^2 and $2y^2$ combination) and substituting "x" with our "z". The "$az + b$" form would be the flexible part of our model that disappears in the second derivative but may also have some overall influence in the prime number structure.

How confident can we be in this thread structure? We can be as certain as if we had flipped a coin 327 times and it landed on the opposite side every time (2, 4, 2, 4…). The probability of that happening is $(½)^{327}$. This gives us over 95 "nines" of reliability. Is there a specific system we are on the edge of decoding? Yes. We must use these threads as a core structure.

In an interview with the renowned expert on prime numbers, Dr. Terence Tao, he revealed that a "larger unknown question is whether hidden patterns exist in the sequence of prime numbers or whether they appear randomly" [10]. We can confidently assert that key patterns do exist and that these key patterns will lead us to the next level of understanding the harmonic behavior of the prime numbers.

5 How to Apply the Framework

Now that we have reviewed the general characteristics and framework of the prime number growth behavior and suggested some ways it can be used for Millennium Problems, we really must consider how it can contribute to other complex and everyday problems. We need to answer the questions: "Why do I care?" and "How am I supposed to use this framework?"

Our hope is that we can apply the known incompressible structure for general problem solving and for creating strong material and biological structures. We will briefly consider two general approaches and also some implications for regular languages to facilitate that process.

5.1 Two General Approaches

One approach is to twist, or manipulate, the double threaded structure at a rate that corresponds to the desired system's natural behavior. We will demonstrate this with an electromagnetic molecular model later.

Another approach is substitution. We all enjoy solving and applying solutions, so our natural inclination is to dig into this "*z*" function and see what is at the core. But, that traditional approach may lead us back to the frustration of dealing with intense integrals and roots that have baffled the most brilliant minds.

In our substitution approach we would select a function or group of functions, and substitute it (or them) in our structure at every location of the multiples of *z*. We could use the known incompressible structure as the standard. Now, that could be powerful in any discipline! A variation of this would be to cube a function, take the second derivative, and substitute it into the multiples of 6*z*.

The tricky part with either manipulation or substitution is still determining the exact distribution of zeroes in the thread-bonds. We have locked-in a structure with the cylinder shells but we probably need future work with a comparison algorithm for matching 90-degree bonds. This is where the advances made in modeling tools might best be used to proposed curl vectors or gradients to the known 6*z* patterns bound to the threads.

5.1 Regular Language Implications

The general method proposed above may be great for dynamic and differential systems, but what about the general logic structure of the prime numbers? The prime numbers have been used in many proofs for mapping a language's sequence to the existence of a recursively enumerable model.

One of the open questions regarding prime numbers is "Does a syntax for the prime numbers exist?" We can confidently say yes. Our "2-4-2-4-2-4…" sequence points us to the core syntax of a regular language. In the threads, the zero multiples of 6 (where $z = 0$ in our $6z$ function) act as bound items on the 2 and 4 threads, as if contained in a primitive recursive function [11]. That is, we know for certain that there are a definite number of zero elements on those threads.

The case is not the same for the zero elements on the bonds between the threads, where the 2-4 and 4-2 bond sequences tell a different story. These zero elements may be considered free or nondeterministic…we don't know how many really should exist between bonds, or if the number varies with growth. Their free zero elements indicate an openness of a pumping lemma, making those bond portions not regular languages [12]. When we think of these zero elements in the bonds it might be best to consider them as compressible, as in a sparse matrix.

6 Parallels in WSEAS Research

Now that we introduced some general approaches to conceptually applying the structure to physical-differential functions and the logical syntax-language problems, we now review some practical research that aligns well with these approaches. In this section of the paper we will consider how to apply this mindset and concept to previous research done by other mathematicians, scientist and engineers in World Scientific and Engineering Academy and Society (WSEAS). We will attempt to consider how this new concept for prime numbers might supplement, some of the detailed research done in the areas of number theory, electron mass, vectors from electromagnetic molecular bonds, and the potential impact on data integrity in cryptanalysis.

6.1 Concept Change in Number Theory

We have two new concepts to consider from the double thread elliptical behavior combined with the harmonic influence of $6z$. One concept is that we have an independent function (z^3) being applied to specifically controlled positions on a constantly accelerating structure. Why should we consider the z^3, or $6z$, function(s) as independent? The answer is that we have a problem with going straight to the typical harmonic partial derivatives and dealing with the product rule. The problem is that the core x^2 and $2y^2$ function after a partial form is applied yields the even scalars of 2 and 4. But, the sums of the $6z$ function also have odd scalar patterns. The pattern of 0-1-1-3-1-1-0 is a good example (in the third vertical rod of the 10-step model). Even determinant approaches would suffer likewise. This is our strongest indication that the $6z$ function, hence the z^3 function, is independent of the x^2 and $2y^2$ function, except with regard to positional location.

Recent research done with logical approaches to biological computational and combinatorial complexity also support initially and temporarily viewing system components independently. The authors proposed a paradigm shift to first find a deterministic solution and then search for a stochastic solution. By using this approach, we can "reduce the search space of the problem by dividing initial data into two groups: a group of initial data which are relevant for the optimal decision and a group of data which are irrelevant for the optimal decision" [13].

That is exactly the type of approach we take by isolating the amazingly consistent 2-4 thread into an initial group. As a result, this step helps determine the possible solutions for the more detailed and complicated behavior of $6z$. In our case, the 2-4 threads provide "knowledge about the distribution density for elements of the optimal decision could support us in creating algorithms for finding an optimal (suboptimal) combinatorial problem solution" [14]. Maintaining a level of independent structure in further analysis of the prime numbers may prove to be essential.

The other concept is really a philosophical question: What if we really have an integer physical model that defines the generic behavior of the complex plane?

6.2 Electron Mass

Could the obvious location-based dependency between our two groups of functions ("x^2, y^2", and "z^3") possibly be comparable to mass and changes in its orbital rate as it accelerates over the speed of light squared? What would Einstein think about this? Maybe one of our closest connections can be considered when we reflect on the work done regarding the harmonic frequency in the noise of electron mass.

Planat, a WSEAS author, expanded on the "recently discovered a possible relationship between $1/f$ frequency noise in oscillator measurements and prime number theory". The result of his work was in "relating exact statistical mechanics of electrons of mass *m* in a box of size *L*" [15]. If we consider the statistical and frequency-based oscillations of a physical system in connection with their behavior on the complex plane, we might have a significant connection to our prime number integer structure. If we can envision these frequencies on the complex plane, can we relate them to our integer prime number structure? Equally, what if we defined locations on the complex plane by their relationship to our physical prime number structure?

This would be an integer approach to harmonics with the same concept that "the degeneracy of energy levels needs the extended frame of algebraic number theory (and the field of quadratic forms)" [15]. This may not get as much endorsement since an integer model based on second derivatives is against the traditional approach of using an "integral representation of gamma function" which "generalizes the factorial function into the complex plane *s*" [16]. The hope is that further research in this area will simplify an approach to modeling problems in the complex plane without some of the awkward integrals that would normally result. The concept of these patterns being energy based will also become significant in out next section regarding molecular bonds.

6.3 Vectors from E-M Molecular Bonds

We continue with the concept of an energy-driven physical model for the growth of prime numbers when we think of intrinsic quality of DNA. "Various base sequences in DNA have different energy of interaction between base pairs; this difference modulates the fine structure of the helix" [17]. As a result, we can expect to see a form of modulation, whether as a result of mass and acceleration or another form of harmonic movement when we manipulate the double-threaded prime number structure to corresponding molecular electromagnetic properties of the DNA bases.

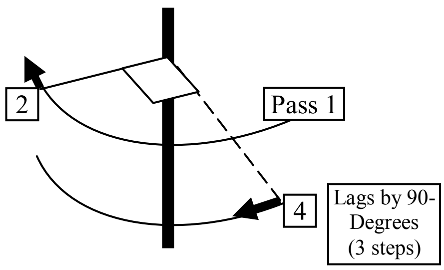

Fig. 2. E-M configuration of 2-4 thread model

When we manipulate the double-threaded structure, we should also be aware how the possible application of the sums of second derivatives may be closely related to the concept in cellular automata (CA), where "basic results on CA deal with additive global dynamics owing to their algebraic structure" [18]. We keep both of these concepts in mind when we apply a (90-degree) structure since "[m]inima with nearly perpendicular base arrangement are important for interactions of the duplex with monomers, as well as for intermediate steps of helix unwinding and of pair formation" [19].

Okay, how do we apply this? Fig. 2 illustrates how we advance the 2-thread three steps in a 12 step per 360-degree model. We force a physical 90-degree relationship between the 2-thread and the 4-thread structure. This gives us a sine function from the 2-thread and a cosine function from the 4-thread. In other words we are showing the total combination of "sin(pi/6, 6*z*) + cos(pi/6, 6*z*)." Something very interesting happens when we do this.

Table 5 Applying E-M model to prime numbers.

Pass	Thread	Extend			Step												Extend			
		10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	2	0	0	0	0	0	0	0	1	0	0	2	0	0	0	0				
	4				0	0	0	0	0	0	0	0	0	0	0	1				
2	2				0	0	0	0	0	2	0	2	0	1	1	1		1		
	4				0	1	0	0	0	1	0	1	0	0	1	0	0			
3	2				0	0	1	0	1	1	0	0	0	0	0	0				
	4				0	0	1	1	0	0	0	0	0	1	1	0				
4	2	1			1	1	1	1	1	2	0	0	0	2	0	2				
	4		0		1	0	0	1	1	0	0	0	1	1	0	1				
5	2	1	0	1	0	3	1	1	2	1	0	0	0	0	0	1		0		
	4				0	0	0	0	0	1	0	0	0	1	1	1	0			
6	2			1	0	1	1	0	0	0	0	0	1	2	0	1				
	4		0	1	0	0	3	1	1	0	1	0	0	0	5	1	0	0		
7	2	0			0	0	0	1	1	1	2	0	0	3	0	0	0			
	4				0	0	0	1	0	0	0	0	0	0	0	1	0			
8	2			1	0	1	0	1	2	0	0	0	0	1	0	1	0	0		
	4		0		0	0	1	1	0	1	2	0	0	1	2	3	0	2		
9	2				0	2	0	0	0	0	0	1	1	0	1	0	0			
	4				0	0	1	1	1	0	1	2	0	1	0	2		0		
10	2				1	0	0	2	0	2	1	4	1	0	0	1	0		0	
	4				0	2	0	0	3	0	0	0	0	0	1	0				0
11	2				2	0	1	0	1	0	0	1	2	0	0	2		2		
	4		0	2	3	2	0	1	0	0	0	0	1	1	0	1	1			
12	2			1	1	1	1	2	0	0	1	2	1	3	0	4	0	2		
	4		0		0	2	0	0	1	1	0	4	1	0	0	0	0			
13	2	0			0	1	1	0	0	0	0	0	0	0	3	1		2		
	4				1	2	0	0	0	3	0	4	0	0	1	2				
14	2				0	0	1	0	0	0	xx	xx	xx	xx	xx	xx				
	4				2	2	0	0	3	1	0	1	xx	xx	xx	xx				

Table 5 is the result of applying the 90-degree bond concept to the 2-4 thread structure. The 2 element that corresponds to the first 4 element in the first pass is 3 steps (90-dgrees) ahead; that is why it is in the extended area to the left of the main 12-step structure. This E-M approach will focus on the multidirectional vector relationships.

In Table 5, the blackened cells with white text are the convergence point for equivalent vectors. These blackened cells are also the large gap jumps in the prime numbers (on the 2-4 threads). Since many vectors overlap, portraying the overlapping and intersecting elements is tricky and we have pushed the limit for the number of vectors displayed to show the significant amount of data. The easiest way to see the vector patterns is to start at a blackened cell and follow the vector with a single color and cell pattern outward. A clear example is gained by starting at the blackened "3" in the 4-thread element at step 3 of the 6^{th} pass. The vector 1-0-1-0-1 goes up from the "3" both vertically and at 45-degrees.

This same approach can be done for all values greater than 1 with consistent vector results. Vectors with only 1 and 0 may seem trivial but they also exist and are most like at the core of a contributing recursive structure. There are definitely more patterns in this structure, but it is beyond our graphical depiction and capability for just one table. Hopefully, the reader will agree that the vector patterns of these 6*z* vectors do not act independently and the components of 6*z* are dependent fucntions.

The author attempted the same approach with a 20-step model and advanced the 2-thread by 5 steps to achieve the same 90-degree affect. That model yielded no significant results that were either consistent or worth mentioning. But, why didn't it work for that model? The best reason may be that our 12-step model is based on 30-degree steps, and a 30-60-90 degree model has the cleanest relationships and values for our driving functions of sine and cosine.

So, what's the big deal? The big deal is that the forced sine-cosine sums of vectors and electromagnetic fields seem to be the strongest model we have. Euler's formula with a definite cosine-sine relationship on a complex plane may be at the core of the nature of the incompressible harmonic and biologically-related physical growth of the prime numbers. Now, that is a big deal!

6.4 Impact on Cryptanalysis

With regard to cryptanalysis, we may be able to apply another level of security and integrity. This is always a concern for our Information Assurance engineers, who continually look for better forms to ensure non-repudiation and data integrity. We consider the two basic functions in signature schemes: "p, q large prime number with $q \mid (p - 1)$" and "Y_U the public key of user U, where $YU = g^X{}_U \bmod p$" [20].

How could we protect the integrity of the key if we considered that $p = 5 + \{$the threaded sequence and influence of $6z\}$? We could use the following six parameters as a type of checksum for data integrity:

1. The coil number.
2. A binary flag for 2-thread location.
3. The position in the 2 to 4 bond.
4. A binary flag for 4-thread location.
5. The position in the 4 to 2 bond.
6. The last multiple of 6z incremented.

For example: Prime number 29 would be defined in this integrity scheme as 3-0-0-0-1-1. If we accept this as a standard approach, a common look-up or reference table for all prime numbers can be easily generated the same way the double-threaded structure was built with the modulo 6 operation. An inexpensive step to improving current data integrity might be a serious benefit to this approach.

In a related recent WSEAS research effort, the authors "pointed out that the problem within Li *et al.* scheme is that the verifier cannot confirm the correctness of the parameter made by the original signer from the received proxy signature. This problem is the fundamental problem of Park and Lee's nominative proxy signature scheme" [21]. Our extra checksum approach might help with this issue.

7 Conclusion

A 5-step or 10-step double helix model for the prime number growth based on the perfectly repeating 2-4 series from performing a post "modulo 6" operation was the driving structure that indicated we are on the right path for understanding the prime numbers. Considering the prime number cylinder flow models as an expression of the sums of second derivatives was proposed. The multitude of perfectly reversing and 90-degree rotating significant sequences cannot be ignored.

An interesting multi-directional vector model becomes apparent when we force the 2-thread as a sine function and the 4-thread as a cosine function. Indications are that there may be interesting connections between this Euler type approach and nature of prime numbers.

Tools and methods for manipulating, applying, and implementing these core model structures and concepts must be taught to the current and the future generations of engineers, scientists, and mathematicians.

No turning back now! Let the flexible double threaded highway pave the path to adapting the physical power and property of the prime numbers' incompressible sequence to reach new computational destinations we could not otherwise obtain.

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