Journal of Army Engineering University of PLA
陆军工程大学学报 ISSN: 2097-0730

Theory Of Higher Order Sequence Of Primes, Askew Primes And Special Curves Connecting Any Two Real Numbers

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ABSTRACT

In this research manuscript, the author has presented a novel notion of Higher Order Sequence Of Primes, Askew Primes And Special Curves Connecting Any Two Real Numbers.

Key Words: *Prime Numbers*

INTRODUCTION

Since, the dawn of civilization, human kind has been leaning on the Sequence of Primes to devise Evolution Schemes akin to the behavior of the Distribution of Primes, in an attempt to mimic natural phenomenon and be able to forecast useful aspects of science of the aforementioned phenomenon. Many western and as well as oriental Mathematicians and Physicsts have understood the importance of Prime Numbers (in the ambit of Quantum Groups, Hopf Algebras, Differentiable Quantum Manifolds, etc.,) in understanding subatomic processes such as Symmetry Breaking, Standard Model Explanation, etc. In this research note, the author advocates a novel concept of Higher Order Sequence Of Primes.

THEORY (AUTHOR'S MODEL OF THEORY OF HIGHER ORDER SEQUENCE OF PRIMES [1], [2], [3], [8])

A Positive Integer Number is considered as a Prime Number in a Certain Higher Order (Positive Integer ≥ 2) Space, say R, if it is factorizable into a Product of (R-1) factors wherein the factors are (R-1) number of Distinct Non-Reducible Positive Integer Numbers (Primes of 2^{nd} Order Space).

Example:

The general Primes that we usually refer to can be called as Primes of 2^{nd} Order Space.

Example:

First Few Elements Of Sequence's Of Higher Order Space Primes	*R^{th} Order Space*
{2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59, …}	R=2
{6 (3x2), 10 (5x2), 14 (7x2), 15 (5x3), 21 (7x3), 22 (11x2), 26 (13x2), 33 (11x3), 34 (17x2), 35 (7x5), 38 (19x2), 39, (13x3), 45 (9x5), ... }	R=3
{30 (5x3x2), 42 (7x3x2), 70 (7x5x2), 84 (7x4x3), 102 (17x3x2), 105 (17x3x2), 110 (11x5x2), 114 (19x3x2), 130 (13x5x2), ...}	R=4
{210 (7x5x3x2), 275 (11x5x3x2), 482 (11x7x3x2), 770 (11x7x5x2), 1155 (11x7x5x3), …}	R=5

We can note that the Primes of any Integral (Positive Integer ≥ 2) Order Space (say R) can be arranged in an increasing order and their position in this order denotes their Higher Order Space Prime Metric Basis Position Number.

We can generate the Sequence Of Any Integral(Positive Integer ≥ 2) Higher Order Primes in the following fashion:

The First Prime of any R^{th} Order Space Sequence Of Primes can be computed by simply considering consecutively the First (R-1) Number of Primes of 2^{nd} Order Space Sequence Of Primes, starting from the First Prime of 2^{nd} Order Space Sequence Of Primes, i.e., 2 and Forming a Product Term of the Form ${}^{R}p_1 = \overbrace{\left\{{}^{2}2_1 \times {}^{2}3_2 \times {}^{2}5_3 \times {}^{2}7_4 \times \ldots\ldots\ldots\ldots \left\{{}^{2}p_{(R-3)}\right\} \times \left\{{}^{2}p_{(R-2)}\right\} \times \left\{{}^{2}p_{(R-1)}\right\}\right\}}^{(R-1)\ Number\ Of\ Product\ Forming\ Factors}$ which becomes the First Prime of any R^{th} Order (Positive Integer ≥ 2) Space Sequence Of Primes as it cannot be factored in terms of R Number of Unique Factors. We Label this Number as ${}^{R}p_1$

One Step Evolution [4], [5]of any element of Second Order Space Sequence Of Primes is the next consecutive Second Order Space Prime element of the given element of Second Order Space Sequence Of Primes. For Example, One Step Evolution of 2 is 3 and of 31 is 37.

The Second Prime of any R^{th} Order (Positive Integer ≥ 2) Space Sequence Of Primes can be computed in the following fashion.

Firstly, we consider consecutively the First (R-1) Number of Primes of 2^{nd} Order Space Sequence Of Primes, starting from the First Prime of 2^{nd} Order Space Sequence Of Primes, i.e., 2 and forming a Product Term of the form ${}^{R}p_1 = \overbrace{\left\{{}^{2}2_1 \times {}^{2}3_2 \times {}^{2}5_3 \times {}^{2}7_4 \times \ldots\ldots\ldots\ldots \left\{{}^{2}p_{(R-3)}\right\} \times \left\{{}^{2}p_{(R-2)}\right\} \times \left\{{}^{2}p_{(R-1)}\right\}\right\}}^{(R-1)\ Number\ Of\ Product\ Forming\ Factors}$ which becomes the

First Prime of any R^th Order (Positive Integer ≥ 2) Space Sequence Of Primes as it cannot be factored in terms of R Number of Unique Factors. We now cause One Step Evolution of that one particular factor among the (R-1) factors such that the Product climb of the value ${}^{R}p_{2}$ over ${}^{R}p_{1}$ is minimum as compared to that gotten by performing the same using any other factor among the (R-1) factors.

{One Step Devolution [4], [5] of any element of Second Order Space Sequence Of Primes is the just previous Second Order Space Prime element of the given element of Second Order Space Sequence Of Primes. For Example, One Step Devolution of 3 is 2 and of 37 is 31}.

We find ${}^{R}p_{3}$ using ${}^{R}p_{2}$ as detailed in the above paragraph, and similarly, we can find any element of the R^{th} Order Sequence Of Primes.

For Example, 210 is the 1^st (Higher Order Space Prime Metric Basis Position Number) element of R=5^th Order Space Sequence Of Primes.
Similarly, 102 is the 5^th (Higher Order Space Prime Metric Basis Position Number) element of R=4^th Order Space Sequence Of Primes.
Therefore, any of these Higher Order Space Primes can be represented as follows:

$$^{Higher\ Order\ Space\ Number}(Number)_{HigherOrderSpacePrimeMetricBasisPositionNumber}$$

That is,
210 can be written as ${}^{5}210_{1}$ and 102 can be written as ${}^{4}210_{5}$.

Each of the rest of the Positive Integers can be classified to belong to it's Unique Parent Sequence Of Higher Non Integral Order Space Primes, at a particular Prime Metric Basis Position Number.

That is, for any Positive Integer, we can use the Method of One Step Evolution successively (as detailed in [4], [5]) and can find all the elements greater than it upto a certain limit. Similarly, we can use the Method Of One Step Devolution successively (as detailed in [4], [5]) and can find all the elements lower than it but greater than zero. These set of numbers when arranged in an order form a Sequence, namely the Sequence Of Higher (Positive Non Integer Order) Primes, of some particular Positive Non Integer Order.

For Example, One Step Evolution of 40,500 is 56,700, see [4], [5], i.e., if 40,500 is ${}^{R}40500_{d}$, then 56,700 is ${}^{R}56700_{(d+1)}$
Furthermore, as a matter of fact, any of rest of the positive integers other than the Sequence of Primes of Any Higher Order(Positive Integer greater than or equal to 2) Space can be written as follows:
Considering any number say f, we can write its nearest primes of any R^th Order Space, on either side as ${}^{R}p_{k}$ and ${}^{2}p_{k+1}$, where ${}^{R}p_{k}$ is the k^{th} Prime and ${}^{R}p_{k+1}$ is the $(k+1)^{th}$ Prime of the Sequence Of Primes

Of the R[th] Order (Positive Integer ≥ 2) Space. We can then write $f = {}^{R}p_{k+\alpha}$ where $\alpha = \left(\frac{f - {}^{R}p_k}{{}^{R}p_{k+1} - {}^{R}p_k}\right)\left(\frac{{}^{R}p_{(f - {}^{R}p_k)}}{{}^{R}p_{({}^{R}p_{k+1} - {}^{R}p_k)}}\right)$ with $0 < \alpha < 1$. Then, $(k + \alpha)$ is the Non Integral Prime Basis Position Number of f. In a similar fashion, any Rational Number $\frac{a}{b}$ can be written as $\frac{a}{b} = \frac{{}^{R}p_{k+\alpha}}{{}^{R}p_{l+\beta}}$ where k, l are some positive integers and $0 < \alpha, \beta < 1$.

Askew Primes And Sequences Of Askew Primes

One can note that any Natural Number ' s ' can be written as $s = (p_1)^{a_1} \cdot (p_2)^{a_2} \cdot (p_3)^{a_3} \cdots\cdots\cdots (p_{z-1})^{a_{z-1}} \cdot (p_z)^{a_z}$ where $p_1, p_2, p_3, \ldots\ldots\ldots, p_{z-1}, p_z$ are some Primes and $a_1, a_2, a_3, \ldots\ldots\ldots, a_{z-1}, a_z$ are some positive integers. Such numbers are called Askew Primes.

Order – The Order of such Askew Primes is given by the sum $a_1, a_2, a_3, \ldots\ldots\ldots,$ $a_1 + a_2 + \ldots. + a_{z-1} + a_z$.

Dimension – The Dimension of the Askew Prime is denoted by a Vector that represents the exponent of each element of Prime Sequence taking part as a term in the product represented by the Askew prime of concern, especially at the same location of the Prime Sequence Basis Position Number of the element of Prime Sequence taking part as a term in the product represented by the Askew prime of concern.

Once, all such Askew Primes are slated, Order wise and Dimension wise, we arrange them in Increasing Order, and each Askew Primes Sequence is a list of such numbers arranged in increasing order and each sequence has the same Order and Dimension Vector.

Special Curves Connecting Any Two Positive Real Numbers

The Special Curves are curves that connect any two real positive numbers based on the continuous segments of Sequence of Primes, any Sequence of Higher Order Primes [1], any Sequence of Askew Primes [2].

The first of the (lower value) point is represented by a fraction of the form $\frac{a_l}{b_l}$ and each of the numerator and denominator are chosen to be those among most nearest to any of: an element of Prime Sequence or any element of Sequence of Higher Order Primes or any element of Sequence of Askew Primes. Similarly, the second (higher value point) is also represented by a fraction of the form and $\frac{a_h}{b_h}$ and again, each of the numerator and denominator are chosen to be those among most nearest to any of: an element of Prime Sequence or any element of Sequence of Higher Order

Primes or any element of Sequence of Askew Primes. We then compute the Lowest Common Multiple of b_l and b_h and write the a_l and a_h as $\frac{a_l}{b_l}LCM(b_l,b_h)$ and $\frac{a_h}{b_h}LCM(b_l,b_h)$. This makes both the points numerators some elements of 'Sequences of Askew Primes, them being $\frac{a_l}{b_l}LCM(b_l,b_h)$ and $\frac{a_h}{b_h}LCM(b_l,b_h)$.

We now call

$r_l = \frac{a_l}{b_l}LCM(b_l,b_h)$ and

$r_h = \frac{a_h}{b_h}LCM(b_l,b_h)$

We now compute the difference

$c_{h1} = r_l -$ {Nearest element of the Askew Prime Sequence of the same Dimension type and Order as r_l and belonging to the Askew Sequence Type (w.r.t Dimension and Order)}. We then again follow the same aforesaid procedure to close c_{h1} and r_h. We keep repeating this schema again and again till we close in our Curve approximation to r_h, to a desired accuracy.

We finally superpose (all the sub component sub sequences, the superposition is to be performed between $(c_{h1},r_h),(c_{h2},r_h),(c_{h3},r_h),....,(c_h k,r_h)$, where at k^{th} iteration, $c_{hk} - r_l \approx 0$ } and divide by the $LCM(b_l,b_h)$ to give us the exact connecting Sequence, which happens to be the natural curve connecting $\frac{a_l}{b_l}$ and $\frac{a_h}{b_h}$.

Net Slope or Cadence Change Optimization Along The Special Curve

One can note that the thusly connecting curve only shows variation between c_{h1} and r_h. All the natural change occurring within this domain seems quite unnatural. Therefore, if we keep shifting the Prime Basis Position Number corresponding to the Nearest element of the Askew Prime Sequence of the same Dimension type and Order as r_l and belonging to the Askew Sequence Type (w.r.t Dimension and Order), i.e., c_{h1} by one position to the left and perform similar analysis again for each such shift case, and also so, for each of the intermitted superpositions considered on the domain c_{h1} and r_h, care should be taken to perform such said SIMILAR analysis again and again to exhaustion on the right side c_{h1} and r_h also, for each iteration, and thusly, iterations are continued to exhaustion. We then compute the Net Slope of Cadence changes involved in each primary shift case. One should note that there would be many primary of primary shift case, primary of primary of primary shift case,... , and so on so forth to exhaustion, i.e., $\left(\underbrace{\text{primary of primary of....of primary}}_{\text{s times}}\right)$ shift case, in each of the case of the right side c_{h1} and r_h.

We consider the superposed sequence corresponding to that particular case which gives a minimum sum of the Net Slope or Cadence changes involved.

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   ISBN-10: 1701201739
   ISBN-13: 978-1701201736

ACKNOWLEDGEMENTS

The author would like to express his deepest gratitude to all the members of his Loving Family, Respectable Teachers, En-Dear-Able Friends, Inspiring Social Figures, Highly Esteemed Professors, Reverence Deserving Deities that have deeply contributed in the formation of the necessary scientific temperament and the social and personal outlook of the author that has resulted in the conception, preparation and authoring of this research manuscript document. The author pays his sincere tribute to all those dedicated and sincere folk of academia, industry and elsewhere who have sacrificed a lot of their structured leisure time and have painstakingly authored treatises on Science, Engineering, Mathematics, Art and Philosophy covering all the developments from time immemorial until then, in their supreme works. It is standing on such treasure of foundation of knowledge, aided with an iota of personal god-gifted creativity that the author bases his foray of wild excursions into the understanding of natural phenomenon and forms new premises and scientifically surmises plausible laws. The author strongly reiterates his sense of gratitude and

infinite indebtedness to all such ‘Philosophical Statesmen’ that are evergreen personal librarians of Science, Art, Mathematics and Philosophy.

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