Theory of Decomposition of Any Set of Given Primes as one or more sets each with Some Periodicity of The Prime Number's Basis Position Number

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Abstract- **In this research investigation, the author has detailed the Theory of Decomposition of Any Set of Given Primes as One or More Sets Each with Some Periodicity of the Prime Number's Basis Position Number.**

Index Terms- Functional Analysis.

INTRODUCTION

The aforementioned Sets which form the Prime Trends are of much importance in Functional Analysis as it allows us to decompose data into Trends with unique Natural Periodicity.

THEORY (AUTHOR'S MODEL OF THEORY OF DECOMPOSITION OF ANY SET OF GIVEN PRIMES AS ONE OR MORE SETS EACH WITH SOME PERIODICTY OF THE PRIME NUMBER'S BASIS POSITION NUMBER)

Say any Set S, is given all of whose elements belong to the Set of Prime Numbers. Let the Cardinality of the Set be n. Furthermore, these numbers are arranged in an ascending order. The following entire analysis is valid while we consider 1 as the First Prime or while we consider 2 as the First Prime.

Now if we represent the Set of Prime Numbers by p_j then $S(1) = p_{j\min}$ and $S(n) = p_{j\max}$. Here, the index represents the Prime Basis Position Number of the Prime p. For example, if 2 is considered as the first prime, then the Prime Basis Position Number of the Prime 2 is, of the Prime 3 is 2, of the Prime 5 is 3, of the Prime 7 is 4 and so on so forth.

We now create Subsets of S in a fashion such that $S_r = \{p_{j\min + rl}\}$

with $r = 0,1,2,....,g$ and $l = 0,1,2,....,\frac{(n-1)}{g}$ and $g \le \left(\frac{n-1}{2}\right)$ for n odd

and

$S_r = \{p_{j\min + rl}\}$

with $r = 0,1,2,....,g$ and $l = 0,1,2,....,\frac{n}{g}$ and $g \le \left(\frac{n}{2}\right)$

for n even.

where all S_r

are distinct with first preference being given to

Case (i) *Bottom Top Approach*

Minimum value of r among the two competing Sets S_r for an element presence only once in S.

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A simple way to find these sets is detailed below using a method detailed below:

For the given set S, we index the elements with their Prime Position Basis Numbers. Let this Set be J. We now do Cartesian cross product of J with J i.e., we find JXJ. Now for these n^2 number of ordered pairs (u,v), we find the absolute value of the difference $\delta_{(u,v)}$ between them. We now separately collect all the u, v's for $\delta_{(u,v)} = 1$, $\delta_{(u,v)} = 2$, $\delta_{(u,v)} = 3$,…., $\delta_{(u,v)} = \left(\frac{n-1}{2}\right)$ if n is odd or $\delta_{(u,v)} = \left(\frac{n}{2}\right)$ if n is even and call them as a set each. We now remove any repeating elements in them and arrange them in ascending order. The thusly gotten sets are the desired sets. This will be explained using an Example below:

Example:

$S = \{3,5,7,13,29,31,53,61,67\}$

Then

$J = \{3,4,5,7,11,12,17,19.20\}$

We now create a table of difference between u and v of the ordered pairs of J X J as shown

Table 1: *Table of difference between u and v of the ordered pairs of J X J*

	3	4	5	7	11	12	17	19	20
3	0	1	2	4	8	9	14	16	17
4	1	0	1	3	7	8	13	15	16
5	2	1	0	2	6	7	12	14	15
7	4	3	2	0	4	5	10	12	13
11	8	7	6	4	0	1	6	8	9
12	9	8	7	5	1	0	5	7	8
17	14	13	12	10	6	5	0	2	3
19	16	15	14	12	8	7	2	0	1
20	17	16	15	13	9	8	3	1	0

Needless to mention, the Set with u,v difference equal to 1 is the Set J itself. We now find all the pairs with u, v difference = 2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17

Table 2: *Table of distilled Non Unique Prime Trends*

2	{3,5,7} {17,19}	
3	{4,7} {17,20}	
4	{3,7,11}	
5	{7,12,17}	
6	{5,11,17}	
7	{4,11} {5,12,19}	
8	{3,11,19} {4,12,20}	
9	{3,12} {11,20}	
10	{7,17}	
11	None	
12	{5,17} {7,19}	
13	{7,20} {4,17}	
14	{3,17} {5,19}	
15	{4,19} {5,20}	
16	{3,19} {4,20}	
17	{3,20}	

But, as we cannot afford to have repeats, we rewrite the Sets of Prime Trends uniquely as follows:

Table 2: *Table of distilled Unique Prime Trends Bottom Top Approach*:

2	{3,5,7} {17,19}	
3	{4,7} {17,20}	
4	{3,7,11}	
5	{7,12,17}	
6	{5,11,17}	
7	{4,11} {5,12,19}	
8	{3,11,19} {4,12,20}	
9	{3,12} {11,20}	
10	{7,17}	
11	None	
12	{5,17} {7,19}	
13	{7,20} {4,17}	
14	{3,17} {5,19}	
15	{4,19} {5,20}	
16	{3,19} {4,20}	
17	{3,20}	

Therefore, we are left with

{3,5,7}

{17,19}

{4,7}

{20}

{11}

{12}

As the Five Prime Trends according to the Bottom Top Approach.

Note: However, the author feels that the aforementioned kind of elimination can be done in such a way that makes the entropy of the system of thusly decomposed Prime Trends, maximal and potential energy minimal. The details of such conservation will be discussed by the author in the near future.

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