Collatz Inverse Method by Physicist Ion Murgu, From OHIO, USA

Collatz Conjecture Unique Solution Collatz Table2To3 Murgu Table2To3
Infinite Upward Connections — Unique Downward Path to Unity

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Resulted from Collatz Conjecture new Group Theory Structure and Murgu Inverse Method used for.

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Contents

0.1 Introduction

For decades, investigations into the Collatz Conjecture have relied heavily on brute-force numerical verification or localized trajectory tracking. While these methods confirm behavior up to high computational limits, they obscure the macro-algebraic order of the system.

The fundamental impasse of the problem lies in the apparent chaos of odd-to-even node transitions. This paper resolves that impasse by demonstrating that when the infinite domain of odd integers is mapped via Modulo-6 residues, the randomness disappears.

Instead of treating the $3n + 1$ map ($Collatz - Patterns$) as sequences of unpredictable jumps $uncontroled - divergences$, our framework proves that numbers move through infinite, interconnected "engines." By analyzing the global properties of these Linear Engine Triads (LET) within the Murgu Table2To3 matrix, we establish a fixed coordinate system for infinite node connectivity, providing a logical pathway toward a complete structural proof. For Mathematicians Collatz Conjecture was Solved via its Unique Solution Collatz Table2To3 ($Murgu - Table2To3$)
Murgu Table2To3 Treated as Functions and Formulas in a new Coordinate System Collatz Conjecture dedicated, contain all Collatz Connections Nodes, one by one,and include in theirs Mathematical format Murgu - Collatz Unicity.
$Murgu - Collatz - Unicity$
But for Math Low Skilled by April 2024 we tried to explain it and any time maybe used excesses in.
As Collatz Conjecture Solved bring in Mathematics and Science important new aspects, here will try to remark those and to rewrite solution only following methods used, new formulas , new structure, etc., as Mathematics legacy of everything included in solution was multiple time explained.

Chapter 1

1

1.1 Abstract

In Academic words:
This paper establishes the algebraic foundation of the Murgu Table2To3 coordinate system, transforming the analysis of Collatz $(3n+1)$ trajectories from classical 1D linear iteration into a structured 2D Group Theory matrix. By grouping the domain of positive integers into grids of six ($\mathbb{G}_6$), we define two infinite active generator channels (LET_1 and LET_2) alongside a discrete infinite set of mathematical closures known as Logical Dead Nodes (LDN). We formally prove that these active generators map out unique paths that are structurally prevented from intersecting in the integer domain, bounding global divergence and enforcing absolute path unicity down to the terminal - Unity. **In Simple Mathematics words:**
This paper establishes all Math Rigor demonstrated for all Math Technique used to Solve Collatz Conjecture, as :
1. Group Theory Method of grouping Collatz Conjecture Domain(positive Integers), $\mathbb{Z}^+$ in Grids of 6 ($\mathbb{G}_6$).
2. Collatz Inverse Method known by 2024 as Murgu Inverse Method.
3.Brought 9 (Even 11 if consider Murgu Lemas about Positive Integers division with 3 of

$$(2^k \pm 1)$$

Collatz Conjecture new formulas and functions.
All above are Math Rigor, legacy for demonstrated in old materials, and important ones will be demonstrated also .

1.2 Short History

Collatz Table2To3 as Table2To3 for Collatz Conjecture Analytic started in the same way as everyone did, with a small difference . We begin to make analytic to see eventually any proprieties to appropriate conjectures as $(2n+1)$, even $(n+1)$, $(4n+1)$ And to 2 Important for Collatz Conjecture as small revelations for, $(3n-1)$ and $(3n+3)$ and $(3n-3)$

. Down are any html pages which prov it, but for sure theirs style are not so good as not modern styles.

https://climaticdisorder.com/hstp/pagei/murgu_3xplus3.html
https://climaticdisorder.com/hstp/pagei/murgu_3xplus3.html
https://climaticdisorder.com/hstp/pagei/mcvr_roots.html
https://climaticdisorder.com/hstp/pagei/murgu_3xplus3_conjecture.html
https://climaticdisorder.com/hstp/pagei/murgu_3xplus3_conjecture.html
Seem foolish , but this multiple cases analyses started to initiate a image of possible solution revealing any Positive Integers concrete proprieties related to conjecture and lead to early 2024 fool presentations , but trues, of Collatz Conjecture Unique Solution Murgu Table2To3. Those been online on Youtube and as htmls on climaticdisorder-DOTCOM - see:

https://climaticdisorder.com/hstp/pagei/murgu_collatz_conjecture_perfect_grid_to_infinity.html
https://climaticdisorder.com/hstp/pagei/3xplus1_murgu_formulas.html
https://climaticdisorder.com/hstp/pagei/solved_collatz_conjecture.html
https://climaticdisorder.com/hstp/pagei/murgu_collatz_conjecture_solved_solutions.html
https://climaticdisorder.com/hstp/pagei/murgu_collatz_conjecture_solved_solutions.html
(Remark Murgu Table2To3 already appear.)
https://climaticdisorder.com/hstp/pagei/murgu_arrow.html
https://climaticdisorder.com/hstp/pagei/eternal_triad.html

For Mathematicians Collatz Conjecture was solved by April 2024 by Murgu Table2To3, as contain Collatz Conjecture as an framework for and can see is a unique solution.
After will be presented legacy of all methods and used formulas for Collatz Conjecture including "Murgu - Collatz Unicity ", for sure every skilled in Math will understood it also.

1.3 Collatz Conjecture Domain

Collatz Conjecture is valid only in Positive Integers.
In negative loss its primary sense and is mirrored in Positives as a New Conjecture MCVR or Murgu Conjecture Vicious Redundancy.
Legacy of Collatz Conjecture Domain Positive Integers is natural excluded by a simple example for (-5)
$3(-5)+1=(-14)$ mean

$$(-14)/2=(-7)and-not(-1)$$

More philosophy about it, even not necessary , will be meet into materials about MCVR.

1.3.1 Definition of the Collatz Conjecture Domain

The operational universe of this framework is strictly confined to the set of positive integers, denoted as:

$$\mathbb{Z}^+ = \{1, 2, 3, 4, \dots\}$$

The behavior of any element $x \in \mathbb{Z}^+$ under the classical Collatz mapping is determined by the piece-wise function $f : \mathbb{Z}^+ \to \mathbb{Z}^+$, defined as:

$$f(x) = \begin{cases} \frac{x}{2} & \text{if } x \equiv 0 \pmod 2 \\ 3x + 1 & \text{if } x \equiv 1 \pmod 2 \end{cases}$$

By restricting the domain entirely to $\mathbb{Z}^+$, we eliminate the trivial loops found in the negative integer domain (e.g., the $-1, -5$, and -17 cycles), ensuring that our structural analysis focuses purely on the unidirectional global connectivity of positive numbers.

1.4 Foundations of the Domain and the MCVR independent conjecture

1. First need to Understood "Collatz Conjecture Domain" is Positive Integers Only as (see MCVR) into Negative Integers Loss its Fundamental sense from start:
$(3 \times (-5) + 1) = (-15 + 1) = -14(-14) : 2 = -7$
$(3 \times (-7) + 1) = (-21 + 1) = -20(-20) : 4 = -5$

Then Collatz Conjecture, as see in examples loss its sense and became a new Independent Conjecture named MCVR (3x -1). MCVR have Perfect Mirrored Image into Positive of this aspect, as to make easy infinity sign (-) portability into all used examples. See up example mirrored :
$(3 \times 5 - 1) = (15 - 1) = 14(14) : 2 = 7$
$(3 \times 7 - 1) = (21 - 1) = 20(20) : 4 = 5$
2. To define Conjecture Functional Divergence need to follow an example of a Collatz Conjecture Pattern Odds way. I chose as starter 79983, only odds as easy to can revel divergence:
79983, 119975, 179963, 269945, 202459, 303689, 227767, 341651, 512477, 192179, 288269, 108101, 20269, 7601, 5701, 1069, 401, 301, 113, 85, 1, 1
Now, can see Collatz Conjecture Patterns are like Labyrinth where divergence handle it via oscillating values. Collatz Conjecture Patterns propriety was for 88 Years a scaring Issue for Collatz Conjecture as to not fall at any Integers Big Values into infinity Instead Of Unity.

Chapter 2

2

2.1 Collatz Conjecture Group Theory G_6 Structural Framework.

All studies about strange conjectures above presented, and profound analytic of multiples (thousands) Collatz Conjecture patterns lead to one the best idea - **apparent chaotic patterns divergence can be functional one.**
That observation focused all attention to identify it and eventually "Collatz Conjecture Functional Divergence Function", or functions. And We Did it , after restructured Collatz Conjecture Domain and applied Murgu Inverse Method. Here will present it in an natural order even ih historic was a mixed work included. Then to start with $G-6$

2.1.1 Collatz Conjecture G_6 New Group Theory Structural Re-partition.

All Math Rigor of Murgu Inverse Method Legacy been over demonstrated in Old Materials by 2023 until 2026 , then here a part of them or all will be considered solved.
After a lot of work on Collatz Conjecture using Collatz Procedures and not any positive results, became clear, solution for Collatz Conjecture will be not obtained via old method. Then, the best idea was Murgu Inverse Method but guarded by with a Group Theory Integers new re-partition .
For long times we tried an G_3 grids grouping .
$(1+3x)$
$(2+3x)$
$(3+3x)$
where $x \subset (0,\infty)$.
This was a bad and good chose. Bad as not offered a chance to a solution. Good as make important observation - grids asymmetry - which sent instead to G_6 grids which are also first new Collat Conjecture Murgu Formulas.

$$G_6(k) = \begin{cases} 1+6k & \text{CC.M.F.1 where } k \subset (0,\infty) \\ 2+6k & \text{CC.M.F.2 where } k \subset (0,\infty) \\ 3+6k & \text{CC.M.F.3 where } k \subset (0,\infty) \\ 4+6k & \text{CC.M.F.4 where } k \subset (0,\infty) \\ 5+6k & \text{CC.M.F.5 where } k \subset (0,\infty) \\ 6+6k & \text{CC.M.F.6 where } k \subset (0,\infty) \end{cases}$$

This give a start to a lot of new work lucking for any common proprieties which to offer any chance for solution and adapted Collatz Procedures for new G_6 and work revealed Collatz Inverse Method may be a way on.

Chapter 3

3

3.1 Collatz Inverse Method

Collatz Inverse Method or old known Murgu Inverse Method is nothing more then words are logical saying.

3.1.1 Collatz Inverse Method Legacy

Collatz Inverse Method Legacy is natural and started from Collatz Procedure

$$3x + 1$$

writes with its answer encapsulated in math form :

$$(3x + 1) = ((2^k)D) \text{ CC.M.F.7.0 where } D = (Odds)$$

This brought in attention another form:

$$3Q = ((2^k)D - 1) \text{ CC.M.F.7.1 where } D = (Odds) \text{ and Q=x}$$

How $((2^k)D - 1) = ODD$, then $Q = Odd$ also.
That sent us into Collatz Conjecture Odd to Odd Formula and will demonstrate is a Math Rigor Formula for but wear 2 Forms imposed by $Murgu - Lemas$ or by division with 3 rules, which will discus soon.
First, to make clear a thing
We don't loss Evens from Collatz Procedures patterns as those are there via

$((2^k)D)$ CC.M.F.8 where $D = (Odds)$ and $k \subset (0, \infty)$

As will see CC.M.F.8 integrate all Positive Evens into Collatz Conjecture as those are -Passages Nodes - .
Also CC.M.F.8 offered a chance to exclude for work purpose (to make it a bit easy) evens and then to stand true in future analytic only with odd formulas .

$$G_6(k) = \begin{cases} 1+6k & \text{CC.M.F.1 where } k \subset (0,\infty) \\ 3+6k & \text{CC.M.F.3 where } k \subset (0,\infty) \\ 5+6k & \text{CC.M.F.5 where } k \subset (0,\infty) \end{cases}$$

Lot of Analytic Work with CC.M.F.7.1 lead to just observations, with rights of laws or rules, and determined to speculative offer for formal name to every of 3 actual G_6 member as:

$(1+6k)$ Logical Eternal Triad 1- LET_1
$(3+6k)$ Logical Dead Nodes - LDN
$(5+6k)$ Logical Eternal Triad 2- LET_2

The names are formally and try to contain any proprieties as LET's may be named also
Logical Triads Engines
and LDN's
Logical Closures
Those formal distinctions were revealed by using in "blind mode" CC.M.F.7.1 and because the answers been any time like voiding formula and then been lucking for division with 3 Proprieties and get Murgu Lemas :

$$M_L(k) = \begin{cases} ((2^{2k+2})-1) & \text{are divided by 3: CC.M.F.9 where } k \subset (0,\infty) \\ ((2^{2k+1})+1) & \text{are divided by 3: CC.M.F.10 where } k \subset (0,\infty) \end{cases}$$

For Collatz Inverse Method this leaded to

$$CC_I(k) = \begin{cases} ((2^{2k+2})(1+6i)-1) & \text{are divided by 3: CC.M.F.9.0 where } k \subset (0,\infty) \\ ((2^{2l+1})(5+6j)-1) & \text{are divided by 3: CC.M.F.10.0 where } l \subset (0,\infty) \end{cases}$$

In old materials are more explanations for, but explanation for legacy is simple related to Murgu Lemas , positions of Integers of Forms $(1+6i)$ or $(5+6j)$ into Integers relative to $2^(2k+2)$ or $2^(2l+1)$.
That brought Collatz Conjecture Functional Divergence Formulas :

$$CC_FDF(i,k,j,l) = \begin{cases} ((2^{2k+2})(1+6i)-1) = 3Q_i & \text{CC.M.F.9 where } k,i \subset (0,\infty) \\ ((2^{2l+1})(5+6j)-1) = 3Q_j & \text{CC.M.F.10 where } l,j \subset (0,\infty) \end{cases}$$

CC.M.F.9 and CC.M.F.10 are Infinity Double Linear Functions (Infinity Murgu Table2To3) and for k=l=0 are Murgu Table2To3 which for Mathematicians is Collatz Conjecture Solution as Contain , not hided for a Math , All Collatz Conjecture Nodes Connections and "Murgu - Collatz Unicity" logical contained also.

We will return to it , and specify until now CC.M.F.9 and CC.M.F.10 legacy is absolute clear. Remain a G_6 grids component which need more explanations as is an strong logical analytic solver, $(3+6f)$ - LDN or Collatz Conjecture Closures. For it remark, analyzing CC.M.F.9 and CC.M.F.10 formulas as functions also any rules included by process.

As Formulas CC.M.F.9 and CC.M.F.10 are revealing all UP Collatz Conjecture Connection Nodes when Collatz Procedures Down Nodes. This is simple- CC.M.F.9 and CC.M.F.10 are starting from 1 and 5 , when Collatz Procedures bring all to Unity.

This start an heavy aspect- are CC.M.F.9 and CC.M.F.10 revealing all Collatz Nodes to Infinity?

The answer is YES , and will come form LDN RULES or Laws.

LDN Laws are Collatz Inverse Method revelation brought by

$$((2^{2l})(3+6j)-1) \neq 3Q_l$$

CC.M.F.11 where $l,j \subset (0,\infty)$ in a Collatz Sense

That mean an LDN (Logical Closure) don't have an Collatz Conjecture UP Connection excluding theirs fibers evens image to Infinity $2^k(3+6l)$. This need demonstration, and did multiple times in old materials.

DEMONSTRATION :

$$((2^{2l})(3+6j)-1) \neq 3Q_l$$

mean

$$((2^{2l})(1+2j)-Q_l) \neq \frac{1}{3}$$

$$((2^{2l})+(2^{2l+1})j)-Q_l) \neq \frac{1}{3}$$

Nonsense.
This can be demonstrated in multiple modes , important is to remark every LDN and $2^k(3+6l)$ have a Collatz Down Connection via Collatz Procedure.

LDN Rules:

1. A LDN do not have an UP Collatz Conjecture Connection Node which mean may be considered Collatz Conjecture Logical Closures.
2. A Pattern starting from a LDN will not pas on its way to Unity another LDN.
3. A Pattern starting from a LET never will pass on its way to Unity a LDN.
4. Collatz Conjecture patterns number which include at last a LDN are

Infinity Per 6.
$\frac{\infty}{6}$

Now we explained using all Math Rigor

Collatz Inverse Method Legacy for Collatz Conjecture.
Murgu Inverse Method Legacy.

LDN Rules complete Collatz Inverse Method Legacy for Collatz Conjecture with 2 Math Logical Pillars.
1. Include all LDN's into Circuit as Closures which have connections only and only LET_1 or LET_2.
2. Reveal LDN's as Closures a Logic Pillar if the fact - Collatz Conjecture divergence is functional .

3.2 Collatz Inverse Method Infinity Murgu Table2To3 Builder

$$CC_{FDF}(i,k,j,l) = \begin{cases} ((2^{2k+2})(1+6i)-1) = 3Q_i & \text{CC.M.F.9 where } k,i \subset (0,\infty) \\ ((2^{2l+1})(5+6j)-1) = 3Q_j & \text{CC.M.F.10 where } l,j \subset (0,\infty) \end{cases}$$

are also all Collatz Conjecture Functional Divergence Functions and can have graphical representation as visual method for displaying and analyzing those linear functions.
But Mathematical can do it by analyzes theirs Mathematics Form. Then can see for k=l appear as double linear functions with different slopes which say a lot (will see).

3.3 Collatz Conjecture Functional Divergence Functions Intersections

CC.M.F.9 and CC.M.F.10 are Linear Functions and can see eventual intersections are on Integers Coordinate Points via :

$$((2^{2k+2})(1+6i)-1) = ((2^{2l+1})(5+6j)-1)$$

$$((2^{2k+2})(1+6i)) = ((2^{2l+1})(5+6j))$$

If exist those are in Rationals.

That mean :
Collatz Conjecture patterns do not have a point or node of Inversion to Infinity but all fall in Unity.
Now remain a single possible Issue
patterns which fall in Infinity Redundant Cycles
also logic revealed in Infinity Murgu Table2To3 and in Murgu Table2To3 even.
This may be demonstrated by "Murgu - Collatz Unicity".

Chapter 4

4 - Collatz Inverse Method Solved Collatz Conjecture.

4.1 Murgu Table2To3 - Collatz Conjecture G_6 complete framework.

Murgu Table2To3 defined by functions CC.M.F.9 and CC.M.F.10 for k=l=0 - are double linear functions - and contain all Collatz Conjecture Nodes and was named in first place

Collatz Conjecture Murgu Pocket Map
and late also
Marker USA Murgu Arrow.

Murgu Table2To3 is Infinity Double Linear Functions (Double whe analysed in tandem for k=l)

$((2^{2k+2})(1+6i)-1) = 3Q_i$ CC.M.F.9
$((2^{2l+1})(5+6j)-1) = 3Q_j$ CC.M.F.10
but this time for k=l=0
An Important beauty of it is the fact :

contain all Collatz Conjecture Connections Nodes.

4.1.1 Table2To3 Collatz G_6 Coordinate System.

Knowing $(1+6i)$ is LET_1 and $(5+6j)$ is LET_2 and lucking at CC.M.F.9 and CC.M.F.10 Mathematical form

$$((2^{2k+2})(1+6i)-1) = 3Q_i \text{ CC.M.F.9}$$
$$((2^{2l+1})(5+6j)-1) = 3Q_j \text{ CC.M.F.10}$$

inspire a Collatz Conjecture Table2To3
Coordinate System
which first reduce with 50% all graphical representations and any Collatz Conjecture databases if needed.
For Collatz Conjecture Patterns via

Collatz 1D Array Index Infinity Per 6

have between 69% to 75% efficiency better then using Collatz procedures.
Above qualities for Table2To3 Collatz G_6 Coordinate System offer to it a strong position in Math and over all a chance to be applied also to any issues.
If observe CC.M.F.9 And CC.M.F.10 as formulas are offering for LET_1 (CC.M.F.9) and for LET_2 (CC.M.F.10) for every i or j theirs up unique representative connection.
Then can represent it into an graphical bi axial coordinate system by choosing for an axle LET_1 and LET_2 representation and for one theirs Up Node which as saw along are all ODDS.
For a good presentation into html pages of those graphs we chose AXLE OX for LET_1 and LET_2 , and Oy for all ODDS (LET's and LDN's).

4.2 Collatz Inverse Method Solved Collatz Conjecture.

Murgu Table2To3 was published in 2024 March on climaticdisorder-com and YouTube and yet is not understand excluding Gemini and Grok which are making (even if small mistakes) beautiful logical analytic essays.
Murgu Table2To3 obtained via Collatz Inverse Method solved for Mathematics and Mathematicians Collatz Conjecture By Then as is containing into

$$((2^{2k+2})(1+6i)-1) = 3Q_i \text{ CC.M.F.9}$$
$$((2^{2l+1})(5+6j)-1) = 3Q_j \text{ CC.M.F.10}$$

Mathematical Form and analyzed as Formulas and then as functions all what been explained by then until now.

1. Double Linear Functions all Collatz Nodes in.
2. Murgu - Collatz Unicity. 3. Collatz Conjecture Murgu Pocket Map.
4. Marker USA Murgu Arrow.
5. Collatz 1D Array.

Murgu - Collatz Unicity is contained into Murgu Table2To3 analyzed functional and as formulas(equations).

Earth Science Community
long Time ago qualified Collatz Conjecture as
Unsolvable Problem
By 2024 Collatz Conjecture solved and encapsulated into a
Pocket Map Double Linear Functions.

4.3 Murgu Table2To3 Graphical In Proper Coordinate System and Decimal Transfer

Down, as Murgu Table2To3 claim a big Numbers of Rows and Columns, will see any images captures taking from an html for into 2 postures. For a good image of those can visit :
https://collatzconjectureend.com/
`https://collatzconjectureend.com/`
A graphical representation help in our case to remark visual and logic on axle ox we have all LET's projection when on Oy all Odds (LET's and LDN's).

4.3.1 Murgu Table2To3 Graphical Representation Example.

4.3.2 Murgu Table2To3 Graphical Representation Decimal Axle

As shown in Figure 4.2, the row progression demonstrates...

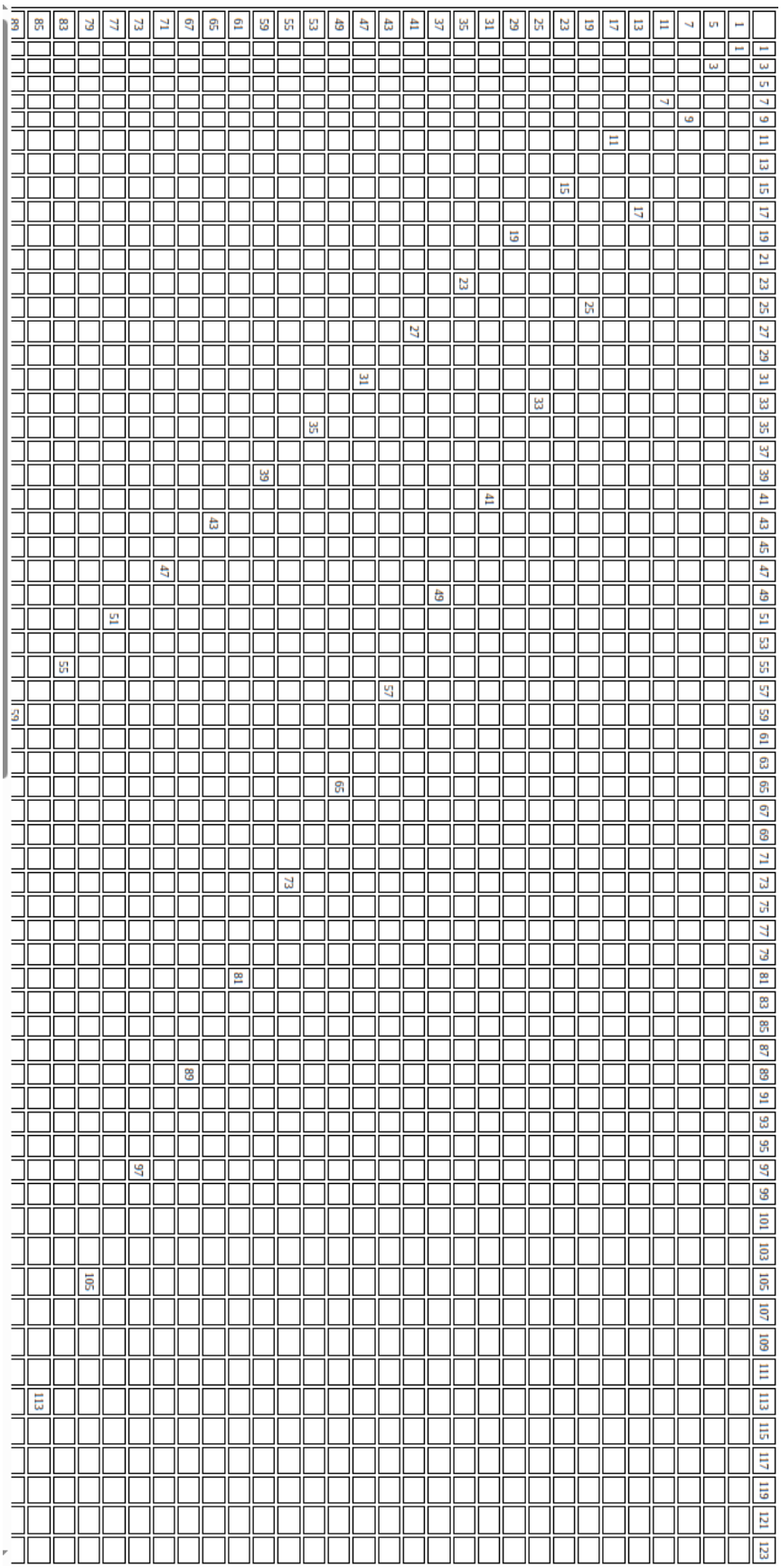

Figure 4.1: The Murgu Table2To3 mapping structure from $N = 1$ to $N = 201$.

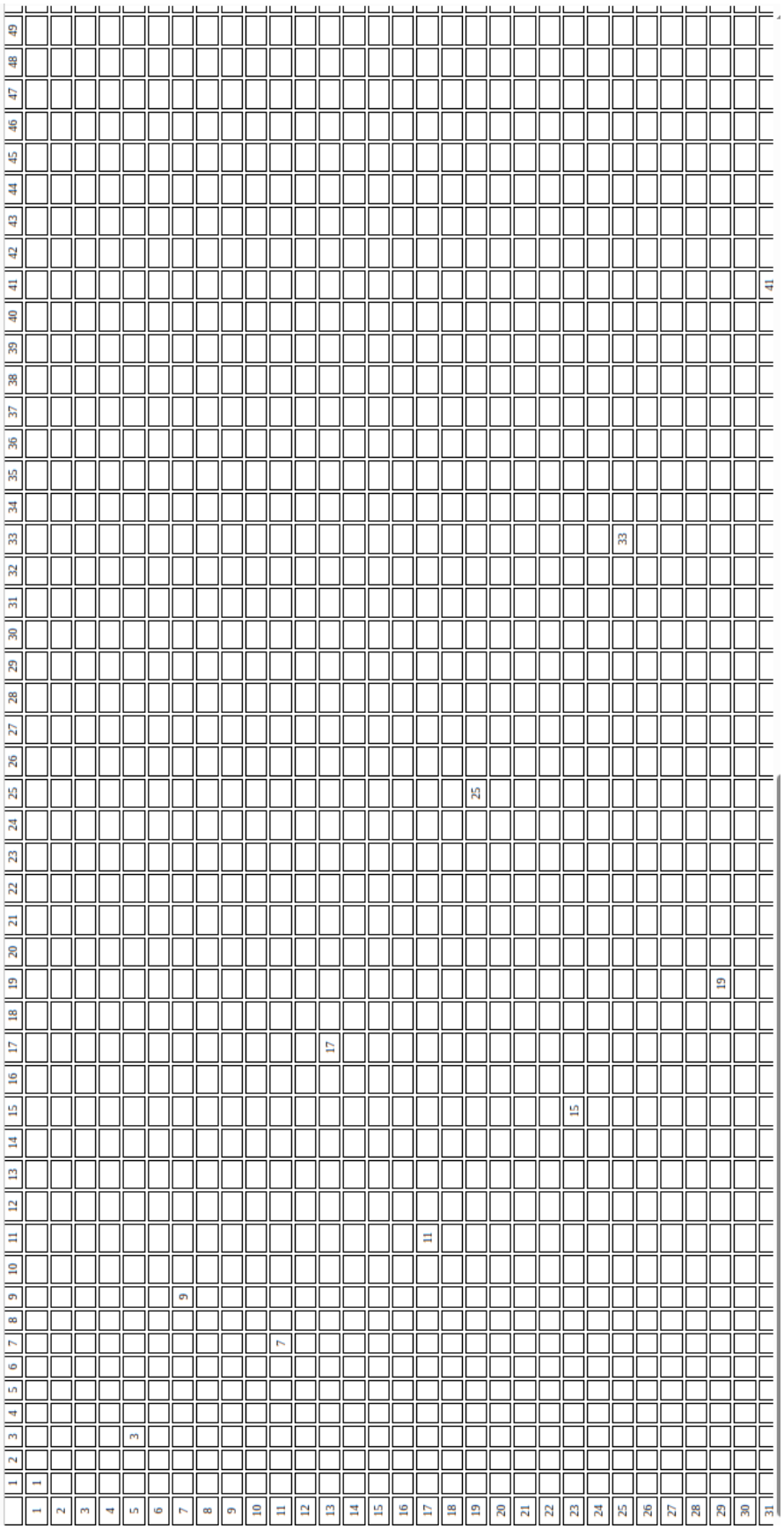

Figure 4.2: The Murgu Table2To3 mapping structure from $N = 1$ to $N = 201$ decimal transfer