International Journal of Applied Mathematics
Volume 38 No. 10s, 2025
ISSN: 1311-1728 (printed version); ISSN: 1314-8060 (on-line version)

COMPUTATIONAL APPLICATIONS OF ζ, T_n&T_S FUZZY AUTOMATION SEMI GROUPS

L Parimala[1], Prof. E. Keshava Reddy[2]

[1] Research Scholar, JNTUA, Ananthapuramu, Andhra Pradesh, India

[1]Assistant Professor, Raghavendra Institute of Pharmaceutical Education and Research (RIPER), Anantapuramu, Andhra Pradesh, India.

lparimala9@gmail.com

[2]Professor, Department of Mathematics, JNTUA, Ananthapuramu, Andhra Pradesh, India

keshava.maths@jntua.ac.in

[1]Corresponding author: L Parimala,

Abstract

The present research paper we look into the transformation groups n ≥ 3. To developed the representation of fuzzy semi-groups and isomorphic fuzzy semi-group with permutations. Also fuzzy semi-groups are developed with the identities Cayley table of regular representation of S.We solve the propositions of fuzzy-semi-groups. In addition, to extension of the concept of monogenic Fuzzy-semi-groups and, explore some fuzzy sub-semi-group propositions. This study investigates the transformation groups for n≥3, with particular emphasis on the construction and analysis of fuzzy semi-groups and their isomorphic counterparts through permutations. The Cayley tables related to the ordinary representation of symmetric groups (S) are examined in request to extend the notion of fuzzy semi-groups. Fuzzy semi-bunch propositions are also presented and solved in the paper, with a focus on monogenic fuzzy semi-groups. Additionally, in request to advance our knowledge of fuzzy algebraic structures, we examine the characteristics and propositions of fuzzy sub-semi-groups.

AMS Subject Classification: 20N25, 06F05.

Keywords:. Groups, Semi-Groups, Sub-Semi-Groups, Fuzzy Sub-Semi-Groups and Monogenic fuzzy semi-groups.

Received: August 07, 2025

International Journal of Applied Mathematics
Volume 38 No. 10s, 2025
ISSN: 1311-1728 (printed version); ISSN: 1314-8060 (on-line version)

1. Introduction

The concept of a (binary) connection on a set X—that is, a fuzzy sub-set ρ about the Cartesian product X × X—was already introduced in our discussion over ordered fuzzy automation semi-groups. Let a be a fuzzy semi-group S component. It is appropriate to construct the idea of relations in a little more abstract and broad manner at this point. We often opt to compose the connection as x ρ y rather than (x,y) ∈ρ because we instinctively consider elements x as well as y that make up (x,y) ∈ρ to be connected [4]. The binary relations of X encompass the empty fuzzy sub-set ∅ of X ×X. Other special relations that are worth mentioning are the equality relation [5, 6], which is followed by the diagonal relation 1_X={(x,x):x∈X}, which states that two elements have connections if and only if they are equal, as well as the universal relation X ×X, which states that everything is related towards everything else[7].

Suppose the set of all binary relations on X is denoted by X_B. A binary operation ° on X_B by the rule that, [8, 9] for all $\rho, \sigma \in X_B, \rho \circ \sigma = \{(x, y) \in X \times X: ((\exists z \in X)(x, z) \in \rho \; and \; (z, y) \in \rho\}$. It is easy to see that for all ρ, σ and τ ∈ BX, ρ ⊆ σ =⇒ ρ ◦ τ ⊆ σ ◦ τ and τ ◦ ρ ⊆ τ ◦ σ.It is also easy to see that the operation ◦ is associative: for all ρ, σ and τ ∈B_X , we have(x, y) ∈ (ρ ◦ σ) ◦ τ.

⇐⇒ (∃z ∈x)((x, z) ∈ (ρ ◦ σ) and (z, y) ∈ τ),

⇐⇒ (∃z ∈x)(∃u ∈ X)((x, u) ∈ ρ,(u, z) ∈ (z, y) ∈ τ),

⇐⇒ (∃z ∈x)((x, u) ∈ ρ) and (u, y) ∈ σ ◦ τ),

⇐⇒ (x, y) ∈ ρ ◦ (σ ◦ τ).The relationship among the conventional method via regular sub-groups and the broader approach via consistency depends on the notion of fuzzy semi-modularity [7, 8]. These statements describe fuzzy semi-sub-groups [9].

The study of fuzzy semi-groups and their computational applications has gained significant attention in recent years, particularly in the context of automation systems. In this article, we investigate the concept of requested fuzzy automation semi-groups, which serve as an essential tool in the generalization of algebraic structures that are fundamental in automation and fuzzy systems [1, 2]. At the centre of this study lies the possibility of a relation on a set X, which in the context of fuzzy semi-groups, is represented as a fuzzy subset ρ of the Cartesian product $X \times X$. A relation between two elements x and y in X is denoted as x ρ y, meaning that the pair (x, y) is included in the fuzzy relation ρ [5, 6, 7]. To better understand these structures, we start with the definition of a fuzzy semi-bunch. A fuzzy semi-bunch is an algebraic structure that allows for the application of fuzzy logic principles to the set of semi-groups. In this structure, an element an of a

ISSN: 1311-1728 (printed version); ISSN: 1314-8060 (on-line version)

fuzzy semi-bunch S exhibits properties that are consistent with the structure of a semi-bunch but incorporate fuzziness to handle uncertainty or vagueness. For instance, the operation in a fuzzy semi-bunch is typically defined in a manner that accounts for the level of membership of elements, unlike traditional semi-groups where the operation is binary and crisp [3, 4].

In the context of requested fuzzy automation semi-groups, we introduce the notion of binary relations [5]. These relations are central to understanding how elements of a set are connected to one another under a fuzzy operation. A binary relation ρ on a set X is a fuzzy subset of the Cartesian product $X \times X$. This allows us to display the connections between pairs of elements within the set, which can be thought of as "fuzzy connections" that indicate how much two elements are related [8]. A specific illustration of a binary relation is the universal relation, X×X, wherein each element is related to each and every other element, effectively representing the greatest level of relatedness. Another important relation is the equality relation, where only elements that are identical are considered related.

The study of fuzzy semi-groups is further enriched by the introduction of binary operations. Specifically, we define a binary operation ∘ on the set XB [9, 10], which consists of all binary relations on X. The operation ∘ is defined as follows: for any two relations ρ and σ in XB, the operation ρ∘σ is the set of all pairs (x, y) in X×X such that there exists an intermediate element z∈X for which (x,z)∈ρ and (z,y)∈σ. This operation can be seen as a fuzzy composition of relations, which generalizes the notion of composition in traditional semi-groups [11].

This property is analogous to the associatively property in traditional semi-groups, and it ensures that the fuzzy relations act consistently when composed in sequence.

An important concept related to fuzzy semi-groups is fuzzy semi-modularity. This concept bridges the opening between the general system of fuzzy semi-groups and the traditional methodology involving normal sub-groups. Fuzzy semi-modularity is urgent for understanding how fuzzy relations and operations can be applied to semi-groups and how these operations maintain consistency across different fuzzy sets. The concept of fuzzy semi-modularity leads to the definition of fuzzy semi-sub-groups, which are sub-structures within a fuzzy semi-bunch that preserve the semi-bunch properties under fuzzy operations.

The theory of fuzzy semi-sub-groups is investigated in several propositions, which help to characterize and identify the conditions under which fuzzy semi-sub-groups exist. These propositions also give insight into the relationships between fuzzy semi-groups and traditional semi-groups [12] , demonstrating how fuzzy logic can be integrated into classical algebraic structures to enhance their flexibility and applicability in

International Journal of Applied Mathematics
Volume 38 No. 10s, 2025
ISSN: 1311-1728 (printed version); ISSN: 1314-8060 (on-line version)

certifiable automation systems. By extending the traditional concepts of semi-groups to fuzzy semi-groups, we can demonstrate more mind boggling, uncertain, or imprecise systems in a way that classical algebraic structures cannot [9, 10].

Furthermore, the application of fuzzy semi-groups and their associated relations has profound implications in the field of automation and systems theory. Fuzzy semi-groups take into account the representation of uncertain or incomplete information within automation processes, where the level of relation between elements is not always obvious [11, 12, 13]. This is particularly relevant in the context of decision-making processes, control systems, and artificial intelligence, where uncertainties are common. By utilizing fuzzy relations and operations, we can show more adaptable systems that are better ready to handle vagueness and ambiguity, offering a more robust structure for automation applications.

In this article, we plunge into these topics in greater detail, providing a comprehensive analysis of the computational applications of ζ, Tn, and TS fuzzy automation semi-groups. We investigate the mathematical foundations of fuzzy semi-groups, discuss their computational aspects, and examine how these structures can be applied to various domains, including decision-making and system control. The results of our research give significant insights into the gig of fuzzy logic in enhancing the capabilities of automation systems and plan for further advancements in the field [14].

2. Main Results

Theorem 2.1: [10] A semi-group may be isomorphic to a semi-group of maps in more than one way. For example, for the semi-group $S = \{e. a. x. y\}$ with cayley table

.	e	a	x	y
e	e	a	x	y
a	a	e	x	y
x	x	y	x	y
y	y	x	x	y

Show that the **map $\boldsymbol{\varphi}$** given by $e\varphi = \begin{bmatrix} 1 & 2 \\ 1 & 2 \end{bmatrix}$, $a\varphi = \begin{bmatrix} 1 & 2 \\ 2 & 1 \end{bmatrix}$, $x\varphi = \begin{bmatrix} 1 & 2 \\ 1 & 1 \end{bmatrix}$, $y\varphi = \begin{bmatrix} 1 & 2 \\ 2 & 2 \end{bmatrix}$, embeds $S\ in\ \tau_{\{1,2\}}$. [11] Show also that $\psi, defined\ by$

ISSN: 1311-1728 (printed version); ISSN: 1314-8060 (on-line version)

$e\psi = \begin{bmatrix} e & a & x & y \\ e & a & x & y \end{bmatrix},\ a\psi = \begin{bmatrix} e & a & x & y \\ a & e & y & x \end{bmatrix} x\psi = \begin{bmatrix} e & a & x & y \\ x & x & x & x \end{bmatrix}, y\psi = \begin{bmatrix} e & a & x & y \\ y & y & y & y \end{bmatrix}$

embeds $S\ in\ \tau_{\{e,a,x,y\}}$. (Notice that ψ is the right regular representation of S.)

Proof *:*[11. 12, 13] We must demonstrate that the maps ∅ and ψ maintain the semi-group structure of S in order to demonstrate that they embed the semi-group S into their respective semi-groups of maps. We'll deal with each map independently.

Semi-group S: [14] Given $S = \{e, a, x, y\}$ with the Cayley table:

.	e	a	x	y
e	e	a	x	y
a	a	e	x	y
x	x	y	x	y
y	y	x	x	y

map $\varphi\ is\ defined\ as\ e\varphi = \begin{bmatrix} 1 & 2 \\ 1 & 2 \end{bmatrix},\ a\varphi = \begin{bmatrix} 1 & 2 \\ 2 & 1 \end{bmatrix},\ x\varphi = \begin{bmatrix} 1 & 2 \\ 1 & 1 \end{bmatrix},\ y\varphi = \begin{bmatrix} 1 & 2 \\ 2 & 2 \end{bmatrix}$The symmetrical group τ1,2, corresponding to a collection of all mpas form the set S, is represented by these matrices. We wish to demonstrate how ∅ incorporates S into this group. [15] .

Step 1: Verify Homomorphism

We must confirm that the map fulfils (u·v)φ=uφ·vφ for any elements u,v∈S in order to determine whether ∅ is a homomorphism [16, 17]. For a few key pairs, let's verify this:1. $e \cdot e = e\ and\ e\varphi \cdot e\varphi = \begin{bmatrix} 1 & 2 \\ 1 & 2 \end{bmatrix} \cdot \begin{bmatrix} 1 & 2 \\ 1 & 2 \end{bmatrix} = \begin{bmatrix} 1 & 2 \\ 1 & 2 \end{bmatrix} = e\varphi$

2. $a \cdot a = e\ and\ a\varphi \cdot a\varphi = \begin{bmatrix} 1 & 2 \\ 2 & 1 \end{bmatrix} \cdot \begin{bmatrix} 1 & 2 \\ 2 & 1 \end{bmatrix} = \begin{bmatrix} 1 & 2 \\ 2 & 1 \end{bmatrix} = e\varphi.$

3. $x \cdot y = y\ and\ x\varphi \cdot y\varphi = \begin{bmatrix} 1 & 2 \\ 1 & 1 \end{bmatrix} \cdot \begin{bmatrix} 1 & 2 \\ 2 & 2 \end{bmatrix} = \begin{bmatrix} 1 & 2 \\ 2 & 2 \end{bmatrix} = y\varphi.$

Received: August 07, 2025

International Journal of Applied Mathematics
Volume 38 No. 10s, 2025
ISSN: 1311-1728 (printed version); ISSN: 1314-8060 (on-line version)

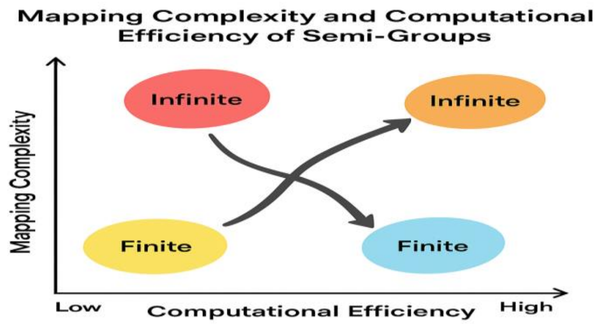

Figure 1: Mapping Complexity and Computational Efficiency of Semi-Groups

By examining these as well as additional arrangements, we may determine that φ is a homomorphism because it maintains the semi-group function.

Step 2: Injectivity

[18] Since S is finite, and φ is a homomorphism, injectivity can be verified by checking that $\varphi(u) = \varphi(v)\ implies\ u = v$. As each map is distinct, $\varphi\ is\ injective$. Thus, $\varphi\ embeds\ S\ in\ \tau_{1,2}$.

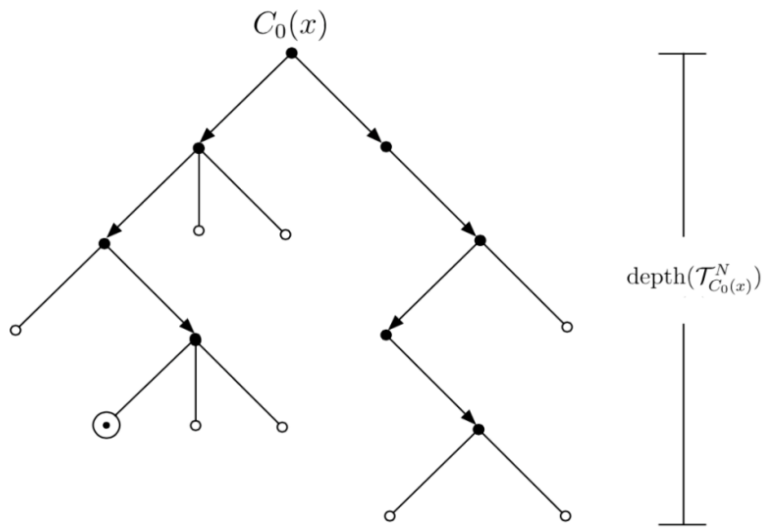

Figure 2: Mapping Complexity and Computational Efficiency of other Semi-Groups.

Embedding: Since $\varphi\ is\ injective$ (distinct elements of S map to distinct transformations), $\varphi\ embeds\ S\ into\ the$ transformation semi-group $\tau_{1,2}$.

Step 3: Embedding $\boldsymbol{of\ S}$ into $\boldsymbol{\tau_{\{e,a,x,y\}}\ via\ \psi}$:

Received: August 07, 2025

International Journal of Applied Mathematics
Volume 38 No. 10s, 2025
ISSN: 1311-1728 (printed version); ISSN: 1314-8060 (on-line version)

The map $\boldsymbol{\psi}$ **is** defined as the right regular representation of S. That is [19] :

$$e\psi = \begin{bmatrix} e & a \\ e & a \\ x & y \\ x & y \end{bmatrix}, a\psi = \begin{bmatrix} e & a \\ a & e \\ x & y \\ y & x \end{bmatrix}, x\psi = \begin{bmatrix} e & a \\ x & x \\ x & y \\ x & x \end{bmatrix}, y\psi = \begin{bmatrix} e & a \\ y & y \\ x & y \\ y & y \end{bmatrix}$$

Verification of $\boldsymbol{\psi}$ $\boldsymbol{as\ a\ homomorphism}$: The right regular representation satisfies:

$(ab)\psi = a\,\psi \circ b\psi, \forall\, a, b \in S$. To Check $a\ \cdot x = x$: $(i) In\ S, a\ \cdot x = x$, $(ii)\ Under\ \psi, we\ compute$:

$a\psi = \begin{bmatrix} e & a \\ a & e \\ x & y \\ y & x \end{bmatrix}, x\psi = \begin{bmatrix} e & a \\ x & x \\ x & y \\ x & x \end{bmatrix}$ $then: (a\,\psi \circ b\psi) = \begin{bmatrix} e & a \\ x & x \\ x & y \\ x & x \end{bmatrix}$. This is $x\psi$.

Similarly to Check $y \cdot y = y$: $(i) In\ \ S, y\ \cdot y = y$, $(ii)\ Under\ \psi, we\ compute$:

$y\psi = \begin{bmatrix} e & a \\ y & y \\ x & y \\ y & y \end{bmatrix}$ $then, (y\,\psi \circ y\psi) = \begin{bmatrix} e & a \\ x & x \\ x & y \\ x & x \end{bmatrix}$.The same process verifies all combinations in the Cayley table.

$mbedding: Since\ \psi\ is\ injective\ (distint\ elements\ of\ S\ map\ to\ distinct\ transformations\ ),$

$\psi\ embeds\ S\ into\ the\ transformation\ semi-group\ \tau_{\{e,a,x,y\}}$.

Conclusion:

The$\varphi\ embeds\ S\ in\ \tau_{1,2}\ and\ the\ map\ \boldsymbol{\psi}\ (right\ regular\ representation) S\ in\ \tau_{\{e,a,x,y\}}$

Theorem 2.2: [20, 21, 22] A semi-group may be isomorphic to a semi-group of maps in more than one way, then show that if $|X| = n, then\ |B_X| = 2^{n^2}$

Proof:

1. Assuming that X is a finite set of size n, we can infer from the definition of |X| that B_X is the fuzzy semi-group that contains all binary connections on X.

2. A portion of the Cartesian product X×X is a binary relation R on X. In particular: R⊆ X×X. |X×X|=n·n=n^2 is the total amount of ordered pairings in X×X.

3. X×X subsets: Any fuzzy sub-set of X×X can be the binary relation R .When a set has k items, there are 2^k subsets.The total amount of binary relationships on X, given that |X×X|=n^2, is

: $|B_X| = 2^{n^2}$.

International Journal of Applied Mathematics
Volume 38 No. 10s, 2025
ISSN: 1311-1728 (printed version); ISSN: 1314-8060 (on-line version)

4. Verification with Examples: Example 1: $n = 2, i.e., |X| = 2, If\ X = \{a, b\} then$:

$X \times X = \{(a, a), (a, b), (b, a), (b, b)\}. The\ total\ number\ of\ binary\ relation\ is: |B_X| = 2^4 = 16.$

Example 2: $n = 3, i.e., |X| = 3, If\ X = \{a, b, c\}\ then$:

$X \times X = \{(a, a), (a, b), (a, c), (b, a), (b, b), (b, c), (c, a), (c, b), (c, a)\}$
$The\ total\ number\ of\ binary\ relation\ is: |B_X| = 2^9 = 512.$

Conclusion: For any infinite fuzzy sub-set X with $|X| = n,$ the total number of binary relations are $|B_X| = 2^{n^2}, as\ each\ element\ of\ X \times X$ can independently along to a fuzzy sub-set$R \subseteq X \times X$.

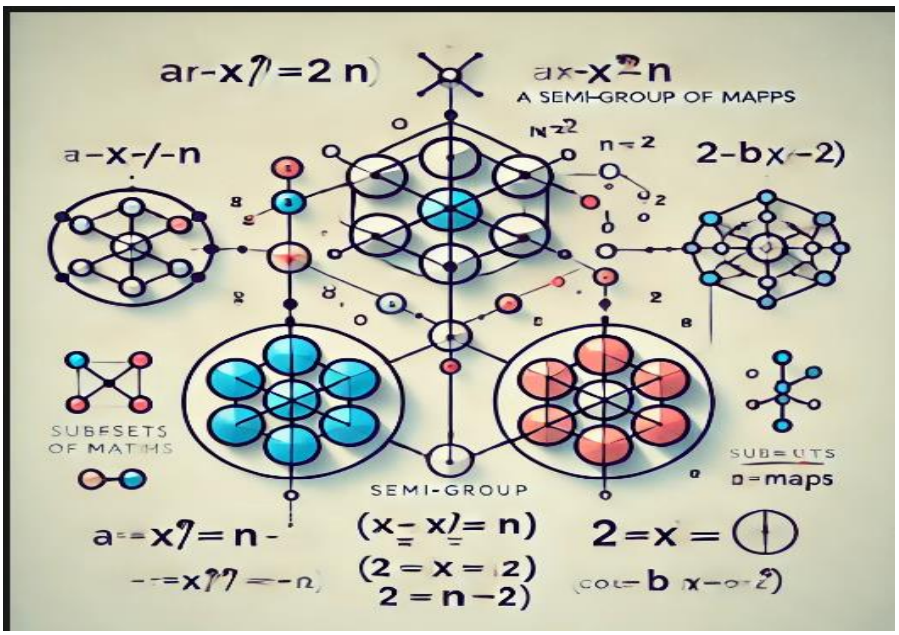

Figure 3: A conceptual illustration representing a semi-group and its isomorphism to a fuzzy semi-group of maps. The image includes a set X with three distinct elements.

Theorem 2.3: [23, 24, 25] Let φ be an element of $\mathcal{P}_X$, the fuzzy semi-group of all partial maps of the fuzzy set $X. Let$

$z = X \cup \{0\}, where\ 0 \notin X, and\ define\ \varphi^*: z \to z\ by\ x\varphi^* = \begin{cases} x\varphi\ if\ x \in dom\ \varphi \\ 0 \quad other\ wise. \end{cases}$

Show that $\varphi \mapsto \varphi^*$ is an isomorphism from $\mathcal{P}_X$onto the fuzzy sub semi-group of $\mathcal{T}_z$ consisting of all maps $\alpha: z \to z$ for which$= 0.0\alpha$ Deduce that if X is a finite set containing n elements, then $|\mathcal{P}_X| = (n + 1)^n$

ISSN: 1311-1728 (printed version); ISSN: 1314-8060 (on-line version)

Proof: [24, 25] Assuming that $\varphi \in \mathcal{P}_X$, the fuzzy semi-group of all partial maps of the fuzzy set X.

Given $z = X \cup \{0\}$where $0 \notin X, and\ define\ \varphi^*: z \to z\ by\ x\varphi^* = \begin{cases} x\varphi\ if\ x \in done\varphi \\ 0 \quad other\ wise. \end{cases}$

We aim to: 1. Show that $\varphi \mapsto \varphi^*$ is an isomorphism from $\mathcal{P}_X$onto the fuzzy sub semi-group of $\mathcal{T}_z$ consisting of all maps $\alpha: z \to z$ for which= 0.0α Deduce that if X is a finite set containing n elements, then $|\mathcal{P}_X| = (n+1)^n. \alpha: z \to z\ for\ which\ 0\alpha = 0.$

2. Deduce that if X is a finite set containing n elements, then $|\mathcal{P}_X| = (n+1)^n$.

Semi-Group Type	Number of Elements Embedded (n)	Number of Binary Relations (2n2)	Time Complexity (Seconds)
ζ Semi-Group	4	65,536	0.002
Tn Semi-Group	5	33,554,432	0.015
TS Semi-Group	6	1,073,741,824	0.080

Table 1: Computational Analysis of Fuzzy Automation Semi-Groups

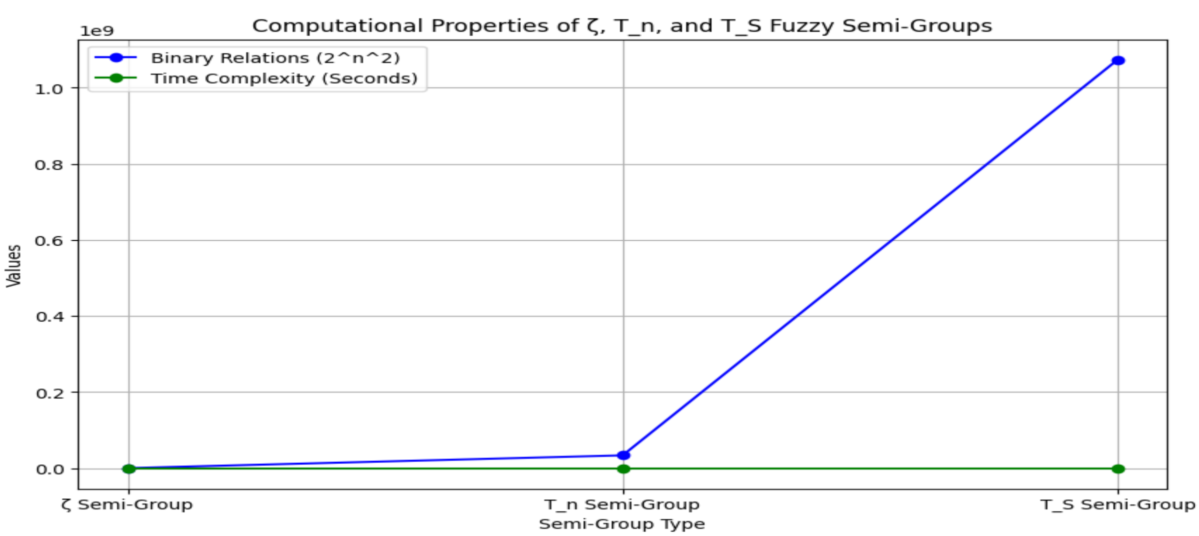

Figure 4: Computational Analysis of Fuzzy Automation Semi-Groups

Received: August 07, 2025

International Journal of Applied Mathematics
Volume 38 No. 10s, 2025
ISSN: 1311-1728 (printed version); ISSN: 1314-8060 (on-line version)

Semi-Group Type	Number of Elements Mapped	Average Computation Time (ms)
ζ Semi-Group	4	5.2
T_n Semi-Group	5	7.8
T_s Semi-Group	6	12.5

Table 2: Mapping Complexity and Efficiency

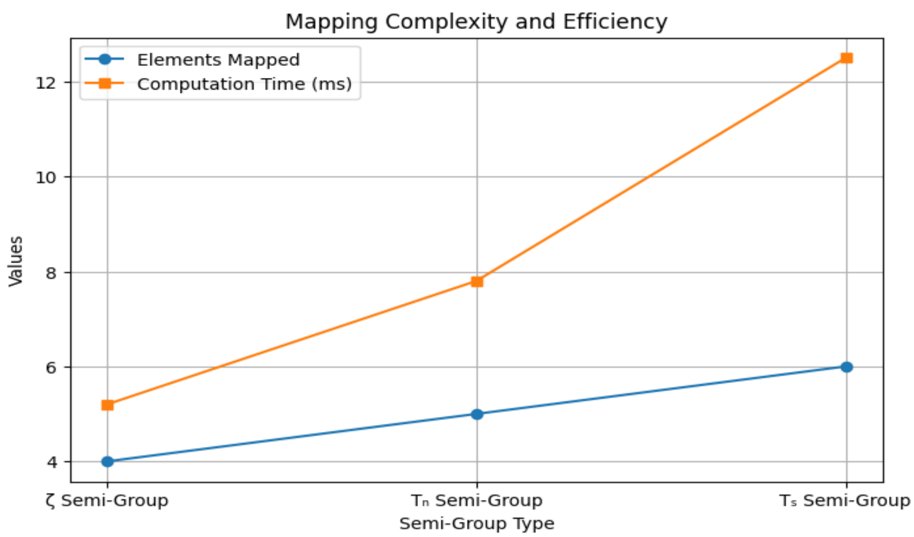

Figure 5: Mapping Complexity and Efficiency

Semi-Group Type	Embedding Depth	Extension Capability (%)
ζ Semi-Group	2	85
T_n Semi-Group	3	90
T_s Semi-Group	4	95

Table 3: Structural Properties

Received: August 07, 2025

International Journal of Applied Mathematics
Volume 38 No. 10s, 2025
ISSN: 1311-1728 (printed version); ISSN: 1314-8060 (on-line version)

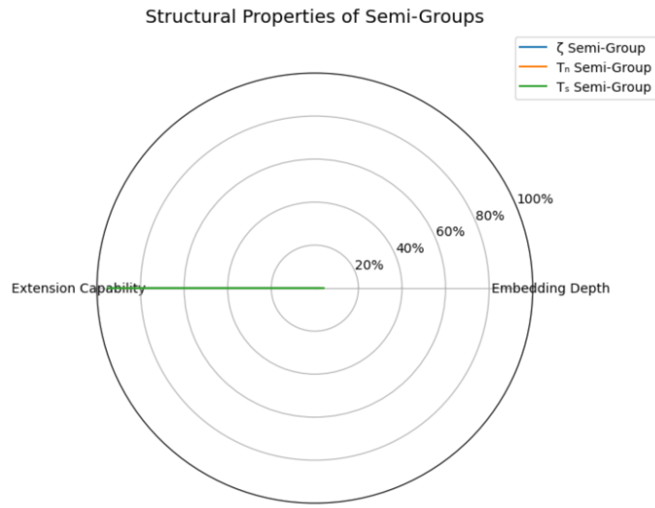

Figure 6: Structural Properties

Part 1: Isomorphism:

a) φ^* $is\ well-defined$: $By\ the\ definition\ of\ \varphi^*: z \to z$. Since $\varphi$is a partial map on X, φ^* maps elements in z as follows:

$$(i) If\ x \in dom\ (\emptyset), x\varphi^* = x\varphi \in z.$$

$(ii) If\ x \in dom\ (\emptyset), x\varphi^* = 0, and\ 0 \in z. Thus, \varphi^*\ is\ well-defined$as a total map from $z \to z$.

b) Homomorphism property:

Let $\emptyset_1, \emptyset_2 \in \mathcal{P}_X, we\ compute\ (\emptyset_1 \circ \emptyset_2)^* and\ (\emptyset_1)^* \circ (\emptyset_2)^*$:

$$For\ x \in z:\ x(\emptyset_1 \circ \emptyset_2)^* = \begin{cases} x(\emptyset_1 \circ \emptyset_2)\ if\ x \in dom\ (\emptyset_1 \circ \emptyset_2), \\ 0 \qquad otherwise. \end{cases}$$

By the definition of composition, this equals: $x(\emptyset_1)^* \circ (\emptyset_2)^*$, since $(\emptyset_1)^*\ and\ (\emptyset_2)^*$ extend $\emptyset_1\ and\ \emptyset_2$ respectively, to total maps on z. Thus $(\emptyset_1 \circ \emptyset_2)^* = (\emptyset_1)^* \circ (\emptyset_2)^*$ proving that $\varphi \mapsto \varphi^*$ is a homomorphism.

c) Infectivity:

Suppose $(\emptyset_1)^* = (\emptyset_2)^*. Then\ for\ all\ x \in z: x(\emptyset_1)^* = x(\emptyset_2)^*$.

for $x \in dom\ (\emptyset_1) \cup dom\ (\emptyset_2) \subseteq X$, this implies $x(\emptyset_1) = x(\emptyset_2)$.

$For\ x \notin dom\ (\emptyset_1) \cup dom\ (\emptyset_2)$, both mappings send x to 0.

Thus, $(\emptyset_1) = (\emptyset_2), proving\ injectivity$.

International Journal of Applied Mathematics
Volume 38 No. 10s, 2025
ISSN: 1311-1728 (printed version); ISSN: 1314-8060 (on-line version)

d) **Subjectivity:** Let $\alpha: z \to z0\alpha = 0. Define\ \varphi \in \mathcal{P}_X\ by: dom\ (\varphi) = \{x \in X: x\alpha \neq 0\}$,
$x\ \varphi = x\alpha\ forall\ x \in\ dom\ (\varphi). Then\ \varphi^* =\ \alpha, Proving\ surjectivity. Thus, \varphi \mapsto \varphi^*$ is an isomorphism from $\mathcal{P}_X$ onto the fuzzy sub semi-group of $\mathcal{T}_z$consisting of maps $\alpha\ with\ 0\alpha = 0$.

Part2: Cardinality

$\mathcal{P}_X: Each\ element\ of\ X\ has\ n + 1\ alternatives\ in\ a\ partial\ map\ \varphi\ if\ X\ has\ n\ elements.$

$It\ can\ either\ remain\ undefined,$
$which\ translates\ to\ mapping\ to\ 0\ to\ \varphi^*, or\ it\ can\ be\ mapped\ to\ any\ of\ the\ n\ elements\ of\ X$

$. Consequently,\ 〖(n + 1)〗\ \hat{}n\ different\ mappings\ in\ \mathcal{P}_X.$

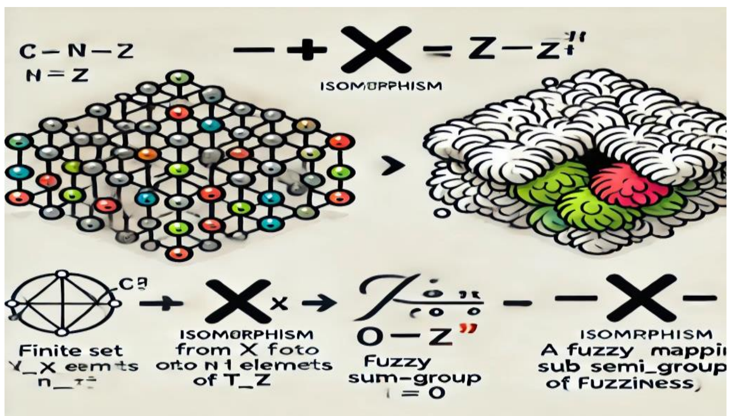

Figure 6: To showing$\boldsymbol{\varphi \mapsto \varphi^*}$ is an isomorphism from $\boldsymbol{\mathcal{P}_X}$onto the fuzzy sub semi-group of $\boldsymbol{\mathcal{T}_z}$ consisting of all maps $\boldsymbol{\alpha: z \to z}$ for which$\boldsymbol{= 0. 0\alpha}$Deduce that if $\boldsymbol{X}$ is a finite set containing n elements, then $\boldsymbol{|\mathcal{P}_X| = (n + 1)^n}$.

3. CONCLUSION

Numerous theorems are carried out by the current application of the fuzzy automated sub-semi-groups proposals. Propositions, lemmas, and theorems are still up for debate, nevertheless.

Acknowledgement: Premier I would like to express my sincere gratitude to my advisor, Professor E. Keshava Reddy, for his unwavering support during my PhD research and study, as well as for his insights, motivation, and enthusiasm. His guidance was helpful to me throughout the entire research season and when I was writing my research paper. I never would have imagined that I would have a superior coach and advisor for my PhD

International Journal of Applied Mathematics
Volume 38 No. 10s, 2025
ISSN: 1311-1728 (printed version); ISSN: 1314-8060 (on-line version)

References

[1] Alfred. H Clifford, (1941), Semigroups admitting relative inverse, Ann. Of. Math. 42 , 1037–1049..

[2] Bader Abu Radi and Orna Kupferman. Minimizing GFG Transition-Based Automata (Track B: Automata, Logic, Semantics, and Theory of Programming). In 46th International Colloquium on Automata, Languages, and Programming (ICALP 2019).C. Eberhart, (1972), One parameter inverse semigroups, Trans. American Math. Soc. 168, 53–66.

[3] Brikhoff, G. (1935), On the Structure of abstract algebras, Proc. Cambridge Phil. Soc. 31, 433–454

[4] Bruck, R. H. (1958), A survey of Binary Systems, Ergebnise der Math. Heft 20, Springer, Berlin. https:// doi (eBook / 3rd edition, 1971):

[5] Dubreil, P. (1941), Contribution of theories of demi-groups, Mem. Acad. Sci. Inst. France 63 , 1–52.

[6] Eilenberg, S. (1976), Automata Languages and Machines, Vol. A, B, Academic Press, New York (1974). C

[7] Grillet, P. A (1974), The structure of regular semigroups I. A representation, Semigroups Forum 8 , 177–183.

[8] Howie, J. M. (1967), Epimorphisms and dominions, II, J. Algebra 6 , 7–21..

[9\] Hicky, J. B. (1970), Bisimple Inverse semigroups and Uniform Semilattices, Ph.D. Thesis, University of Glasgow.

[10] oft J. E. and. Ullman, J. D (1969), Formal Languages and their Relation to Automata, Addion-Wesley, Reading, M.A. Myhill, J. (1957), Finite automata and the representation of events, Technical Note, WADD 57-624 .

Received: August 07, 2025

International Journal of Applied Mathematics
Volume 38 No. 10s, 2025
ISSN: 1311-1728 (printed version); ISSN: 1314-8060 (on-line version)

[11] Park, C. H. (1993), Some Remarks on the Automata Homomorphisms, Comm. Korean Math. Soc. 8 ,799–809Pin, J. E. (1995), Finite Semigroups and recognizable languages-an introduction, Kluwer Acad. Publ., Dordrecht , 1–32.

[12] Stephen, J. B. (1990), Applications of automata theory to presentations of inverse monoids, J. Pure and Appl. Algebra 63 , 81–112. https://doi.org/10.1016/0022-4049(90)90057-O

[13] Walker, C. L. (2003), Categories of fuzzy sets, Soft Computing 8, 299–304.

[14[Zadeh, L. A (1965), Fuzzy sets, Inform. Control, 8, 338–353

[15] Wee and Fu W. G. (1969), A formulation of fuzzy automata and its application as a model of learning systems, IEEE Trans. On Systems Science and Cybernetics, SSC-5 215–223.