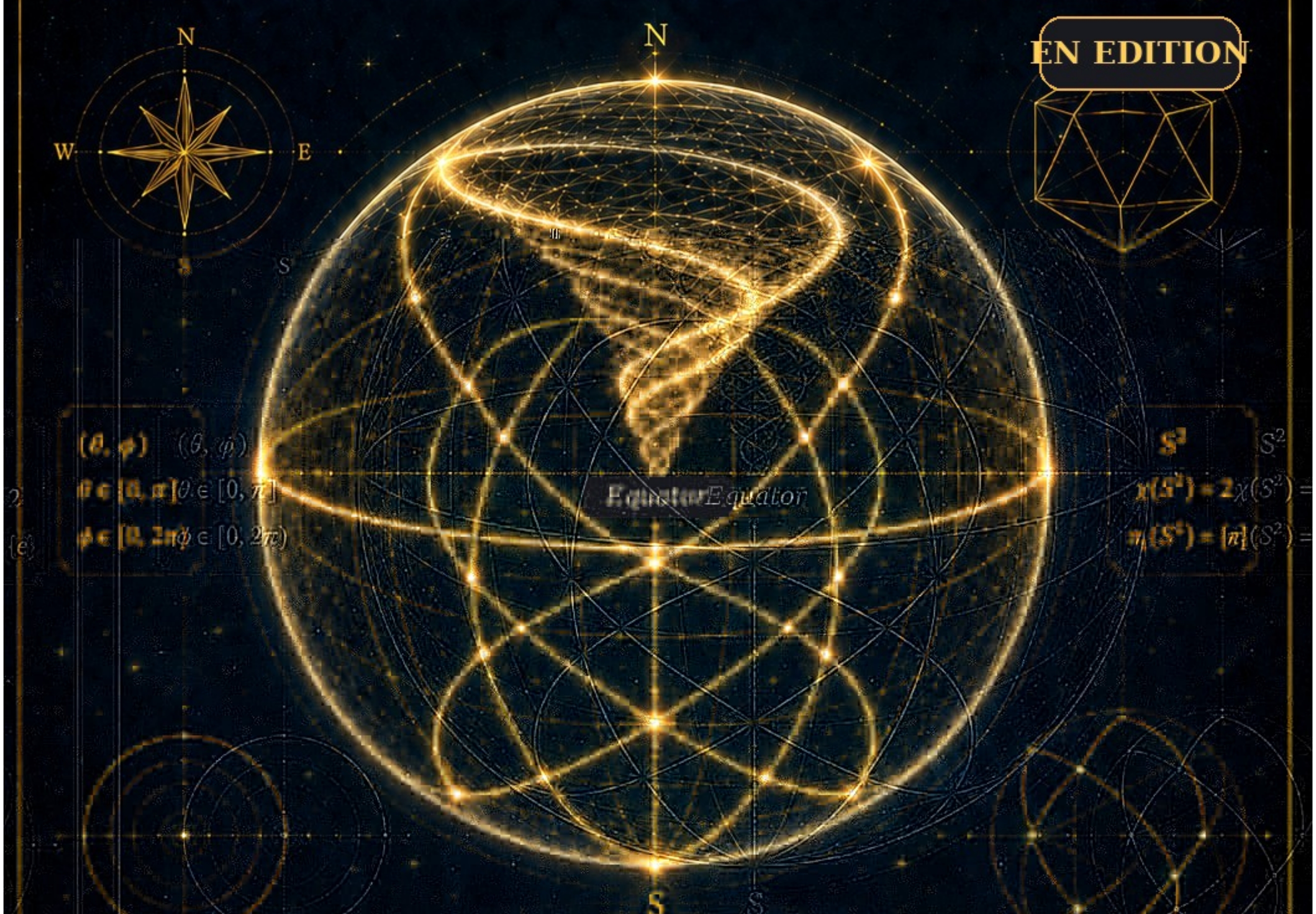
SPHERICAL CYCLIC TWIST
TSC(n)

Controlled generation of closed cyclic loops on the sphere

EN EDITION



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~ Doru ~

Geometric, topological and combinatorial model

June 2026

English public edition

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Editorial note

This English edition is intended for international public reading. The Romanian document remains the reference version for the original terminology and for the authorial development of the model.

The text presents TSC(n) as a geometric, topological and combinatorial framework. Physical, magnetic or engineering interpretations are treated as possible directions of application and not as experimental validation.

Contents

Abstract

This work proposes TSC(n), Spherical Cyclic Twist, as a deterministic method for generating controlled closed cyclic loops on the sphere. The model begins with a support sphere S_R, an equatorial plane Π_0, an equatorial circle E_R and a regular n-gon inscribed on the equator.

The local minimal level of the construction is given by elementary small circles generated by consecutive vertices, d = 1. The structural level of the even-m and odd-m branches uses discrete orders d selected by the symmetry of each case, such as d = 3, 5, 7, ..., 1. Therefore the TSC(8), TSC(12), TSC(16) and TSC(20) figures do not contradict the local basis d = 1; they represent the structural level of the model.

The central object of the work is not the initial circle, but the closed cyclic loop Γ_i obtained after twist. For n = 2m, the number of final loops is controlled by the arithmetic criterion:

$$N\_comp = gcd(s, m)$$

The work classifies TSC(n) systems into two branches: the even-m branch, organized by the symmetry marker M0*, and the odd-m branch, where the real central element M0 appears. These markers have structural and visual roles, while the central theorem remains the control of loop count through the orbits of the translation $k \mapsto k + s$ in the cyclic group Z_m.

0. Status and scope

The work formulates a geometric, topological and combinatorial model. It does not start from an experimental physical claim, but from a deterministic construction on the sphere.

The object of the work is the rule by which an equatorial discretization generates semicircles, modular twists and closed cyclic loops. The conceptual relation is:

$$S\_R \rightarrow SC(n) \rightarrow TSC(n,s)$$

Possible physical, magnetic, energetic or constructive applications are further directions. In this work, the claims are kept within the geometric and combinatorial framework.

1. Introduction

1.1. Central problem

On a sphere, many circles and paths can be defined. The problem studied here is whether a discrete rule can generate controlled closed cyclic loops on the surface of the sphere.

equatorial polygon → circle families → North/South semiarcs → modular twist → closed cyclic loops

The initial circles are the construction stage. The closed cyclic loops are the central result.

1.2. Basic idea

We start from a support sphere and from a regular polygon with n vertices inscribed on the equatorial circle. For $n = 2m$, the model defines vertex pairs, northern and southern semiarcs, and then a modular reconnection of step s.

$$\text{twist} = \text{reconnection of the Northern hemisphere relative to the Southern hemisphere}$$

1.3. Main result

The main result is the control formula for the number of components:

$$N\_comp = gcd(s, m)$$

This formula is proved by decomposing the modular translation on Z_m into orbits.

2. Fundamental geometric framework

2.1. Support sphere

Consider a sphere of radius R centered at the origin O = (0,0,0):

$$S\_R = \{ (x,y,z) \in R^3 \mid x^2 + y^2 + z^2 = R^2 \}$$

In figures and checks one may use the normalization R = 1, without loss of combinatorial or topological structure.

2.2. Equatorial plane and equatorial circle

$$\Pi\_0 = \{ (x,y,z) \in R^3 \mid z = 0 \}$$

$$E\_R = S\_R \cap \Pi\_0 = \{ (x,y,0) \in R^3 \mid x^2 + y^2 = R^2 \}$$

2.3. Inscribed regular polygon

On the equatorial circle we inscribe a regular polygon with n vertices, where $n = 2m$. The vertices are:

$$V\_k = (R \sin(2\pi(k-1)/n), R \cos(2\pi(k-1)/n), 0),\ \ k = 1,\dots,n$$

2.4. North and South hemispheres

$$S\_R^+ = \{ (x,y,z) \in S\_R \mid z \geq 0 \}$$

$$S\_R^- = \{ (x,y,z) \in S\_R \mid z \leq 0 \}$$

The separation between the Northern and Southern hemispheres is required for defining the twist gluing function.

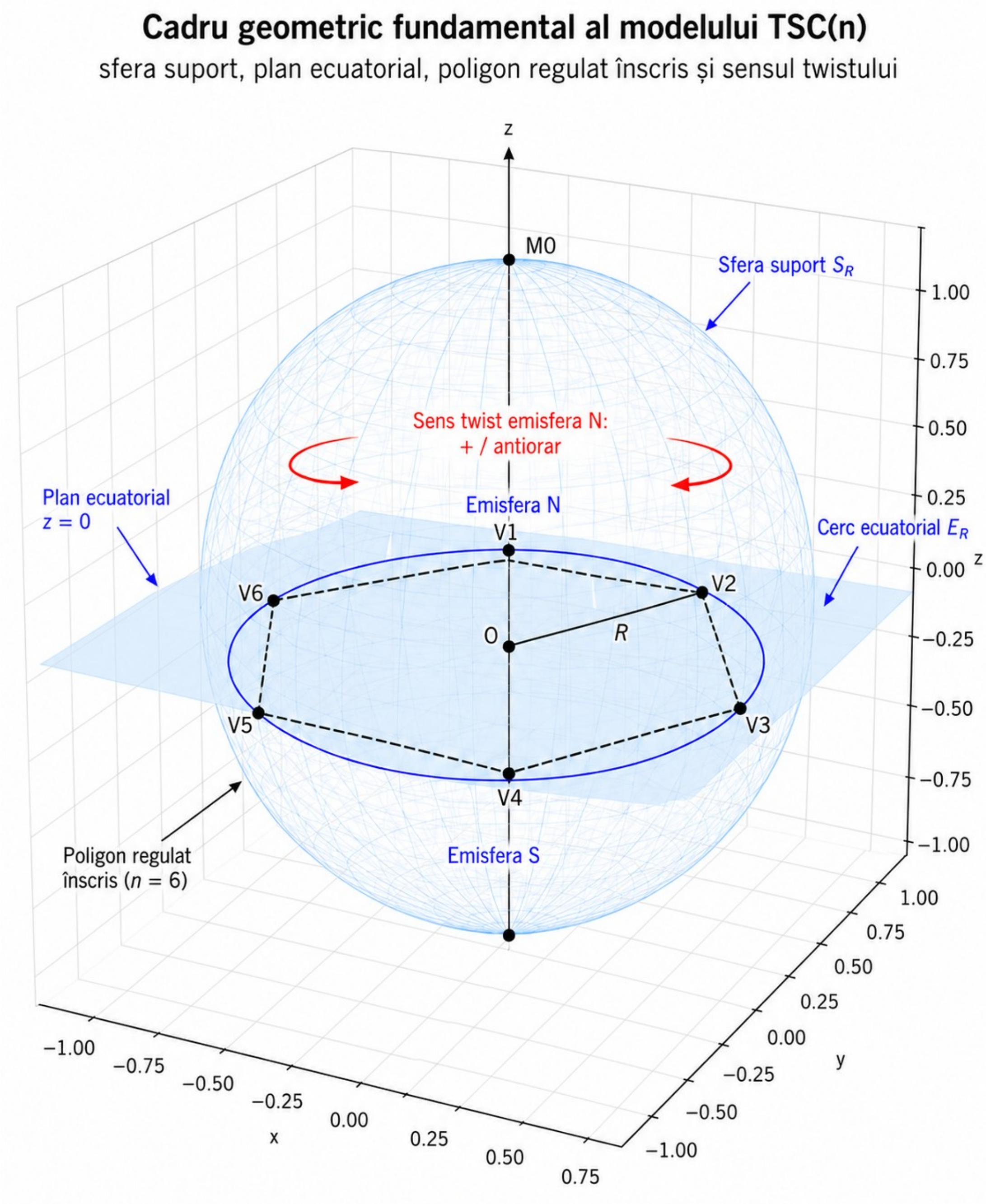

Figure 1. Fundamental geometric framework of TSC(n): support sphere, equatorial plane, inscribed regular polygon and twist direction.

3. Circles of order d and model levels

To avoid confusion between the minimal local case and the structural families used in the main figures, we explicitly introduce the modular order d of the circles.

$$C\_k\textasciicircum(d) = S\_R \cap P(V\_k,\ V\_[k+d]\_n), \quad d = 1,2,\ldots,m$$

$$[k]\_n = ((k-1) \bmod n) + 1$$

3.1. The three levels

The minimal local level is $d = 1$. It generates elementary small circles through consecutive vertices.

The structural level of the even-m and odd-m branches uses discrete orders d established by the symmetry of each case. For the even-m branch, the structural orders are:

$$D\_m = \{ m-1, m-3, m-5, \dots, 1 \}$$

Thus TSC(8) uses D_4 = {3,1}, TSC(12) uses D_6 = {5,3,1}, TSC(16) uses D_8 = {7,5,3,1}, and TSC(20) uses D_10 = {9,7,5,3,1}.

The general extension level studies all possible orders d, including the limiting case $d = m$.

4. Elementary small circles and structural families

4.1. Minimal case d = 1

$$C\_k\verb|^|(1) = S\_R \cap P(V\_k,\ V\_[k+1]\_n)$$

For consecutive vertices, the chord does not pass through the center of the sphere, so the associated plane does not contain the origin O. Its intersection with the sphere is an elementary small circle.

$$\delta\_1 = R\cos(\pi/n)$$

$$\rho\_1 = sqrt(R\verb|^|2 - \delta\_1\verb|^|2) = R\sin(\pi/n)$$

4.2. Vertical plane associated with a chord

Let V_a = (x_a, y_a, 0) and V_b = (x_b, y_b, 0). The chord line V_aV_b in the equatorial plane has the form:

$$A\_ab\ x + B\_ab\ y = C\_ab$$

$$A\_ab = y\_b - y\_a, \quad B\_ab = x\_a - x\_b, \quad C\_ab = A\_ab\ x\_a + B\_ab\ y\_a$$

$$P\_ab = \{ (x,y,z) \in R\verb|^|3 \mid A\_ab\ x + B\_ab\ y = C\_ab \}$$

$$C\_ab = S\_R \cap P\_ab$$

4.3. Structural families

Circles of order $d > 1$ appear in the main branch analysis as structural families, not as arbitrary extensions. They are required for TSC(8), TSC(12), TSC(16), TSC(20) and for the corresponding cases in the odd-m branch.

5. Twist as an equatorial gluing map

5.1. North/South semiarcs

$$C\_k\verb|^|+ = C\_k\verb|^|(d) \cap S\_R\verb|^|+$$

$$C\_k^- = C\_k^{(d)} \cap S\_R^-$$

$$\partial C\_k^+ = \partial C\_k^- = \{ V\_k,\ V\_[k+d]\_n \}$$

5.2. Oriented gluing function

The modular twist of step s is defined as a gluing function on the boundary. For the structural case of order d:

$$g\_s : \partial C\_k^+ \to \partial C\_[k+s]\_n^-$$

$$g\_s(V\_k)=V\_[k+s]\_n, \quad g\_s(V\_[k+d]\_n)=V\_[k+s+d]\_n$$

The gluing is considered oriented and compatible with the chosen twist direction. Under this convention, the northern semiarc is reconnected to the modularly shifted southern semiarc without free ends. More rigorously, the gluing function constructs a reconnected topological space in which semiarc endpoints are identified according to the modular rule.

$$\Gamma\_i = C\_\{a\_1\}^+ \cup\_\{g\_s\} C\_\{b\_1\}^- \cup\_\{g\_s\} C\_\{a\_2\}^+ \cup\_\{g\_s\} C\_\{b\_2\}^- \cup \ldots$$

$$\partial\Gamma\_i = \varnothing$$

5.3. Intersections and immersion

The loops Γ_i are components of the abstract space obtained by gluing. In their representation on the sphere, visual intersections or transverse immersions may occur at equatorial vertices. These intersections do not cancel the identity of the components as distinct orbits of the combinatorial construction.

6. Main theorem: number of components

6.1. Statement

Let TSC(n,s) be a Spherical Cyclic Twist system constructed for n = 2m. In the reduced combinatorial model of the North/South reconnection, the number of closed cyclic components obtained after twist is:

$$N\_comp = gcd(s, m)$$

6.2. Proof

At the combinatorial level, the reconnection induced by the twist is equivalent to the action of the map:

$$\tau\_s : Z\_m \to Z\_m$$

$$\tau\_s(k) = k + s \pmod m$$

The cyclic components are the orbits of τ_s. Let d = gcd(s,m). The smallest positive integer r such that $r\,s \equiv 0 \pmod m$ is:

$$r = m / gcd(s,m)$$

Therefore each orbit has length m/d. Since Z_m has m elements, the number of orbits is:

$$m / (m/d) = d$$

Hence:

$$N\_comp = d = gcd(s,m)$$

The number of components is not an empirical observation from generated figures; it follows from the arithmetic structure of modular translation on the cyclic group Z_m.

6.3. Topological remark

Each orbit determines a component Γ_i by successive gluing of semiarcs. Under the ideal assumption that semiarcs are injective images of compact intervals and that the only identifications are those prescribed by g_s, the resulting component is a closed curve. If, in addition, there are no unprescribed self-intersections, then:

$$\Gamma\_i \simeq S\text{^}1$$

This topological statement is separate from the combinatorial proof of N_comp = gcd(s,m).

7. Closed cyclic loops as the central object

The initial circles are not the final object of the model. They provide the semiarcs which, through twist, are reconnected into closed cyclic loops.

$$TSC(n,s) = \Gamma\_1 \cup \Gamma\_2 \cup \ldots \cup \Gamma\_N\_comp$$

$$N\_comp = gcd(s,m)$$

The controlled object of the model is the number and organization of the final loops, not merely the pre-twist geometry.

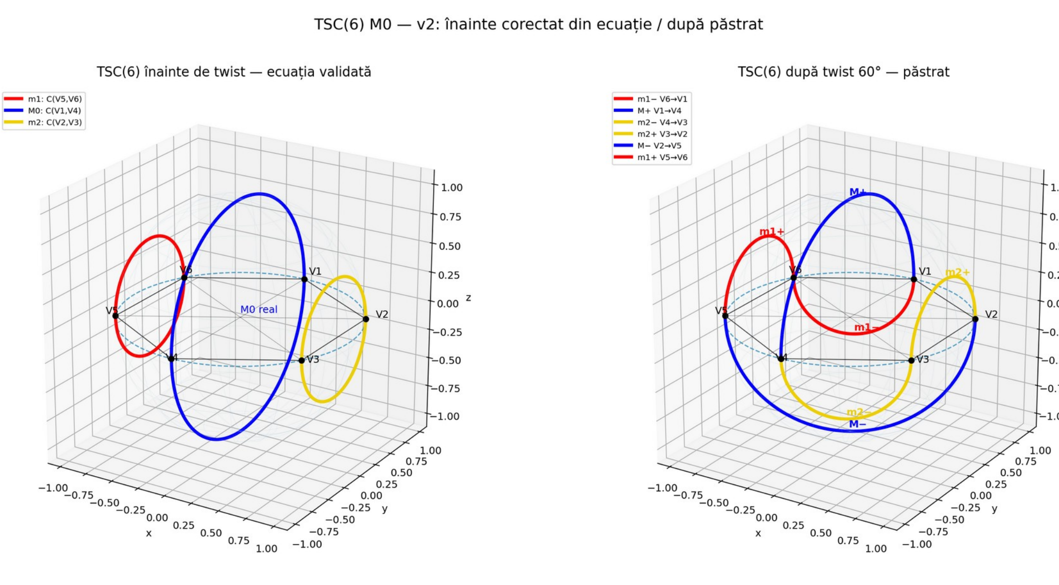

Figure 2. TSC(6): first case with real M0 and final loop for s = 1.

8. Central table of cyclic loops

Case	n	m	Branch	s analyzed	gcd(s,m)	Final loops
TSC(4)	4	2	even m	1	1	1
TSC(6)	6	3	odd m	1	1	1
TSC(8)	8	4	even m	1,2	1,2	1 or 2
TSC(10)	10	5	odd m	1,2,3	1,1,1	1
TSC(12)	12	6	even m	1,2,3	1,2,3	1,2 or 3
TSC(14)	14	7	odd m	1,2,3,4	1,1,1,1	1
TSC(16)	16	8	even m	1,2,3,4	1,2,1,4	1,2 or 4
TSC(18)	18	9	odd m	1,2,3,4,5	1,1,3,1,1	1 or 3
TSC(20)	20	10	even m	1,2,3,4,5	1,2,1,2,5	1,2 or 5
TSC(22)	22	11	odd m	1-6	1,1,1,1,1,1	1
TSC(30)	30	15	odd composite	1-8	1,1,3,1,5,3,1,1	1,3 or 5

The table shows that the controlled object of the model is the number of final cyclic loops.

9. The even-m branch

The even-m branch occurs for n = 2m with m even. In this branch there is no real central circle; a symmetry marker M0* appears.

$$m \in 2N \Rightarrow M0^*$$

M0* is a symmetry and mirroring marker, not an effective circle of the system. It visually organizes the structural families, but it is not the central theorem.

For this branch, the structural orders are D_m = {m−1, m−3, ..., 1}.

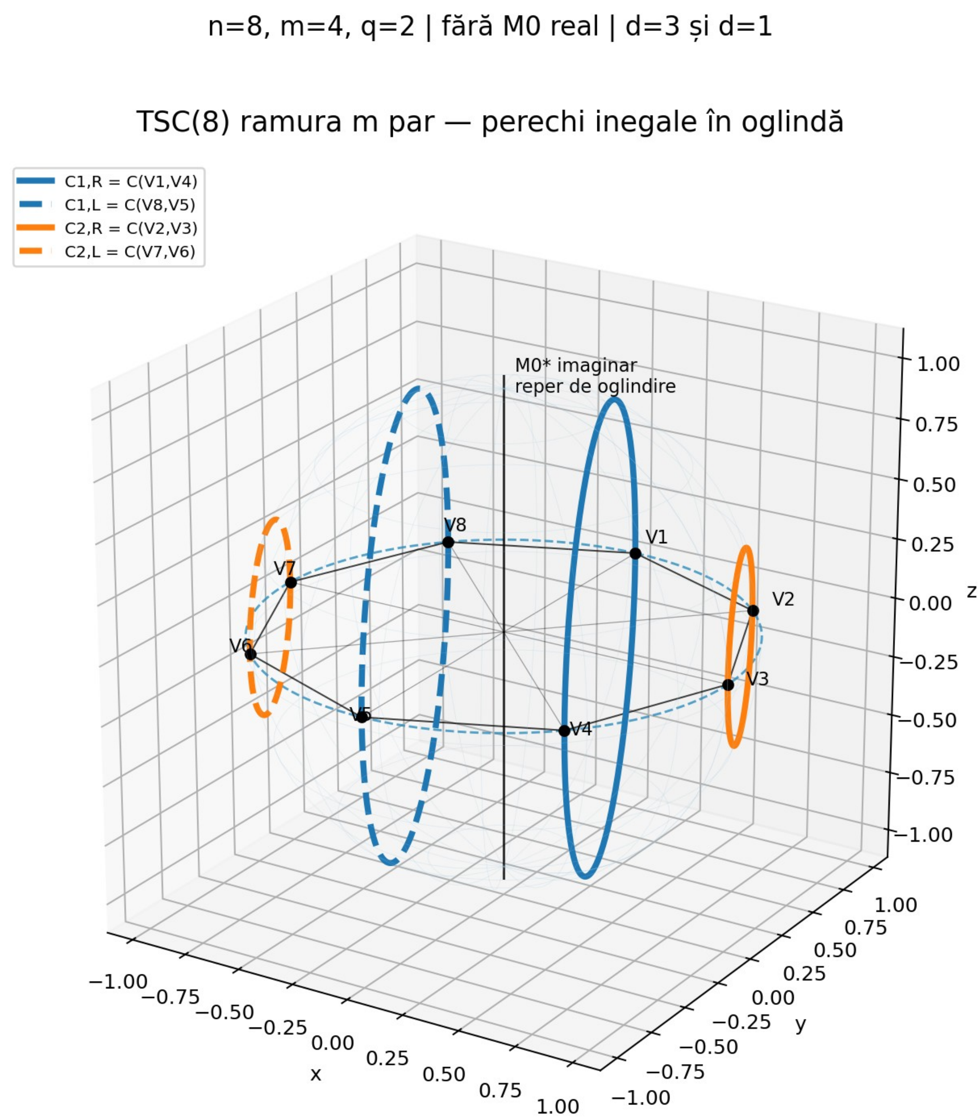

Figure 3. TSC(8) before twist: even-m organization with M0 symmetry marker.*

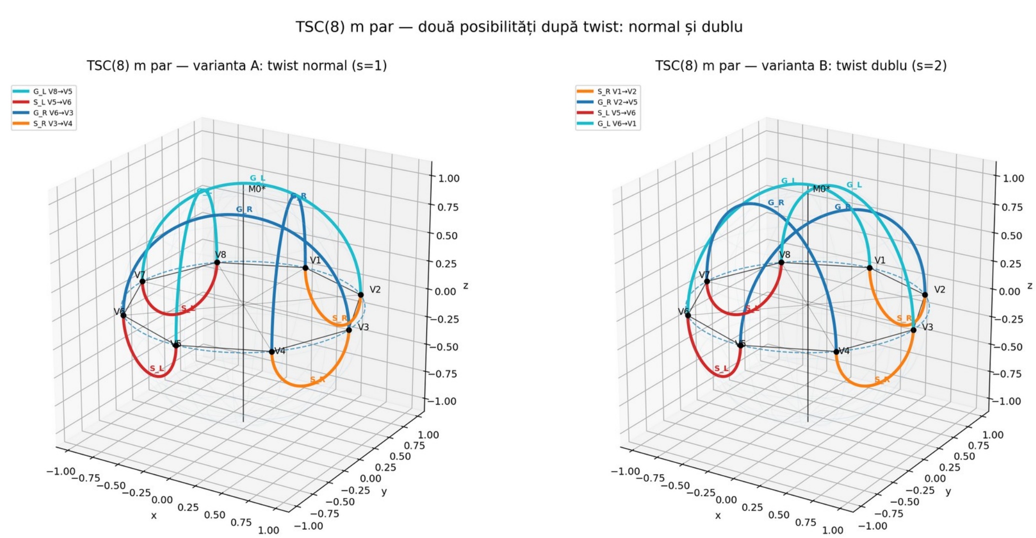

Figure 4. TSC(8) after twist: final loops for s = 1 and s = 2.

10. The odd-m branch

The odd-m branch occurs for n = 2m with m odd. In this branch a real central element M0 appears.

$$m\ odd \Rightarrow M0$$

M0 is a central organizing element of the system, in contrast with M0*, which is only a symmetry marker in the even-m branch. The central role of the work remains the control of final loops by gcd(s,m).

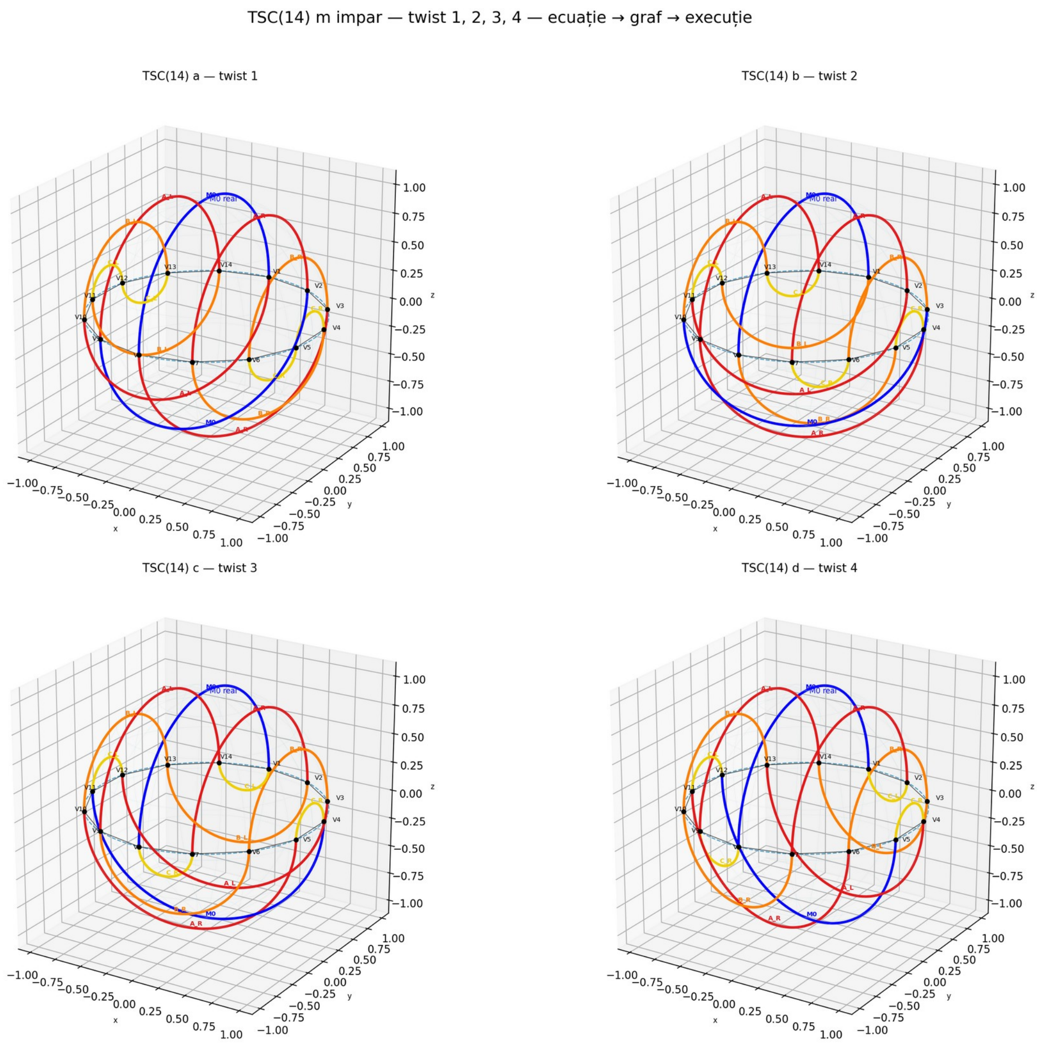

Figure 5. TSC(14) after twist: extended prime case with a single loop for coprime steps.

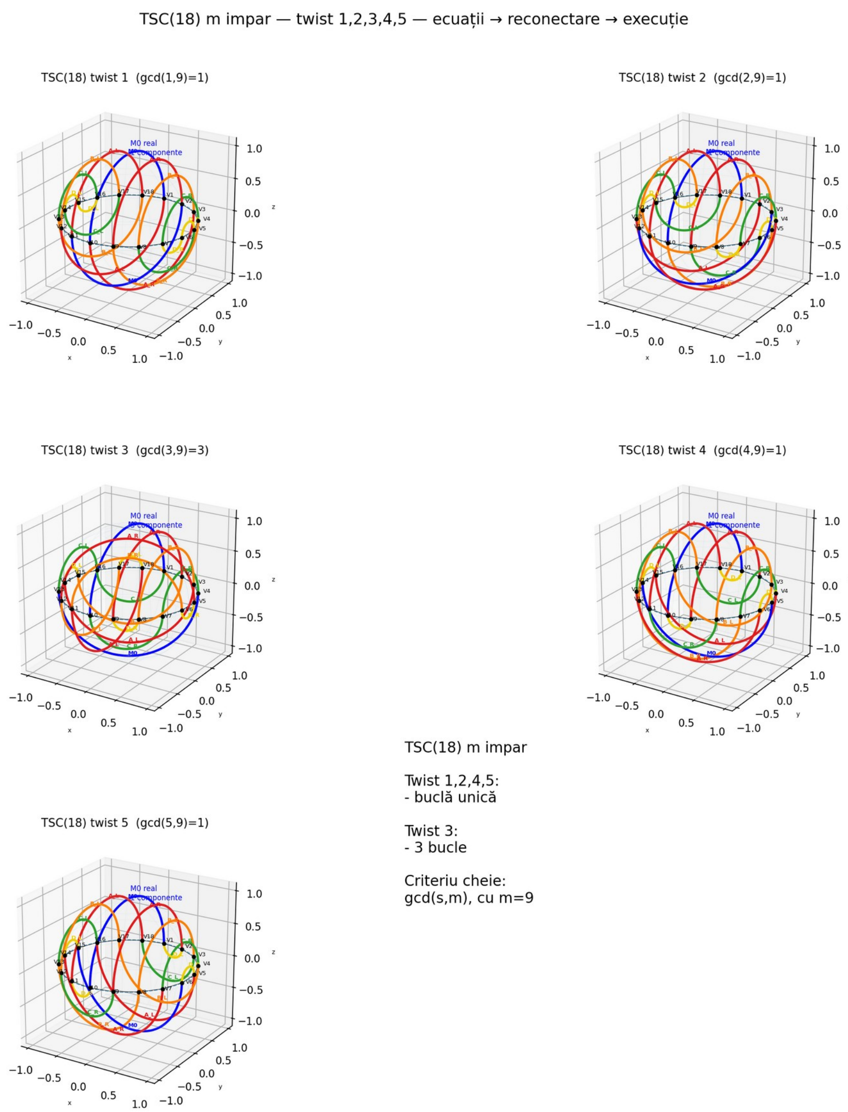

Figure 6. TSC(18) after twist: corrective case, three final loops for s = 3.

11. General extension by order d

The general extension allows investigation of all vertex pairs separated by modular distance d.

$$C\_k^\wedge(d) = S\_R \cap P(V\_k,\ V\_[k+d]\_n), \quad d = 1,2,\ldots,m$$

For 1 < d < m, the circles are non-central and have relatively larger radii than the elementary ones.

$$\delta\_d = R\ |\cos(\pi d/n)|$$

$$\rho\_d = \mathrm{sqrt}(R^\wedge 2 - \delta\_d^\wedge 2) = R\ |\sin(\pi d/n)|$$

The case d = m is the special limit in which the plane passes through the center of the sphere.

$$d = m \Rightarrow \delta\_m = 0, \quad \rho\_m = R$$

Here the circle becomes a great circle/geodesic. This modifies the geometric nature of the construction and must be analyzed separately in later work.

12. Deterministic verification methodology

For each TSC(n) case, verification follows a deterministic algorithm:

1. Generate vertices $V_1,\dots,V_n$.
2. Choose the structural families of order d.
3. Separate each circle into North/South semiarcs.
4. Apply the gluing function g_s at the equator.
5. Trace the components Γ_i.
6. Count the components.
7. Verify $N_{comp} = \gcd(s,m)$.
8. Generate the deterministic figure and CSV tables.

The figures are verifiable results of the rules, not free visual interpretations. Check files remain audit support, while the document contains the equations and conceptual proofs.

13. Limitations

The model is formulated for $n = 2m$ and therefore does not fully treat the odd-n case.

The work does not claim the general absence of self-intersections. The loops Γ_i are components of the abstract space obtained by gluing; their projection on the sphere may produce visual intersections or transverse immersions. This remains a later subject of study.

The case $d = m$, corresponding to great/geodesic circles, is introduced as a special limit but is not fully developed.

The work is not a complete physical theory and does not provide experimental validation. It establishes the geometric and combinatorial framework of the model.

14. Original contributions

- definition of TSC(n) as a system for controlled generation of closed cyclic loops;
- separation of the minimal $d = 1$ level from the structural families of order d;
- definition of twist as an oriented equatorial gluing map;
- proof of the criterion $N_{comp} = \gcd(s,m)$ through orbits in Z_m;
- separation of the even-m / odd-m branches by M0* and M0;
- deterministic verification through figures, components and tables;
- delimitation of the $d > 1$ extension and the limiting case $d = m$.

15. Application directions

The TSC(n) model remains geometric, but it can open directions for the study of topological structures, closed flux paths, cyclic modes and applied architectures. These directions are subsequent developments and do not constitute physical validation of the model.

16. General conclusion

TSC(n) proposes a geometric and combinatorial framework for the controlled generation of closed cyclic loops on the sphere.

$$TSC(n,s) = \Gamma\_1 \cup \Gamma\_2 \cup \ldots \cup \Gamma\_gcd(s,m)$$

$$N\_comp = gcd(s,m)$$

The main theorem shows that the twist step controls the number of components through the orbits of modular translation on Z_m. Thus the central relation is not only verified by cases but deduced from the arithmetic structure of the model.

Elementary small circles d = 1 form the minimal local level, while structural families of order d organize the cases in the even-m and odd-m branches. M0* and M0 are structural classification markers, but the final object remains the system of closed cyclic loops.

Therefore TSC(n) is a formal system through which closed cyclic paths on the sphere can be generated, classified and verified deterministically.

Part II. Applied extension: TSD/MTSD/TTC/TTT

This part is an applied extension of the geometric model. It must be read as a theoretical and design-oriented continuation: TSC(n) provides the geometric grammar, while TSD/MTSD/TTC/TTT explore dynamic, magnetic, tubular and monodromic interpretations.

17. From TSC(n) to TSD(n)

TSC(n) is the general spherical cyclic geometric framework. TSD(n), Twist Spherical Dynamics, is treated as a dynamic specialization of TSC(n), especially for even n.

$$TSD(n) \subset TSC(n)$$

The conceptual chain used in the applied section is:

$$TSC(n) \rightarrow TSD(n) \rightarrow MTSD(n) \rightarrow M3TSD(6) \rightarrow M3TSD(6){+}STSD(6)$$

Here MTSD(n) denotes the magnetic or material-magnetic interpretation, M3TSD(6) denotes three MTSD(6) layers defased at 0°, 120° and 240°, and STSD(6) denotes a central solenoidal or working-space path.

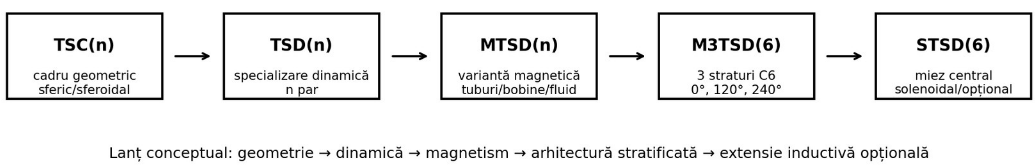

Figure 7. Conceptual chain from TSC(n) to TSD, MTSD and STSD.

18. Tubular TSC(6): corrected geometric constraint

The constructive tubular interpretation must use the chord of the regular n-gon, not the arc length. The general formula is:

$$a\_n = 2R \sin(\pi/n)$$

$$d\_tub,max = a\_n$$

$$r\_tub,max = a\_n/2 = R \sin(\pi/n)$$

For TSC(6), since sin(π/6) = 1/2:

$$a\_6 = R, \quad d\_tub,max = R, \quad r\_tub,max = R/2$$

The older relation r_tub = (π/6)R is an arc-length relation and must not be used as the maximum constructive tube radius.

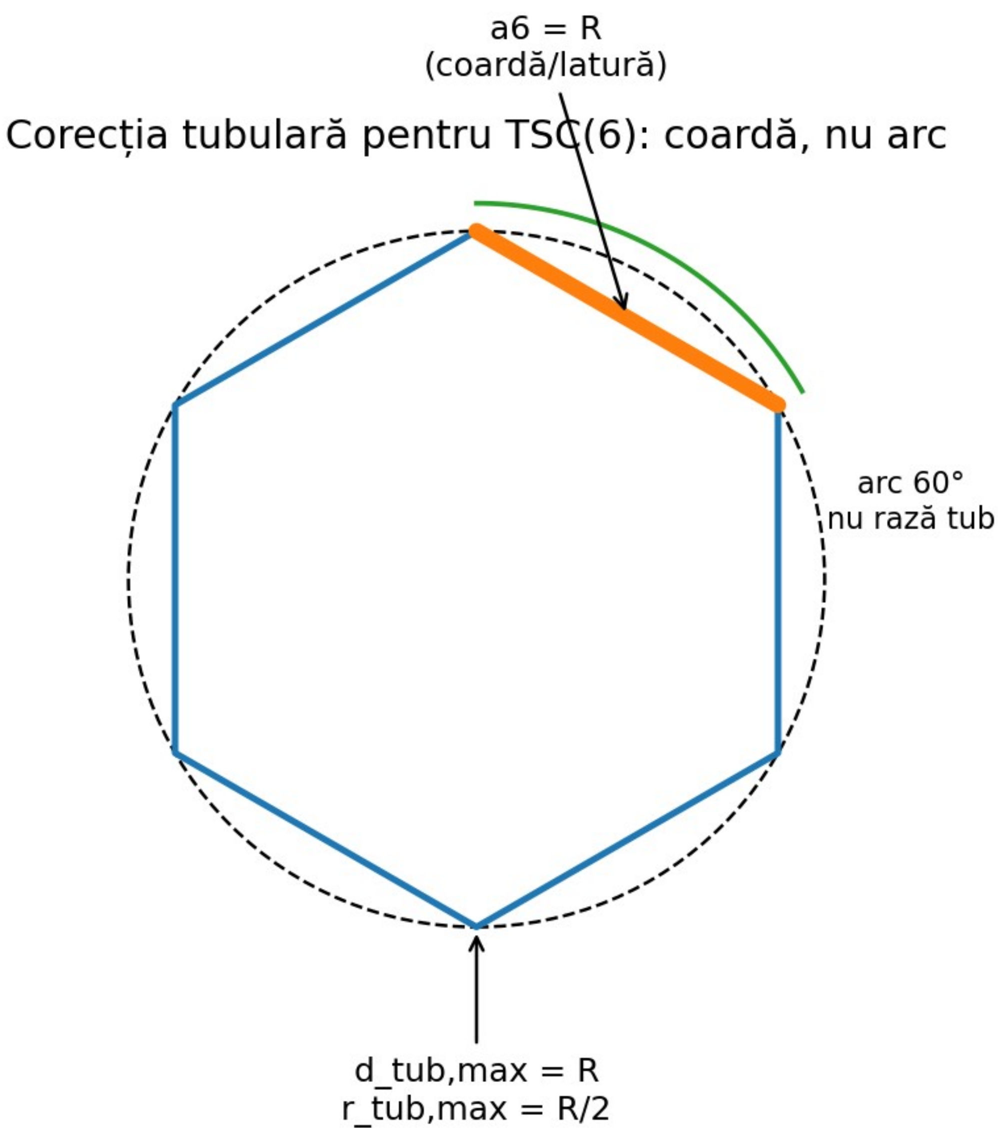

Figure 8. Corrected tubular rule for TSC(6): chord, not arc.

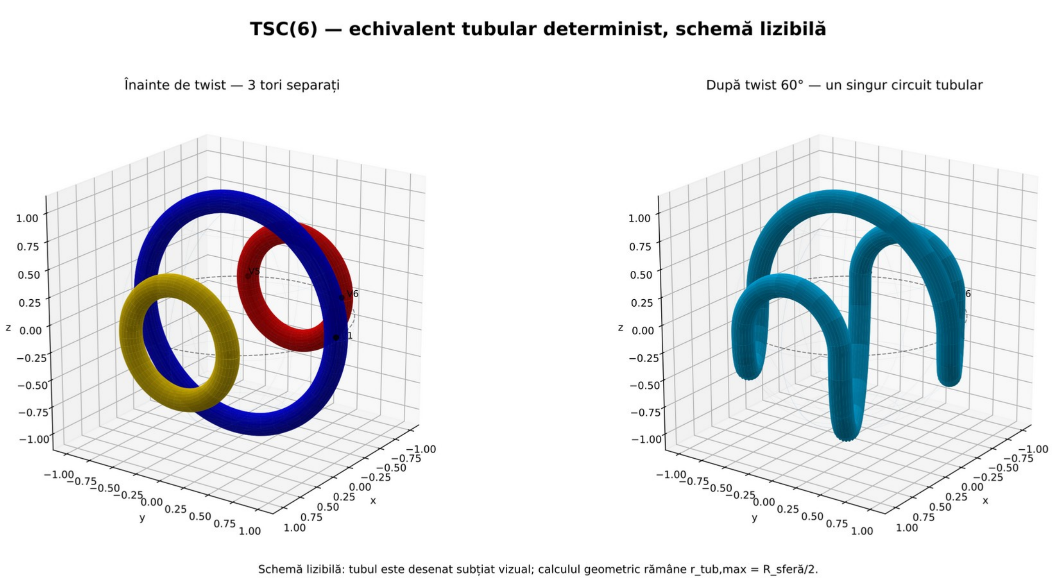

Figure 9. Deterministic readable tubular equivalent for TSC(6), visually thinned for clarity.

19. Local vector model of the magnetic direction

If the TSC/TSD path is interpreted as a tube containing magnetic fluid or as a tightly wound local solenoidal guide, the internal directed field may be approximated by a filamentary model. Let Γ(u) be the tubular path and t(u) its unit tangent vector:

$$t(u) = \Gamma'(u) / \|\Gamma'(u)\|$$

Then a local guided-field approximation may be written as:

$$B(\Gamma(u), t) \approx B\_0(t) \cdot t(u)$$

This expression describes the internal direction of guided magnetization or the axis of a solenoidal/tubular field. It is not a complete exterior Biot-Savart or Maxwell-field solution. A full physical model must separately compute the dispersion field, boundary conditions and the constraint ∇·B = 0.

20. TTC/TTT(6): hexagonal section and monodromy

TTC/TTT(6) is a toroidal or tubular structure with a hexagonal section and internal monodromy. The twist acts on the frame of the hexagonal section along the path, not on a generic circular section.

For the classical TTC6 case:

$$60° \text{ per full turn}$$

$$30° \text{ per hemisphere}$$

$$10° \text{ per } 60° \text{ sector}$$

A 120° twist corresponds to step +2 mod 6, giving the cycles (A → C → E → A) and (B → D → F → B). A 180° twist corresponds to step +3 mod 6, giving paired exchanges (A ↔️ D), (B ↔️ E), (C ↔️ F).

21. C1 + C6[C6]: addressing and permutation map

The C1 + C6[C6] scheme is a combinatorial map for naming, tubes, channels, phases, permutations and twists. It does not fix the final physical scale of the tubes.

$$C1 = \text{global center}$$

$$a,b,c,d,e,f = \text{external } C6 \text{ positions}$$

$$A,B,C,D,E,F = \text{internal } C6 \text{ positions}$$

$$Element = (i,j), \quad i \in \text{external } C6, \quad j \in \text{internal } C6$$

$$T\_s(i,j) = (i+1,\ j+s) \bmod 6$$

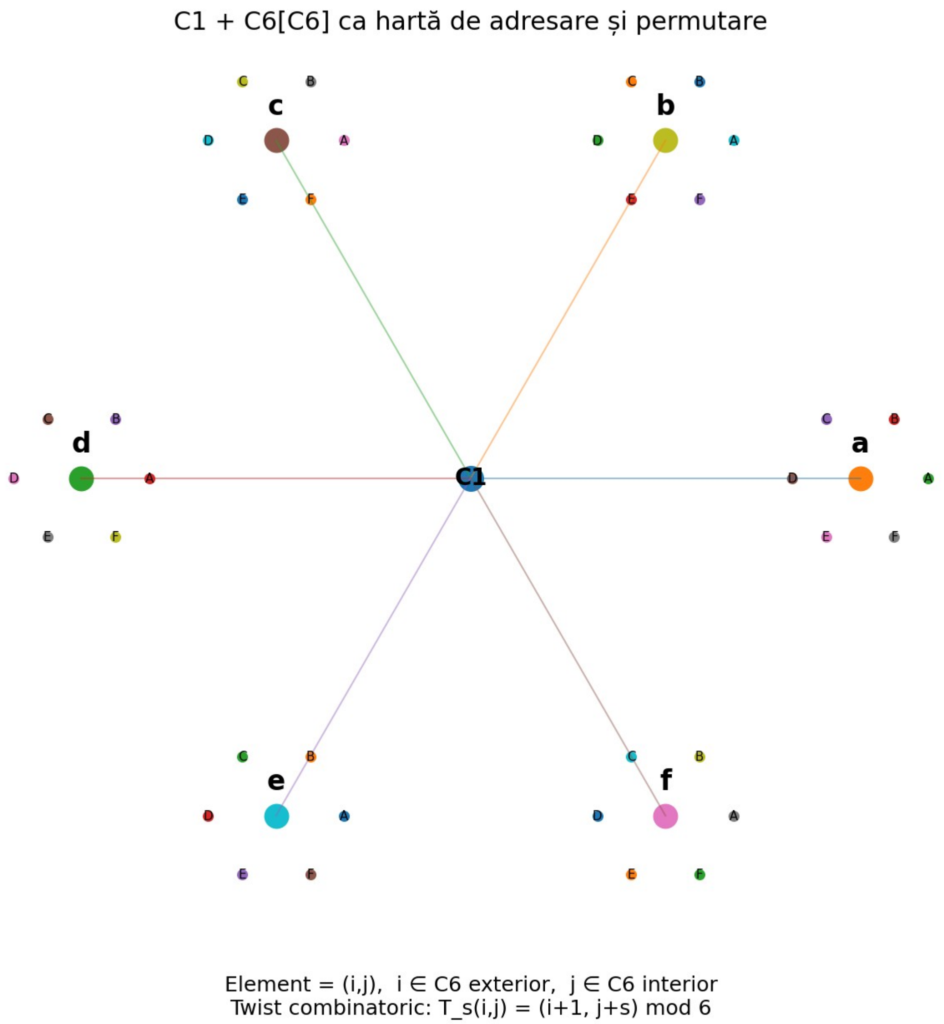

Figure 10. C1 + C6[C6] as addressing and permutation map.

22. M3TSD(6)+STSD(6): 3+1 layered architecture

The layered 3+1 architecture uses the same validated TSC(6) loop on multiple scaled levels. It is a field-organization or working-space extension, not a necessary starting point of the model.

$$TSC6{+}1 = \Gamma\_3 \cup \Gamma\_2 \cup \Gamma\_1 \cup \Gamma\_0$$

$$\Gamma\_i(t) = S\_\{\lambda\_i\}\ R\_z(\theta\_i)\ \Gamma\_6(t)$$

$$\lambda = 1,\ 0.75,\ 0.75\^{}2,\ 0.75\^{}3$$

$$\theta = 0°,\ 120°,\ 240°,\ 0°$$

The external layers can be interpreted as defased TSC/TSD levels, while the central level may be used as a working-space path or as an optional inductive path, depending on the application.

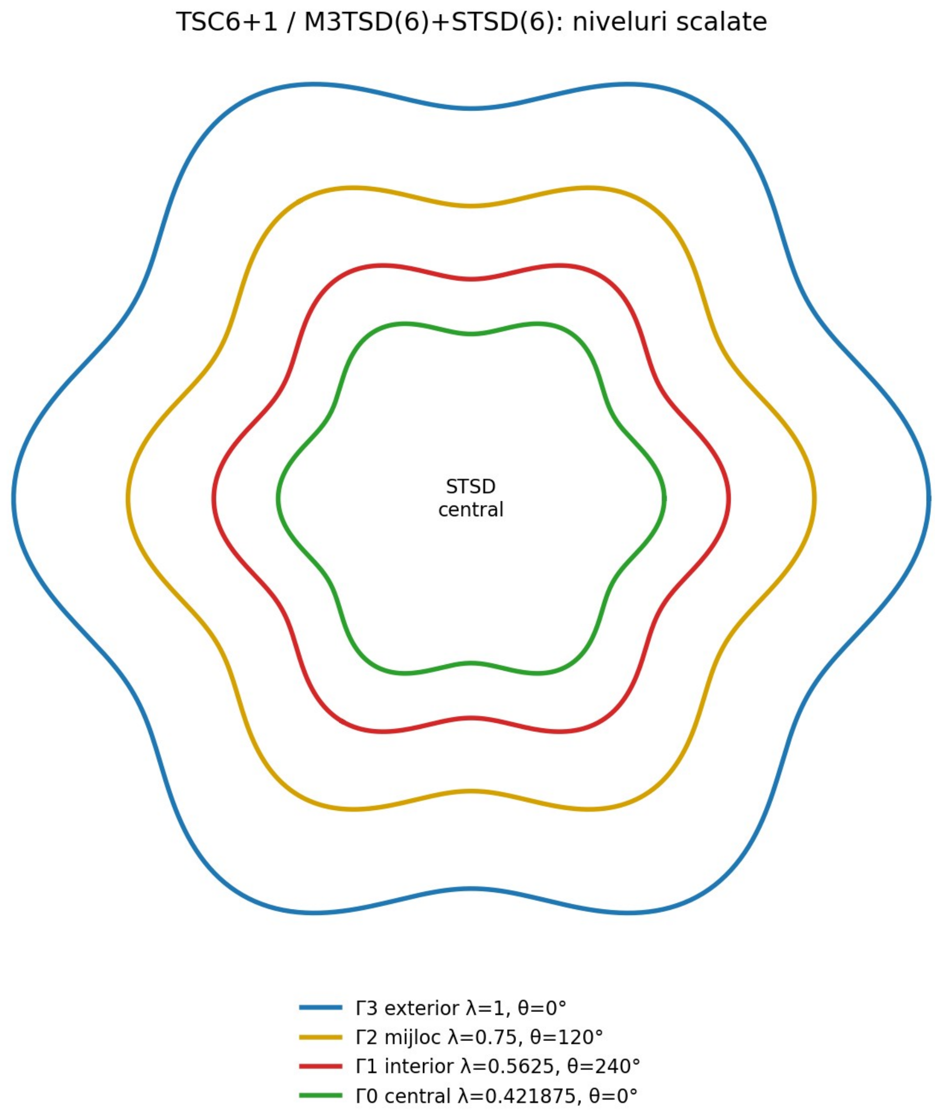

Figure 11. TSC6+1 / M3TSD(6)+STSD(6): same validated loop scaled in 3+1 levels.

23. Flux and optional induction

If the central path is used inductively, the central flux through a surface Σ_0 may be written as:

$$\Phi\_0(t) = \int\_\{\Sigma\_0\} B\_tot(r,t) \cdot dS$$

In a normalized mutual-inductance representation:

$$\Phi\_0(t) = M\_03\ I\_3(t) + M\_02\ I\_2(t) + M\_01\ I\_1(t)$$

The induced voltage is then governed by Faraday-Lenz:

$$V\_0(t) = -N\ d\Phi\_0(t)/dt$$

This is an optional branch of the model. The primary purpose of the applied architecture remains controlled magnetic-field geometry and a central working space, not a claim of energy generation without input.

If a normalized three-phase example produces a non-zero resultant, this does not imply free energy. It indicates that the discrete segment positions and the radial scaling λ break exact cancellation in the central workspace.

24. Validation protocol

9. Validate the TSC(6) loop and its closure.
10. Validate tube radius, diameter and loop length.
11. Validate constructability: fluid path, segmented path, or special HexaMagn branch.
12. Validate coil phases and orientations.
13. Compute B(r,t) and the relevant gradients.
14. Compute flux only if an inductive central path exists.
15. Run numerical simulation.
16. Only after that, build and measure an experimental prototype.

25. Final public statement

TSC/TSD/TTC/TTT should not be reduced to a single piece, device or physical claim. Together they form a geometric and topological grammar for paths, tubes, fields, permutations and magnetic working spaces.

The main theoretical contribution remains the formal TSC(n) mechanism for generating, classifying and verifying closed cyclic loops on a sphere. The applied section extends this grammar toward controlled-field architectures and constructive design hypotheses.

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