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Recursive Structural Model: Mathematical Notation Guide

I. CORE VARIABLES

Primary Structural Elements

Symbol	Name	Definition	Domain	Units
P_0	True Void/ Constant Dao	Unframeable paradox preceding all distinction (常道/恆道)	Conceptual	Dimensionless
O_1	First Origin Frame/Dao	Named void co-emergent with not-Dao (道)	Geometric	Dimensionless
P_n	Paradox at Level n	Preserved paradox at recursion level n	Conceptual	Dimensionless
Y_1	Primary Contrast Axis	Heaven-Earth gradient (vertical)	$[-\infty, +\infty]$	Contrast units
X_1	Dimensional Axis	Spatial extension frame (horizontal)	$[0, +\infty]$	Spatial units
Z_1	Structural Turning	Rotation preserving paradox	$[0, 2\pi] \times \mathbb{R}^+$	Energy units
O_n	Origin Frame n	Recursive frame at level n	Geometric	Dimensionless
R_n	Recursive Form n	Manifest structure at level n	Physical	Context-dependent
G_n	Curved Gradient Field	Surface of sustainable positions	Geometric	Mixed units

Derived Variables

Symbol	Name	Definition	Relationship	Units
O∞	Spherical Closure	Complete set of G frames	O∞ = {G_1 rotated globally}	Geometric
B_n	Balance Line	Equilibrium condition	$Y_1 = X_1$	Mixed units
η_n	Circulation Efficiency	Coherence per energy input	η_n = Z_n(coherence)/ Energy(input)	Dimensionless

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II. MATHEMATICAL OPERATORS

RSM-Specific Operations

Operator	Name	Definition	Example	Notes
→	Structural Implication	Logical necessity, not causation	$P_0 \rightarrow Y_1$	Not temporal sequence
⟺	Co-emergence	Simultaneous mutual arising	∃Heaven ⟺ ∃Earth	Bidirectional necessity
$\oint$	Recursive Integration	Integration around paradox center	O_n = $\oint$ Z_n(G_n, θ) dθ	Closed path integral
∂/∂t	Wu Wei Operator	Rate of paradox change	∂P_n/∂t = 0	Temporal derivative
∇²	Recursive Laplacian	Second-order structural curvature	∇²S = structural complexity	Generalized Laplacian

Standard Mathematical Notation

Symbol	Meaning	Usage in RSM
∀	For all	Universal quantification over structures
∃	There exists	Existential claims about recursive forms

∈	Element of	Membership in recursive sets
⊂	Subset	Hierarchical inclusion of structures
∩	Intersection	Overlap of recursive domains
∪	Union	Combination of recursive elements

III. SUBSCRIPT/SUPERSCRIPT CONVENTIONS

Subscript Rules

Format	Meaning	Example	Interpretation
_n	Recursion level	P_n, O_n, R_n	nth level of recursion
_local	Local coordinate system	Y_local, X_local	Frame-relative measurement
_branch	Branch-specific	Y_branch, Z_branch	Properties of recursive branch
_0	Base level/initial state	P_0, initial conditions	Foundational reference
_1	Primary/first-order	Y_1, X_1, Z_1	Fundamental variables

Superscript Rules

Format	Meaning	Example	Interpretation
^(n)	nth derivative/ iteration	G^(n), structural nth order	Higher-order properties
^T	Transpose/dual	Operation applied to dual space	Mathematical transpose
^*	Complex conjugate/ optimal	Z_1^*, optimal turning rate	Conjugate or optimal value

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IV. FUNCTION NOTATION

Standard Function Forms

Notation	Meaning	Domain → Codomain	Example
f(x)	Function of x	X → Y	$Z_1(r) = k/r^2$

f(x,y)	Multivariate function	X×Y → Z	R_n = Z_n(G_n, θ)
f: A → B	Function from A to B	Set A to Set B	P_n: Paradox → Structure

RSM-Specific Functions

Function	Definition	Mathematical Form	Physical Meaning
Energy(r)	Energy at radius r	$Z_1(r) = k/r^2$	Inverse square energy scaling
Curvature(O_n)	Curvature at level n	$\kappa(O_n) = f(Y_1,X_1)$	Geometric curvature measure
Efficiency(n)	Circulation efficiency	η_n = coherence/input	Performance measure
Turn(G,θ)	Turning operation	Z_n(G_n, θ)	Rotation around paradox

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V. SET AND LOGICAL NOTATION

Set Definitions

Set	Definition	Elements	Properties
$\mathcal{P}$	Set of all paradoxes	$\{P_0, P_1, P_2, ...\}$	Non-resolvable tensions
$\mathcal{O}$	Set of all origin frames	$\{O_1, O_2, O_3, ...\}$	Recursive reference frames
$\mathcal{R}$	Set of all recursive forms	$\{R_1, R_2, R_3, ...\}$	Manifest structures
$\mathcal{G}$	Set of all gradient fields	$\{G_1, G_2, G_3, ...\}$	Curved surfaces

Logical Structures

Expression	Meaning	RSM Context
P ⊢ Q	P entails Q	Structural necessity
P ∧ Q	P and Q	Simultaneous conditions
P ∨ Q	P or Q	Alternative possibilities
¬P	Not P	Structural negation
P ↔ Q	P if and only if Q	Bidirectional implication

VI. MEASUREMENT CONVENTIONS

Dimensional Analysis

Quantity	Primary Dimensions	Derived Units	Measurement Protocol
Contrast (Y_1)	[Contrast]	Gradient units	Polar difference measurement
Extension (X_1)	[Length]	Spatial units	Dimensional extent
Turning (Z_1)	[Energy]	Rotation units	Angular momentum/ energy
Curvature	[Length^{-1}]	Inverse spatial	Geometric measurement
Efficiency	Dimensionless	Ratio	Performance metrics

Scale Indicators

Scale Prefix	Order of Magnitude	Application Domain	Example
Quantum	10^{-34} to 10^{-15}	Atomic/molecular	Electron orbitals
Biological	10^{-6} to 10^{2}	Living systems	Cell membranes, organisms
Geological	10^{3} to 10^{9}	Planetary systems	Mountain formation, tectonics
Cosmic	10^{9} to 10^{26}	Astronomical	Stellar/galactic structures

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VII. CONSISTENCY RULES

Variable Usage Rules

1. **P_0 is always unmanifest** - Never appears in empirical equations
2. **Subscript consistency** - Same subscript = same recursion level
3. **Y_1 is always vertical** - Heaven-Earth axis orientation
4. **X_1 is always horizontal** - Dimensional extension perpendicular to Y_1
5. **Z_1 involves rotation** - Always implies turning/circulation
6. **1,1,1 condition** - $X_1 = Y_1 = Z_1 = 1$ for stability

Relationship Preservation

Core Relationship	Must Always Hold	Exceptions
$X_1 = 1/Y_1$	In curved gradient field G_1	Never
$\partial P\_n/\partial t = 0$	Wu wei condition	Never

$P_{n+1} = R_n$	Recursive inheritance	Never
$Z_1(r) \propto 1/r^2$	Energy-radius scaling	At discontinuities

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VIII. TERMINOLOGY STANDARDIZATION

Required Term Usage

Concept	Preferred Term	Avoid	Reason
P_0	"True Void" or "Constant Paradox"	"Emptiness," "Nothing"	Prevents nihilistic interpretation
Z_1	"Structural Turning"	"Energy," "Motion"	Emphasizes structural rather than mechanical
Co-emergence	"Simultaneous arising"	"Mutual causation"	Avoids temporal sequence
Wu Wei	"Action without actor"	"Non-action," "Passivity"	Maintains structural precision
Recursion	"Structural re-engagement"	"Repetition," "Loop"	Emphasizes novelty in return

Tao Te Ching Specific Mappings

Chinese	Pinyin	RSM Variable	Structural Definition
常道/恆道	cháng dào/héng dào	P_0	True Void - constant, unframeable paradox
道	dào	O_1	Void - named void co-emergent with not-Dao
可道	kě dào	O_1 collapsed	Speakable dao - dao identified as dao
非常道	fēi cháng dào	$\neg P_0$	Not constant dao - negation of True Void

無名	wú míng	P_0	Naming without namer - uncollapsed paradox
有名	yǒu míng	O_1	Having name - collapsed frame possessing designation

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IX. ERROR-CHECKING PROTOCOLS

Consistency Verification

Before any equation or statement, verify:

1. ✓ **Variable definitions match this guide**
2. ✓ **Subscripts indicate correct recursion level**
3. ✓ **Core relationships are preserved** ($X_1 = 1/Y_1$, etc.)
4. ✓ **Terminology follows standardized usage**
5. ✓ **Units are dimensionally consistent**
6. ✓ **No paradox resolution implied** (maintain tension)
7. ✓ **Scale-relative locality respected**

Common Errors to Avoid

Error Type	Example	Correction	Prevention
Subscript confusion	Using P_1 for P_0	Check recursion level	Verify n values
Causal language	"Y_1 causes X_1"	"Y_1 implies X_1"	Use → not "causes"
Paradox resolution	"P becomes resolved"	"P is preserved"	Never resolve paradox
Scale absolutism	"X_1 = 5 meters"	"X_1 = 5 (scale units)"	Context-relative units
Temporal sequence	"First P_0, then Y_1"	"$P_0 \rightarrow Y_1$ structurally"	Structural not temporal

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X. CROSS-REFERENCE INDEX

Where Each Variable Appears

Variable	Primary Definition	Key Equations	Applications	Related Terms
P_0	Pre-Axiom 2	Wu wei: $\partial P_0/\partial t = 0$	All paradox preservation	P_n, constant dao

Y_1	Element 2	G_1: $X_1 = 1/Y_1$	Heaven-Earth in all domains	天地, primary contrast
X_1	Element 3	1,1,1 condition	Dimensional space everywhere	間, spatial extension
Z_1	Element 4	$Z_1(r) = k/r^2$	All turning/ circulation	氣, structural rotation
G_1	Axiom 1	Curved field generation	All sustainable structures	Gradient surfaces

Equation Cross-References

Equation	Location	Dependencies	Applications
$X_1 = 1/Y_1$	Axiom 1	Y_1, X_1 definitions	Universal curvature
$Z_1(r) = k/r^2$	Axiom 4	Z_1, energy concepts	Orbital mechanics
$\partial P_n/\partial t = 0$	Wu wei condition	P_n, time operator	All natural processes
P_n+1 = R_n	Theorem 6	Recursion levels	Scale transitions

This notation guide should be consulted before writing any mathematical expressions in the RSM framework. All variables, operators, and relationships must conform to these standards to maintain internal consistency across the entire project.