On Contribution of Jainology to Indian Karma Structures

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1. Introduction to the Contents

From the *Saṭkhaṇḍāgama* (c. 2nd ceutury A. D) and the *Kasāyapāhuḍa sutta* (c. 1st century A. D.) Prakrit texts, Nemicandra (c. 11th century A. D.) compiled in abstract form the texts known as *Gommaṭasāra* and *Labdhisāra* respectively. The author has contributed three research papers regarding the contents of these volumes.[1] The commentaries on the works of Nemicandra were prepared respectively by Keśavarṇ[2] (c. 14th century A. D.) Nemicandra[3] (c. 16th century A. D.). Mādhavacandra Traividya[4] (c. 1203 A. D.) as well as Ṭoḍaramala[5] (c. 1761 A. D.), Abhayacandra Saidhāntī[6] (c. 13th century) is also known to have compiled a commentary.

The approach to the topics is set theoretic[7] and methodology

1. (a) *Saṭkhaṇḍāgama* with *Dhavalā* commentary, vols. 1-16, Amaraoti and Vidisha, of H. L. Jain, 1939-1959.
   (b) *Mahābandha*, volumes 1-7, Bhāratiya Jñānapītha, Kashi, 1947-1958.
   (c) *Kasāya Pāhuḍa, Jai Dhavalā* commentary, Jaina Sangha, Mathura (series). Cf also cūrṇi sūtras of Yativṛṣabha, Calcutta, 1955.
   (d) *Gommaṭasāra* and *Labdhisāra* of Nemicandra, 'siddhānta cakravartī' alongwith *Manda bodha Prabodhīnī*, *Jīvatattva Pradīpikā* and *Samyak-Jnana Candrikā* commentaries, edited by G. L. Jain & S. L. Jain, Calcutta, C. 1919, (including *Artha Samdṛṣṭi* chapters contributed by Ṭoḍaramala).
2. Cf. 2 (d)
3. Cf ibid.
4. Cf ibid.
5. ibid.
6. Cf. ibid.
7. Jain, L. C., Set Theory in Jaina School of Mathematics I. J. H. S. vol. 8 nos. 182, 19'3, pp. 1.27

symbolic.[8] In the earlier portions of the texts, post universal *Lokottara* measures *pramāṇa* are set up in relation to the bios detailed with respect to individual control station *guṇa sthānas*.[9] The next part of *Gommaṭasāra* (*Karma-kāṇḍa*) details about the theory of karmic bonds, rise and state in structural forms.[10] The material in *Labdhisāra* deals with the dynamics of the karma system in an elaborate mathematical approach.[11] The equation of motion of the complex system dealing with the nisusus (*niṣekas*) expressible as tatrads of (i) Configurations (*prakṛtīs*) (ii) *mass numbers* (*pradeśas*), (iii) *energy-levels* (*anubhāga aṁśas*) and (iv) *life-time* intervals (*sthiti*) pose the most trying problems of bio-science phenomena.[12]

2. Structures in Karmic Masses

One may recall the treatment of an instant-effective-bond (*Samaya-prabaddha*) in a previous research paper.[13] In order to understand the structure of a nisus, with life-time zero to prescribed instants, one has to give a general expression to the instant-effective-bond in terms of the configuration, the syeer-vector-group and the geometric regression. Let $B^{C^{\alpha}}_{S_{\beta}G_{P}}$ denote the set of karma particles of $C_{\alpha th}$ configuration ($\alpha = 1, 2, \ldots$), of $S_{\beta th}$ super-vector-group (β 1,2, ...) of karma particles

8. (a) Jain, L. C., On the Jaina School of Mathematics, C. L. Smriti Granth, Calcutta, 1967, 265–292 (Eng. Sec.)
   (b) Jain L. C., Jaina, Mathematical Contribution of Ṭoḍaramala of Jaipur, The Jaina Antiquary, Vol. 30, no 1, 1977, pp 10-22.
   (c) Jain, L. C., of Perspectives of System—Theoretic Technique in Jaina School of Mathematics, between 1400-1800 A. D., Jain Journal, Calcutta, Vol. 13, no 2, Oct. 1978, pp. 49–66.
9. (a) Jain, L. C., Mathematical Foundations of Karma : Quantum System Theory, I, Anusandhan Patrika, Jaina Viśva Bharati, Ladnun, 1073, pp 1–19.
   (b) Jain, L. C., System Theory in Jaina School of Mathematics, I. J. H. S., vol. 14 no. 1, 1979, pp 31–65
10. Cf. ibid.
11. Cf. 8 (c) and 9, op cit.
12. Cf. ibid.
13. Cf. 9 (a), op. cit., and Cf also 7, op. cit.

contained in $G\gamma$th geometric regression ($\gamma=1,2,\ldots$) of the instant-effective bond (*Samayaprabaddha*) which varies in its contents of karma particles according to variations in *Yoga* or volution and *kaṣāya* or affection. Thus not only B varies, but its subparts in C_α S_β and $G\gamma$ also have varied values, every instant. Let the vector groups contained in (*vargaṇā*) be denoted by W_V^I where I denotes indivisible-corresponding-sections (*avibhāgī* praticchedas) of affine or antiaffine energy-levels (*anubhāga aṁśa*) of impartation controls in each of subscupt V of vectors (*vargas*) contained in a particular vector group. Here I will represent the least value of I, $*S_\alpha$ will denote the total number of super-vector-groups (*spardhakas*) contained in a geometric regression (*guṇahāni*) corresponding to $C_{\alpha th}$ configuration of karma, and d will denote the common difference through which the vectors go on decreasing at every next step, in the next nisus having an instant less of life time for a particular configuration.[14]

Thus,

$$B^{C_\alpha}_{S_\beta G_\gamma} \equiv \frac{W_V^{\beta i^* S_\alpha^{\gamma-1}}}{2^{\gamma-1}} - \frac{(\beta-1)i\, S_\alpha^{\gamma-1}}{2^{\gamma-1}} + \frac{W_V^{\beta i^* S_\alpha^{\gamma-1}+1}}{2^{\gamma-1}} - \left[\frac{(B-1)i^* S_\alpha^{\gamma-1}}{2^{\gamma-1}}+1\right]\frac{d}{2^{\gamma-1}} + \cdots + \frac{W_V^{2\beta i^* S_\alpha^{\gamma-1}-1}}{2^{\gamma-1}}\left(\frac{\beta i^* S_\alpha^{\gamma-1}}{2\gamma-1}-1\right)\frac{d}{2\gamma-1} \quad \ldots(2.1)$$

This gives a general expression which may be further detailed as follows :

Thus the bond fluent of first super vector group of the first geometric regression of first configuration (so labelled) is

$$B^1_{11} \equiv W_v^s + W_{v-d}^{s+1} + W_{v-2d}^{s+2} + W_{v-3d}^{s+3} + \cdots + W_{v-(s-11d)}^{2s-1} \quad \ldots(2.2)$$

The bond fluent of second super-vector-group of the first geometric of first configuration is :

$$B^1_{21} \equiv W_{v-sd}^{2s} + W_{v-(s+1)d}^{2s+1} + W_{v-(s+2)d}^{2s+2} + \cdots + W_{v-(2s-1)d}^{3s-1} \quad \ldots(2.3)$$

14. Cf. 9 (a).

The bond fluent of third super-vector-vector group of the first geometric regression of first configuration is :

$$B^1_{31} \equiv W^{3s}_{v-2sd} + W^{3s+1}_{v-(2s+1)d} + \quad + W^{4s-1}_{v-(3s-1)d} \qquad \ldots(2.4)$$

etc., till v/2 - 1 number of particles are not obtained.

Thus the bond fluent of the nth super-vector-group of first geometric regression of the first configuration is

$$B^1_{n1} \equiv W^{ns}_{v-(n-1)sd} + W^{ns+1}_{v-\{(n-1)s+1\}d} + \cdots + W^{(n+1)s-1}_{v-\{(ns-1)\}d} \qquad \ldots(2.5)$$

The bond fluent of first super-vector group of *second* geometric regression of first configuration is

$$B^1_{12} \equiv W^{(n+1)s}_{\frac{v}{2}} + W^{(n+1)s+1}_{\frac{v}{2}-\frac{d}{2}} + \ldots + W^{(n+1)s+s-1}_{\frac{v}{2}-(s-1)\frac{d}{2}} \qquad \ldots(2.6)$$

Similarly

$$B^1_{22} \equiv W^{(n+2)s}_{\frac{v}{2}-\frac{s.d}{2}} + W^{(n+2)s+1}_{\frac{v}{2}-(s+1)\frac{d}{2}} + \ldots + W^{(n+2)s+s-1}_{\frac{v}{2}-(2s-1)\frac{d}{2}} \qquad \ldots(2.7)$$

And the bond fluent of nth super-vector group of the second geometic regression of first configuration is

$$B^1_{n2} \equiv W^{2ns}_{\frac{v}{2}-(n-1)\,s.\frac{d}{2}} + W^{2ns+1}_{\frac{v}{2}\;[(n-1)\,(s+1)]\,\frac{d}{2}} + \ldots + W^{2ns+s-1}_{\frac{v}{2}-(ns-1)\,\frac{d}{2}} \qquad \ldots(2.8)$$

Similarly the bond fluent of first, second etc. super-vector groups of rth geometric regression of first configuration are given as follows :

$$B^1_{1\gamma} \equiv W^{\{(\gamma-1)n+1\}s}_{\frac{v}{2^{\gamma-1}}} + W^{\{(\gamma-1)n+1\}s+1}_{\frac{v}{2^{\gamma-1}}-\frac{d}{2^{\gamma-1}}} + \ldots + W^{\{(\gamma-1)n+1\}s+s-1}_{\frac{v}{2^{\gamma-1}}-(s-1)\frac{d}{2^{\gamma-1}}} \qquad \ldots(2.9)$$

$$B^{1}_{2\gamma} \equiv W^{\{(\gamma-1)n+2\}s}_{\frac{v}{2^{\gamma-1}} - s\frac{d}{2^{\gamma-1}}} + W^{\{(\gamma-1)(n+2)\}s+1}_{\frac{v}{2^{\gamma-1}} - (s+1)\frac{d}{2^{\gamma-1}}} + \ldots$$

$$+ \ldots + W^{\{\gamma-1)n+2\}s+(s-1)}_{\frac{v}{2^{\gamma-1}} - (2s-1)\frac{d}{2^{\gamma-1}}} \qquad \ldots(2.10)$$

$$B^{1}_{n\gamma} = W^{\gamma ns}_{\frac{v}{2^{r-1}} - (n-1)s\frac{d}{2^{r-1}}} + W^{\gamma ns+1}_{\frac{v}{2^{\gamma-1}} - \{(n-1)s+1\}\frac{d}{2^{\gamma-1}}} + \ldots$$

$$+ \ldots + W^{\gamma ns+s-1}_{\frac{v}{2^{\gamma-1}} - (ns-1)\frac{d}{2^{\gamma\ 1}}} \qquad \ldots(2.11)$$

Similarly, the bond fluent, for second, third & upto one hundred forty eighth configuration may be depicted through W^{I}_{v} the B's. There will be difference in the values of r, d, v, s, and they be shown as variables in manipulation of different configuration, but the structures for all configurations will be grouped as above matrices' summation. Thus in $B^{C\alpha}_{S_\beta}\ G_\gamma$ the second super-vector group of the third geometric regression of Cα th configuration of karma will be given as under :

$$B^{C\alpha}_{S_\beta G_\gamma} \equiv W^{2i\ *S^{2}_{\alpha}}_{\frac{v}{2^2} - \frac{i}{2^2}\frac{d}{2^2}} + W^{2i*S\alpha^{2}+1}_{\frac{v}{2^2} - \left(\frac{i}{2^2}+1\right)\frac{d}{2^2}} + \ldots$$

$$+ W^{3i*\ S^{2}_{\alpha}-1}_{\frac{v}{2^2} - \left(\frac{2.i*S\alpha^2}{2^2} - 1\right)\frac{d}{2^2}} \qquad \ldots(2.12)$$

Where Sα will denote the total number of super-vector groups contained in a geometric regression Gγ corresponding to Cα th configuration of karma as shown above.

The total number of W's above will denote the numbers of instants in the set (set) of life-time stay of the karma bond corresponding to a particular configuration and this will be denoted by cardinal of the set β family, for a particular geometric regression.

Thus the number of nisusus, represented by $B^{C_\alpha}_{S_\beta} G_\gamma$ will be $\beta.\gamma$ for a particular configuration and for all configurations it will be $\beta.\gamma - \alpha$, constituting a three dimensional matrix.

For an input of instant effective-bond B or due to charge of Yoga[16], B's say x B, shall also have the same total number of W's, i. e., $\beta.\gamma.\alpha$ although the other quantities will have an over all charge proportional to x. Let the product $\beta \gamma \alpha$ be denoted by y. Then the charge in the y the nisus W_y till it decays shall be

$$\alpha_y \frac{d^y W_y}{d l^y} \quad \text{or} \quad \alpha_y Z^y (t).$$

Similarly change in the next will be $\alpha_{y-1} Z^{y-1}$ (t) and so on. In the and the total charge in the input column (in the karma life-time structure) in γ instants will be zero if it is time-invarient, that is if

$$\alpha_y Z^y (t) + \alpha_{y-1} Z^{y-1} (t) + \ldots\ldots\ldots\ldots + d_0 = 0 \qquad (2.13)$$

Similar situation may arise for all state columns, but when there are changes, matters for solutions will become very complicated and require a computers technique in graphics of events for manipulation.

As the instant-effective-bond can be put as an input-values vectors column, the whole change may be denoted by dB/dt also, as an instant, of d(xB)/dt in special *Yoga* and *Kaṣāya* circumstances.

The geometric regressions could also be put in a matrix form. Thus the nth geometric regression of karmic matter separate from indivisible-corresponding-sections could be written in the form

$$\left|\begin{array}{l} \frac{v}{2^{n-1}} - (ws-1)\frac{d}{2^{n-1}} \ldots, \ \frac{v}{2^{n-1}} - (2w-1)\frac{d}{2^{n-1}}, \ \frac{v}{2^{n-1}} - (w-1)\frac{d}{2^{n-1}} \\ \frac{v}{2^{n-1}} - (w(s-1)1)\frac{d}{2^{n-1}}, \ \ldots, \ \frac{v}{2^{n-1}} - (w-1)\frac{d}{2^{n-1}}, \ \frac{v}{2^{n-1}} - \frac{d}{2^{n-1}} \\ \frac{v}{2^{n-1}} - w(s-1)\frac{d}{2^{n-1}}, \ldots, \ \frac{v}{2^{n-1}} - w\frac{d}{2^{n-1}}, \ \frac{v}{2^{n-1}} \end{array}\right| \quad \ldots (2.14)$$

15. Cf. 7, op. cit.

16. Cf. 9 (a)

when basic vectors in terms of the fractional multiples of V as elements, regressive with fractional multiple of basic vectors d as common difference, vector group (or simply vectors w as numbers of rows) and tensors s as number of columns starting from extreme right lowest corner represent n various geometric regressions.

Similarly, following matrices, have the same number w of rows and the number s of columns, as above, have i as a notation for indivisible-corrsponding-sections, and represent the imparlation intensities associated with each basic vector of the corresponding elements of the above matrices according to the position in the rows & columns.

The n th geometric regression of the recoil (*anubhāga*) intensity-- is given by

$$\begin{bmatrix} nsi+(w-1), \ldots, & ((n-1)s+2)i+(w-1), & ((n-1)s+1)i+(w-1) \\ \vdots & \vdots & \vdots \\ nsi+1 \quad , \ldots, & ((n-1)s+2)i+1 & ,((n-1)s+1)i+1 \\ nsi \quad , \ldots, & (n-1)s+2)i & ,((n-1)s+1)i \end{bmatrix} \ldots (2.15)$$

All the above matrices are in correspondence with a particular configurational structure in relation to karmic bonds etc. Further the equation (2.13) may be written as

$$z(t) = Az(t) \qquad (2.16)$$

or

$$\frac{d}{dt}\begin{bmatrix} z_y(t) \\ \vdots \\ z_2(t) \\ z_1(t) \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 & 0\ldots0 \\ 0 & 0 & 1 & 0\ldots0 \\ & & \cdots & \\ \cdot\cdot & & & \\ -a_0 & -a_1 & -a_2 & \ldots a_{y-1} \end{bmatrix} \begin{bmatrix} z_y(t) \\ z_{y-1}(t) \\ \cdots \\ z_1(t) \end{bmatrix} \quad \ldots (2.17)$$

The solution of the above matric differential equation give

$$z(t) = e^{At}\, z(0) = \phi(t)\, z(0) \qquad (2.18)$$

where $z(0)$ is $z(t)$ at $t=0$, and

$$e^{At} = \phi(t)$$

is called tracnition matric which is a $y \times y$ square matric by

$$\phi(t) = \begin{bmatrix} 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & \ldots0 \\ \cdots & \cdots & \cdots & \cdots & \cdots & \cdots \\ \cdots & \cdots & \cdots & \cdots & \cdots & \cdots \\ \cdots & \cdots & \cdots & \cdots & \cdots & \cdots \\ -a_0 & -a_1 & -a_2 & \ldots & -a_{y-1} & \end{bmatrix} \quad \ldots\ldots (2.19)$$

Mark that e^{At} could also be expanded in the form of a uniformly convergent series

$$e^{At} = I + At + \dots \dots + \frac{A^n t^n}{\underline{|n}} + \dots \quad (2.20)$$

subject to the conrition

$$\frac{\| A^n t^n \|}{\underline{|n}} \leqslant \frac{\| A \|^n | t |^n}{\underline{|n}} \quad (2.21)$$

Thus the instant-effective-bond comes as an input wave group, goes as an output–wave group, and what stays is the statewave group, in bond, in tensorial forms as above. A more elaborate form of derivation of the differential equation & its solution may be sought, by assuming the form of a variable nisus in the triangular matrix for state-transition phenomera. We may also represent the input wave or output wave group as ψ in place of $B^{C_\alpha}_{S_\beta} G_\gamma$ with the matrix form as detailed above, as a wave tensorial function of *Yoga* and *kaṣāya* as well as time. If *Yoga* and *Kaṣāya* are kept constant, the wave function may be said to Satisfy

$$\phi_1 (v, \psi) \nabla^2 \psi + \phi_2 (v, i) \psi = \phi_3 (v, i) \frac{\partial \psi}{\partial t} \dots \dots \quad (2.22)$$

ϕ_1, ϕ_2, ϕ_3 could also be constants in tensorial form for certain fixed values of V and i; the threshold creator quanta of karmic matter mass & its intensity of recoil energy. The karmic wave contains mass and energy in subtle forms as above. We know that the configuration will take the shape of waves, for according to Jaina school an ultimate particle, at on instant, by virtue of velocity could be present at *more than one point* in space. In any configuration it has a momentum and energy of recoil. Thus the solution of the above wave equation shall have a more complicated form, in exponential than as that anticipated in (2.18), its coefficients being calculated from the elements of the the state-triangular matrix.

The ψ may be regarded as a *guṇahānī spardhaka* or a sum of *vargaṇās*. Thus the ψ waves here may also be regarded as sum of wavelets in form of Set of *varganās*, etc. or also in form of set of *niṣekas*, which drops out utimately after its life time, giving out unpulses. Thus the *samaya-*

prabaddha wave can be very properly given in terms of the multiple periodic waves, having their different periods of use as well as decay, depending upon various operators, known as (i) time (ii) *Yoga* (iii) *Kaṣāya* (iv) *adhaḥ pravṛtta* karaṃa (low tended activity) (v) *apūrva karaṇa* (invariant activity) and so on. Thus the manipulation of the karma system could be effected either through matrix mechanics (triangular state matrix, column input matrix, row output matrix) for different configuration, as well as through wave mechanics, with the help of differential equations comprising of various operators, operands and transformas. The remaining study is left for future, after a deeper probe in the search for the appropriate modern tools of mathematics.

3. Structures in Phases of Bios

The bios remains in the phases of *Yoga* upto the thirteenth control station (*guṇasthāna*), after which it is free *Yoga*. The phare of *kaṣāya* remain up to the *ksīṇakaṣāya* or twelfth control station. The descriphon of *Yoga* and *kaṣāya* structures have been detailed in a previous paper on system theory (System Theory) in Jaina School of Mathematics.

In this paper a survey of the above is given. The eperational *Yoga* stations are of three types (1) *upapāda* (2) *ekānta vṛdhhi* (3) *pariṇāma*.[17] All the *Yoga* stations are innumerate part of the *Jagaśreṇi* (set of points in a world line.) Every station of *Yoga* is classified into five subtypes of structures responsible for configuration (*Prakṛti*) and point (particle)-(*pradesa*) bonds : 1) *varga* 2) *vargaṇā* 3) *spardhaka* 4) *guṇāhani* 5) *avishāga*-praticcheda[18]. They may be called basic vector, vector-group, super-vector-group, geometric regression and indivisible-corresponding-section respectively. They have the same structure as the karmic matters, as shown previously; showing group equivalence and harmony in vibration, motion or intensity of recoil.

Now these phases are worthy of attention, which are the cause of perturbations or modification in the state matrix. First the details of the low-tended activity (*adhah pravṛtti karaṇ*) are taken up[19]. The

17. Cf. 1 (d) , *Gommaṭasāra, Karmakāṇḍa*, VV. 218–242.
13. Cf. ibid, VV. 223–231.
19. (a) Cf. 1 (d), *Gommaṭasāra, Jīvakāṇḍa*, VV. 48–57.
    (b) Cf. 1 (d), *Gommaṭasāra, Karmakāṇḍa*, VV. 896–912
    (c) Cf. 1 (d) *Labdhisāra*, VV. 33–165, & c.

period is *Inter-muhūrta* (*) (*numerate āvalis*: set of instants ranging from an instant greater than *āvali* to fortyeight minutes less two instants. *Bhinna muhūrta* is a *mūhūrta* less an instant. The number of *pariṇāmas* is innumerate universes (set of points), with similar increment, in flow of time. This activity may be for annihilation-sameliness (*kṣāyika-samyaktva*, for parting with endless-bonding of affection (*anantānubandhi Kaṣāya*), for subsidence or annihilation of mixed or disposition delusion (*deśa or sakalacāritra*). The bonding of lifetime is also altered proportionately, in ratio of innumerate part of *Palya*, decreasing in every section of time-interval of *Inter-muhūrtas*. This results in infinite-times purity, bonding of infinite times of graceful recoil intensity bonding of infinitesimal part of ungraceful recoil intensity, and numerate thousand terms reduction in life-time bonding. The protract (*anukṛṣṭi*) structure of the *pariṇāmas* (resulting phases) is calculated as follows :[20]

The progression is arithmetical and the following formulas are applied in manipulation.

SARVADHANA is the sum, *gaccha* is number of

(*) Gf. *Dhavalā* 3/1,2,6/67/6. Cf, also 3/1,2,6/69,5 for approximate *Muhūrta*, which may be greater than a *muhūrta*, and may also be called *antarmuhūrta*.

Terms, *ādi* is the first term, *caya* is the common difference. The form in which the formulas appear are :

$$\left.\begin{matrix}\textit{Sarvadhana}\\ \text{or}\\ \textit{śreḍhiyoga}\end{matrix}\right\} = \frac{\textit{gaccha}}{2}\,[2\,(\text{adi}) + (\textit{gaccha} - 1)\,\textit{caya}]$$

$$\textit{caya} = \frac{\textit{średhiyoga} - (\textit{gaccha})\,(\textit{ādi})}{\left(\dfrac{(\textit{gaccha})^2 - \textit{gaccha}}{2}\right)}$$

$$= \frac{\textit{Śreḍhiyoga}}{(\textit{gaccha})^2} \times \frac{1}{\textit{saṃkhyāta}}$$

(approximately) there, *Saṃkhyāta* is to be solved for by the method of indeterminate analysis)

$$\textit{caya dhana} = [\textit{sarvadhana} - (\textit{gaccha}\,(\textit{ādi})]$$

$$\frac{\textit{ādi} = \textit{sarvadhāna} - \textit{cayadhana}}{\textit{gaccha}}$$

$$\textit{ādi dhana} = \textit{sarvadhana} - \textit{cayadhana}$$

$$= \textit{ādi} \times \textit{gaccha}$$

20. Cf. 19 (a), op. cit.

For illustrating the general and protract structures the following working symbolism is adopted :

Jagaśreṇi (world-line)	L
Asaṃkhyāta (innumerate)	d
Saṃkhyāta (numerate)	s
Āvali (tail)	R

For the general structure, the following data is available :

Number of terms	Rsss
Common differences	$\frac{L^3 d}{(Rsss)(Rsss)(s)}$
Sum of common differences (*caya dhana*)	$\frac{L^3 d (Rsss - 1)}{(Rsss) s (2)}$
Sum of first term (*ādidhana*)	$\frac{L^3 d [1 + Rsss (2s - 1)]}{(Rsss)(s)(2)}$
Quantum of *Pariṇāmas* at first instant	$\frac{L^3 d [1 + Rsss (2s - 1)]}{(Rsss)(Rsss)(s)(2)}$
Quantum of *Pariṇāmas* at last instant	$\frac{L^3 d\, Rsss (2s + 1) - 1}{(Rsss)(Rsss)(s)(2)}$

It is understood at present that these values could be obtained through indeterminate analysis, for the formulas form linear equations in more than one unknown, the solutions being in positive integers alone. The method has been discussed by Mahāvīrācārya in GS. S. (miscellaneous treatment) chaper on various bypesof *kuṭṭīkāras* (indeterminate analysis) (6.79 ½ et seq.)

Data for the protract structure is as follows :

Common difference	$\frac{L^3 a}{(Rsss)(Rsss)(s\,s)(Rss)}$
Sum of common differences (*caya dhana*)	$\frac{L^3 a (Rss - 1)}{(Rsss)(Rsss)(s)(2)}$
Difference of *sarvadhana* and *cayadhana*	$\frac{L^3 a [2 + Rss \{ s (2s - 1) - 1 \}]}{(Rsss)(Rsss)(s)(2)}$
First portion in relation to first instant	$\frac{L^3 a [2 + Rss \{ s (2s - 1) - 1 \}]}{(Rsss)(Rsss)(s) Rss) (2)}$
Last portion in relation to first instant	$\frac{L^3 a [Rss \{ s (2s - 1) + 1 \}]}{(Rsss)(Rsss)(s)(Rss)(2)}$

Whole quantum of *parināmas* in relation to last instant	$\frac{L^3 a\,[Rsss\,(2s+1)-1]}{(Rsss)\,(Rsss)\,(s)\,(2)}$
First portion in relation to last instant	$\frac{L^3 a\,[Rss\,\{s\,(2s+1)-1\}]}{(Rsss)\,(Rsss)\,(s)\,(2)\,(Rss)}$
Last portion in relation to last instant	$\frac{L^3 a\,[Rss\,\{s\,(2s+1)+1\}-2]}{(Rsss)\,(Rsss)\,(s)\,(2)\,(Rss)}$

The minimum protract portion in relation to first instant is

$$\frac{L^3 a\,[Rss\,\{s\,(2s-1)-1\}-2]}{(Rsss)\,(Rsss)\,(s)\,(2)\,(Rss)}$$

or $\frac{L^3 a}{F^2 s}$ where F is Finger (aṅgula) set of points

In the above *Parinamas* there is six-station set :

$$\frac{L^3 a}{F^2 s\left(\frac{F+1}{a}.\ \frac{F+1}{a}.\ \frac{F+1}{a}.\ \frac{F+1}{a}.\ \frac{F+1}{a}\right)}$$

The structure for the unprecedent activity is similar, but without protract structure. There is the structure for the invariant activity.(21)

It is not understood, how the mathematical correlation has been set up between the structures of the state karmic matrix and the above activity structures. The simultaneity of phases of bios and karmic matter without a difference of even an instant is also not explanable in the similar way as is the indivisibility of an instant during the motion of a particle or bios.

21. Cf. ibid.