**Prof. Dr. Alfred Toth**

# Polycontextural semiotic operations

*For Rose*, this article, which I started more than 8 years ago in „Ye Olde Lantern“ from where I tried to go on Panizza’s trip to the moon by aid of the trans-operators.

## 1. Contextures and number structures

On the basis of Rudolf Kaehr’s work (cf. bibliography), it is now possible, to reformulate the contexture-free polycontextural.-semiotic notations given in Toth (2003, pp. 36 ss.) in order to obtain a relatively complete organon of polycontextural semiotic operations which form, together with other topics, the heart of polycontexural semiotics. This will turn out to be of much bigger importance then the analysis of sub-signs or semioses.

2. The following table gives the three number structures of proto-, deutero- and trito-numbers for the first three contextures C1 – C3:

| Proto | Deutero | | Trito | Deci | |
|---|---|---|---|---|---|
| 0 | 0 | (1.1), (1.2), (2.1), (2.2) | 0 | 0 | C1 |
| 00 | 00 | (2.2), (2.3), (3.2), (3.3) | 00 | 0 | |
| 01 | 01 | | 01 | 1 | C2 |
| 000 | 000 | (1.1), (1.3), (3.1), (3.3) | 000 | 0 | |
| 001 | 001 | | 001 | 1 | |
| 012 | 012 | | 010 | 3 | C3 |
| | | | 011 | 4 | |
| | | | 012 | 5 | |

As one sees easily, we have

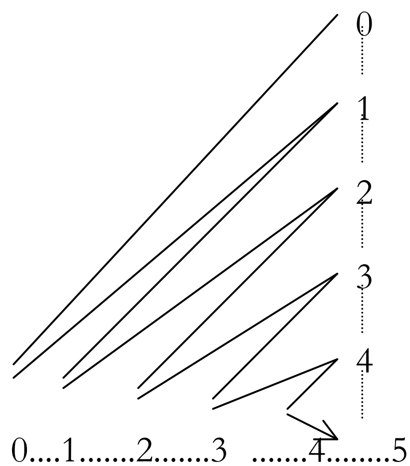
Trito-Structure $\subset$ Deutero-Strucure $\subset$Protostructure, but

C1 ⊄ C2 ⊄ C2.

According to the decimal equivalents to the right, we also see 1) that the Peano number 2 cannot be represented by a kenogramm, and 2) that many numbers are represented in different contextures and number structures. However, with that, the question arises how trito-numbers are to be introduced. Günther (1976-80, II, p. 261) had suggested that qualitative numbers are counted along two number axes which are orthogonal to one another. Therefore, trito-numbers are introduced, like proto- and deutero-numbers, but differemt from the Peano numbers, in a two-dimensional, planar way.

| ← | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | 0 |
| | | | | | | | 1 | 1 |
| | | | | | | 1 | 2 | 2 |
| | | | | | 1 | 2 | 3 | 3 |
| | | | | 1 | 2 | 3 | 4 | 4 |
| | | | 1 | 2 | 3 | 4 | 5 | 5 |
| | | 1 | 2 | 3 | 4 | 5 | 6 | 6 |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 7 |

↓




Summing up: In order to inaugurate a qualitative mathematics and a structural semiotics, proto- and deutero-numbers are not sufficient, because they still can be displayed in pure quantities, i.e. as pairs (m: n) and as partitions ($m^n$). Since this is not the case anymore for trito-numbers, they form the basis for qualitative mathematics and structural semiotics. However, one must not forget that the trito-numbers are just *differentiae specifiae* of the deutero-numbers, and the deutero-numbers just *differentiae specificae* of the proto-numbers (cf. in German Individuum-Art-Gattung).

## 2. Polycontextural operators

We differentiate between Intra- and Trans-operators (cf. Kronthaler 1986, pp. 37 ss.). Intra-operators connect qualitative numbers of the same quality, i.e. the same length, and cannot go out of a contexture. Trans-operators connect qualitative numbes of different qualities, i.e. length, and go between different contextures.

### 2.1. Intra-operators

### 2.1.1. Ein- und mehr-stellige Intra-Operatoren

As examples, trito-numbers are chosen, since several operators are non-trivial only for those. As examples for mappings of sub-signs and sign-relations to kenograms cf. Toth (2009).

#### 2.1.1.1. Delete

Symbol: $L^i$. Deletes the i-th position, i.e. of $w_i$.
Example for i = 1: $L^0$(001023) = Ø01023

Example for i = 2: $L^{1,3}$(001023) = 0Ø1Ø23.

Example for i = m* (delete all positions):
$L_6$(001023) = ØØØØØØ.

#### 2.1.1.2. Insert

Symbol: $B^i_h$. Inserts the value h in the place i.

Example for i = 3 and h = 2: $B^3{}_2$(001Ø23) = 001223.

Example for i = 1, j = 3, h = 0 and k = 0: $B^1{}_0{}^3{}_0$(0Ø1Ø23) = 001023.

Example for $B_{h, k, ..., l, m}$* (Insert h, k, ..., l, m into all places):
$B_{001023}$(ØØØØØØ) = 001023.

#### 2.1.1.3. Nulling

Symbol: $N^i$. Nulling of the i-th position, d.h. $w_i \rightarrow 0$.

Example for i = 5: $N^5(001023) = 001020$.

Example for $N^{ij}$ ($w_i \rightarrow 0$ und $w_j \rightarrow 0$), i = 4, j = 5: $N^{45}(001023) = 001000$.

Example for $N_m$* (Nulling of all positions): $N_6(001023) = 000000$.

#### 2.1.1.4. Maximizing

Symbol: $M^i$. Maximizing $w_i$.

Example for i = 1: $M^1(001023) = 011023$.

Example for $M^{ij}$ (Maximizing of $w_i$ and $w_j$), i = 1, j = 2:
$M^{1,2}(001023) = 012023$.

Example for $M_m$* (maximizing of all positions): $M_6(001023) = 012345$.

#### 2.1.1.5. Change of insertion

Symbol: $W^i_h$. $w_i \rightarrow h$.

Example for i = 3, h = 1: $W^i_h(001023) = 001123$.

Example for $W^{i\,j}_{h\,k}$ ($w_i \rightarrow h$ and $w_j \rightarrow k$), i = 3, h = 1, j = 5, k = 1:
$W^{3\,5}_{1\,1}(001023) = 001121$.

Example for $W_{h, k, \ldots, l, m}$* (Change of insertion of all places): $W_{012000}(001023) = 012000$.

#### 2.1.1.6. Transposition

Symbol: $T^i_h$. Transposition of $w_i$ and $w_h$.

Example for i = 3, h = 4: $T^3_4(001023) = 001203$.

Example for $T^{i\,j}_{h\,k}$ ($w_i \rightarrow w_h$ and $w_j \rightarrow w_k$), i = 3, h = 4, j = 4, k = 5:

$T^{3}{}_{4}{}^{4}{}_{5}(001023) = 001230$.

For complete transposition cf. 2.1.1.7. Permutation.

### 2.1.1.7. Permutation

Symbol: $P_{i0 \ldots im-1}{*}.\ w_0 \ldots w_{m-1} \rightarrow w_{i0} \ldots w_{im-1}$.

Example: $P_{124530}(001023) = 012300$.

### 2.1.1.8. Partial reflection

Symbol: $R^{\square\square\square\square\square\blacksquare\blacksquare\blacksquare}$. Partial reflection of the i positions, marked by "$\blacksquare$".

Examples: $R^{\square\square\square\blacksquare\blacksquare\blacksquare}(001023) = 001320 = 001230$.
$R^{\blacksquare\blacksquare\blacksquare\square\square\square}(001023) = 010023$.

Example for $R_m{*}$ (total reflection): $R_6(001023) = 320100 = 012300$.

### 2.1.1.9. Quasi Intra Reflection

Symbol: ${}^{r}R^{\square\square\square\square\square\blacksquare\blacksquare\blacksquare}$. Works like 2.1.1.8., however, not as mapping $K_m \rightarrow K_m$, but into the reflected contexture $K_m \rightarrow {}_mK$, i.e., normal form transformation which may be necessary after the reflection, works not on $K_m$, but on ${}_mK$.

Example: ${}^{r}R^{\square\square\square\blacksquare\blacksquare\blacksquare}(001023) = 0320100$.

Example for ${}^{r}R_m{*}$ (Quasi-Intra-Total-Reflection): ${}^{r}R_m(001023) = 320100$.

## 2.1.2. One-PLACED Intra Operators

### 2.1.2.1. Normal form Operator

Symbol: N: PN $\rightarrow$ PN, DN $\rightarrow$ DN, TN $\rightarrow$ TN (PN = .Proto-number, etc).

Example: N(2838538) = 0121321.

#### 2.1.2.2. Constancy Operator

The constancy operator $K_{zm}$ maps all kenograms onto $z_m \in K_m$ ab. Special cases are the operators $L_m$(chap. 2.1.1.1.), $N_m$(chap. 2.1.1.3) und $M_m$(chap. 2.1.1.4).

#### 2.1.2.3. Reflectors

Symbol: $R_m$, ${}^rR_m$. $T_m \rightarrow {}_mT$, cf. chap. 2.1.1.8. and chap. 2.1.1.9.

#### 2.1.2.4. Intra-Successor

##### 2.1.2.4.1. Proto-Intra-Successor $^i{}_PN_m$

| | | | | |
|---|---|---|---|---|
| Examples: | $p_m$ | 0000 | 0001 | 0012 |
| | $p'_m$ | 0001 | 0012 | 0123 |

##### 2.1.2.4.2. Deutero-Intra-Successor $^i{}_DN_m$

| | | | | |
|---|---|---|---|---|
| Examples: | $d_m$ | $00012\underline{3}$, | $000111222\underline{3}$, | $0012\underline{3}$ |
| | $d'_m$ | $00112\underline{2}$, | $000111223\underline{3}$, | $0123\underline{4}$ |

##### 2.1.2.4.3. Trito-Intra-Successor $^i{}_TN_m$

| | | | | | |
|---|---|---|---|---|---|
| Examples: | $t_m$ | $0\underline{0}$ | n | | |
| | $t'_m$ | $0\underline{1}$ | $t'_m$ | $0^1 \leftrightarrow \underline{1}^1$ | |
| | $t_m$ | $00\underline{0}$, | $00\underline{0}$, | $00\underline{0}$ | |
| | $t'_m$ | $01\underline{0}$, | $00\underline{1}$, | $01\underline{2}$ | |
| | $t_m$ | $000\underline{0}$, | $000\underline{0}$, | $000\underline{0}$, | $000\underline{0}$ |
| | $t'_m$ | $001\underline{0}$, | $000\underline{1}$, | $001\underline{2}$, | $012\underline{3}$ |

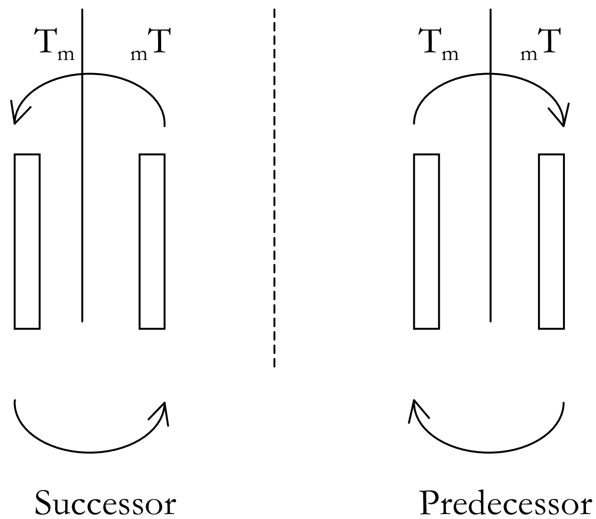
#### 2.1.2.5. Intra-Predecessor

#### 2.1.2.6. n-times Intra-Successor $^iN^n$ and -Predecessor $^iV^n$

If the successor $^iN_m$ or the predecessor $^iV_m$, respectively, work n-times after one another, then we have $^iN^n{}_m$ bzw. $^iV^n{}_m$ (Kronthaler 1986, p. 45).

### 2.1.2.7. Total Reflector $^{r}R_m$

Inside of the complete system




for every kenogram „the number of its successor is even to the number of its predecessor and each time finite, if one counts only once. The application of the successor and predecessor operations is here unlimited, it can be applied infinite times after one another [...]. The Intra-operators, introduced up to now, especially successor and predecessor, are valid also in each of their reflected structures $_mK = {}^{r}R(K_m)$" (Kronthaler 1986, p. 48 s.):

| | | | | |
|---|---|---|---|---|
| Example: | ↑Predecessor | 000123 | 321000 | Successor↑ |
| | | 001234 | 432100 | |
| | ↓Successor | 012345 | 543210 | Predecessor ↓ |

### 2.1.3. Multi-PLACED Intra-Operators

#### 2.1.3.1. Intra-Addition +

##### 2.1.3.1.1. Proto-Intra-Addition

Example:

| | |
|---|---|
| 5:1 | 00000 |
| 5:3 | 00012 |
| 5:4 | 00123 |

Another display uses the successor ${}^{i}N^{n}_{m}$. If one lets the indices away, we obtain:$p^s = p^i + p^j = N^j(p^i) = N^i(p^j)$.

Example: $p^1 + p^3 = N^3(p^1) = N^1(p^3) = N^3(00000) = N^1(00012) = 00123$.

##### 2.1.3.1.2. Deutero-Intra-Addition

Example:

| | | | | |
|---|---|---|---|---|
| | 000111 | + | 000123 | = 012345 |
| $N^1$ | 000112 | | 000112 | $V^1$ |
| $N^2$ | 000123 | | 000111 | $V^2$ |
| $N^3$ | 001122 | | 000012 | $V^3$ |
| $N^4$ | 001123 | | 000011 | $V^4$ |
| $N^5$ | 001234 | | 000001 | $V^5$ |
| $N^6$ | 012345 | | **000000** | $V^6$ |

##### 2.1.3.1.3. Trito-Intra-Addition

Both methods, the ordinal and the one using the successor/predecessor auxiliary algorithm, correspond exactly to deutero-addition (Kronthaler 1986, p. 51; chap. 2.1.3.1.2.).

### 2.1.3.2. Intra-Subtraction –

Intra-Subtraction is the converse operation to Intra-Addition. For all three number structures, the same applys. Let be $i < j$. Then we get $d^j - d^i = d^{j-i} = V^n(d^j)$ with n from $V^n(d^i) = 0........0$ or $N^n(0........0) = d^i$ (Kronthaler 1986, p. 51).

### 2.1.3.3. Addition and subtraction in the system $K_m$ — $_mK$

Example: $-0001203 \neq {}^rR(0001203) = 3021000$.

## 2.2. Trans-Operatoren

### 2.2.1. One- und multi-placed Trans-operators

#### 2.2.1.1. Absorption

Symbol: $A^i_m = A(\ {}^i\ )$. Absorbs the i-th position: $K_m \rightarrow K_{m-1}$, $m > 1$.
Example: $A^3(00102) = 0001$.

Symbol: $A^{i,j}_m = A(\ {}^{i\ j}\ )$. Absorbs the i-th and j-th position: $K_m \rightarrow K_{m-2}$, $m > 2$.
Example: $A^{1\ 3}(00102) = 001$.

Symbol: $A^{i1,\ \ldots,\ in}_m$. Absorbs $i_1, \ldots, i_n$: $K_m \rightarrow K_{m-n}$, $n < m$.
Example: A(00102) = 01.

Symbol: $A^{(m-1)}{}_m$. Absorbs all but 1 position: $K_m \rightarrow K_1$.
Example: $A^{(4)}(00102) = 0$.

Symbol: $A_m*$. Total absorption: $K_m \rightarrow \bullet$ (Extinctor).
Example: $A_5(00102) = \bullet$.

### 2.2.1.2. Splitting

Symbol: $Z^{i,j}_m$. Splits a kenogram in two parts of lengths i and j, i + j = m:

$K_m \rightarrow K_i$, $K_m \rightarrow K_j$

Example: $Z^{2\,3}$(00102) → 00, → 012

$Z_m$*: Splitting of the kenogram in single parts of length 1.

Example: $Z_5$(00102) → 0, → 0, → 0, → $0^1$, → 0

### 2.2.1.3. Iteration

Symbol: ${}_mI^i_j$. Iterates the i-th position j-times: $K_m \rightarrow K_{m+j}$.
Example: $I^2_3$(00102) = 00111102.

Symbol: ${}_mI^{i\,k}_{j\,l}$. Iterates the i-th position j-times and the k-th position l-times: $K_m \rightarrow K_{m+j+l}$.
Example: ${}_mI^{0\,2}_{3\,2}$(00102) = 0000011102.

Symbol: ${}_mI_{jo, \ldots , jm-1}$*. Iterator as a special case of a successor.
Example: $I_{31232}$(00102) = 0000001110000222.

## 2.2.2. One-PLACED Trans-operators

### 2.2.2.1. Trans-Successor ${}^t\mathbf{N}_m$

#### 2.2.2.1.1. Proto-Trans-Successor ${}^t{}_P\mathbf{N}_m$

Example: ${}^t{}_P$N(0012) = Ø0012 — 00012, — 00123

### 2.2.2.1.2. Deutero-Trans-Successor $^{t}{}_{D}N_{m}$

Example: $^{t}{}_{D}N(0012)$ → 00112
$^{t}{}_{D}N(0012)$ → 00122

### 2.2.2.1.3. Trito-Trans-Successor $^{t}{}_{T}N_{m}$

Example:

0102 → 01012 → 01012
0102 → 10102 ~ → 01012

### 2.2.2.2. Trans-Predecessor $^{t}V_{m}$

### 2.2.2.2.1. Proto-Trans-Predecessor $^{t}{}_{P}V_{m}$

Example:

000123 → ~~0~~00123 ~ 0~~0~~0123 ~ 00~~0~~123
000123 → 00012~~3~~ ~ 0001~~2~~3 ~ 000~~1~~23

### 2.2.2.2.2. Deutero-Trans-Predecessor $^{t}{}_{D}V_{m}$ and
### 2.2.2.2.3. Trito-Trans-Predecessor $^{t}{}_{D}V_{m}$

Cf. Kronthaler (1986, pp. 59 ff.).

### 2.2.2.3. n-times Trans-Successor $^{t}N^{n}{}_{m}$ and
### 2.2.2.4. n-times Trans-Predecessor $^{t}V^{n}{}_{m}$

For $^{t}{}_{P}N^{n}{}_{m}$, $^{t}{}_{D}N^{n}{}_{m}$, $^{t}{}_{T}N^{n}{}_{m}$ and $^{t}{}_{P}V^{n}{}_{m}$, $^{t}{}_{D}V^{n}{}_{m}$, $^{t}{}_{T}V^{n}{}_{m}$ cf. Kronthaler (1986, pp. 62 ss.).

## 2.2.3. Multi-PLACED Trans-operators

### 2.2.3.1. Trans-Addition t

### 2.2.3.1.a. Absorptive Trans-Addition

#### 2.2.3.1.a.1. Totally absorptive Trans-Addition

Left-Absorption: $z_m + z_n$

Right-Absorption: $z_n + z_m$

$$\left.\begin{array}{l} z_m + z_n \\ z_n + z_m \end{array}\right\} = z_n$$

#### 2.2.3.1.a.1.1. Canonical cases

01023 t 010 = 01023

01023 t 012 = 01023

#### 2.2.3.1.a.1.2. Absorption under Splitting

If the Splitting has length 1, only the lengths of the summands n and m are taken in consideration, becaue we have:

[0] ~ [1] ~ [2] ~ ...

Another possibility to differentiate concerns the length of single Splitting-parts (Kronthaler 1986, pp.67 ss.)::

Length 1: 0   0 1 0 2 3

| 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|

Lenght 1–2–3:   0 1 0 2 3

| 0 | 0 0 | 1 | impossible! |
|---|---|---|---|

(Kronthaler 1986, p. 66).

### 2.2.3.1.a.2. Teilabsorptive Trans-Addition

Example: 0 | 0 1 | 0 2 = 0 0 1 0 2 0

t | 0 1 | 0 |

absorbs 2 positions, juxtaposes 1 position: $T_{5+1} = T_6$.

left-absorptiv: $t_m$ t $t_n$ = $t_s$ right-absorptiv: $t_n$ t $t_m$ = $t'_s$

In the following example, both cases be right-absorptive. What has been absorbed, is split:

| 0 0 1 0 2 3 | t | 0 1 0 | 2 | = 0 0 1 0 2 3 | 2 |

What is absorbing, is split:

| 0 0 1 0 | 2 3 | t | 0 1 0 | 2 | = 0 | 0 1 0 | 2 | 2 3

### 2.2.3.1.b. Juxtapositive Trans-Addition

### 2.2.3.1.b.1. Canonical cases

### 2.2.3.1.b.1.1. Normal form juxtapositive t-Addition

Trito-numbers: | 0 1 0 2 | t | 0 0 1 2 3 0 | =

| 0 1 0 2 | 0 0 1 2 3 0 | ≠

| 0 0 1 2 3 0 | t | 0 1 0 2 | = | 0 0 1 2 3 0 | 0 1 0 2 |

Deutero-numbers: 00112 t 001123 = 00112001123 ~ 00001111223

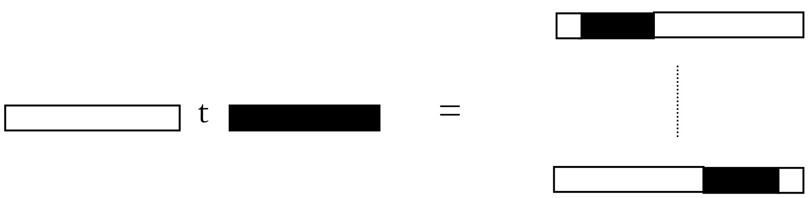
Proto-numbers: 0012 t 001201 impossible, since 0 can be iterated!

**2.2.3.1.b.1.2. Juxtaposition to the normal form of equivalent enograms**

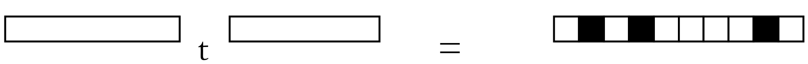
Example: 010 t 00 = 01000
11
22 ~ 01033 ~ ...

**2.2.3.1.b.2. Splitting**

**2.2.3.1.b.2.1.** One summand appears in normal form, the other is split arbitrarily (Kronthaler 1986, p. 67):
Splitting left (analogously right)



**2.2.3.1.b.2.2.** Both summands are split in arbitrary form (total splitting)



**2.2.3.1.c. Juxtapositive Trans-Addition**

Cf. Kronthaler (1986: 67).

**2.2.3.1.d. t-Addition → i-Addition**

Cf. Kronthaler (1986: 67f.).

### 2.2.3.1.1. Proto-Trans-Addition

#### 2.2.3.1.1.1. Absorptive Proto-Trans-Addition

Total Absorption:

```
Pm     0  0  0  1  2  3       6:4  but cf.     0  0  0  1  2  3       6:4

t            0  1  2          3:3          t         0  1  2  3  4  5:5
   ____________________________                ________________________
   =   0  0  0  1  2  3       6:4          =   impossible
```

Partial Absorption:

```
Pn+m–1  0  0  0  1  2  3            6:4    and   0  0  0  1  2  3       6:4

t             0  1  2               3:3    t           0  1  2          3:3
    ____________________________________         ________________________
    =   0  0  0  1  2  3  4  5      8:6          0  0  0  0 1 2  3 4    8:5


Pn+m–4    0 0  0  0  0 1  2  3 4  5              10:6

t                 0  0 1  2  3 4  5  6            8:7
    ______________________________________________
    =  0  0  0  0  0  1  2  3  4 5  6 7 8  9     14:10  and

       0  0  0  0  0  1  2  3  4 5               10:6

t                  0  1  2  3  4 5                7:6
    ______________________________________________
    =  0  0  0  0  0  0  1  2  3 4 5  6 7  8     14:9
```

```
      0   0   1   2   3      =  ______   00001234 }
      |   ¦    \                ------   00000123 }  P8
  t    0  0  0  1               ======   0000123  }
  ___________________           ......   0001234  }  P7
                                ______
                                ------
                                ......
                                ______   000123      P6
```

### 2.2.3.1.1.2. Juxtapositive Proto-Trans-Addition in the Minimal-Contexture $P_{n+m}$

#### 2.2.3.1.1.2.1. Mediated juxtapositive

```
          ________________                      _____    __________
Example: 0  0  01  2  34 5   t   0  01  2 3  =   00 0  0 0  1 2   3  4  567 8
                                    ↓   ↓  ↓
                                    6   7  8
```

#### 2.2.3.1.1.2.2. Unmediated juxtapositive

Example:

```
__________________       ------------      ____________
0   0  0  1   2 3 4 5   t   0 1  2 3   4   =   0 001  2 345  6 789(10)  (unmediated)
                            ↓ ↓  ↓  ↓ ↓       ____---  _____  ------
                            6 7  8 9   10     0  0  0 0 12345 6 78 9     (mediated)
```

### 2.2.3.1.2. Deutero-Trans-Addition

#### 2.2.3.1.2.1. Absorptive Deutero-Trans-Addition

Totally absorptive Deutero-Trans-Addition:

```
    0   0   0   1   1   whereas      0   0   0   0   1   1
        |   |   |   |                            |   |   |
t       0   0   1   1            t           0   0   1   2
____________________              ________________________
=   0   0   0   1   1                =  impossible!
```

Partially absorptive Deutero-Trans-Addition:

```
    0  0  0  1  1      = ——— 00001112 ⎫
       |  ⁞  ¦           ---- 00000112 ⎭  D8

t      0  0  1  2        ······ 0001112  ⎫
                         ———             ⎬ D7
                         ----            ⎪
                         ——— 0000112     ⎭

                         ······          ⎫
                         ----            ⎬
                         ——— 000112      ⎭ D6
```

(There are still more possibilities left.)

**2.2.3.1.2.2. Juxtapositive Deutero-Trans-Addition**

**2.2.3.1.2.2.1. Mediated juxtapositive Deutero-Trans-Addition**

Example: (The connecting lines symbolize the addition of the corresponding iteration numbers.)

```
    0  0  1  1  2  3
        \  \  \  \  \
t   0  0  0  1  1  2  3  4
____________________________________________
=   0  0  0  0  0  1  1  1  1  2  2  3  3  4
```

**2.2.3.1.2.2.2. Unmediated juxtapositive Deutero-Trans-Addition**

Cf.. Kronthaler (1986, p. 71).

### 2.2.3.1.3. Trito-Trans-Addition

#### 2.2.3.1.3.1. Absorptive Trito-t-Addition

Examples:

Totally absorptive Trito-Trans-: Addition:

| | | | | | | |
|---|---|---|---|---|---|---|
| | 0 | 1 | 0 | 2 | 1 | 3 |
| t | | | 0 | 1 | 2 | |
| = | 0 | 1 | 0 | 2 | 1 | 3 |

Partially absorptive Trito-Trans-Addition:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | 0 | 1 | 0 | 2 | 1 | 3 | |
| t | | | 0 | 1 | 2 | 3 | 4 |
| = | 0 | 1 | 0 | 2 | 1 | 3 | 4 |

#### 2.2.3.1.3.2. Juxtapositive Trito-t-Addition

##### 2.2.3.1.3.2.1. Canonical cases

###### 2.2.3.1.3.2.1.1. Normalform-Juxtapositiv

Cf. Kronthaler (1986, p. 72).

###### 2.2.3.1.3.2.1.2. Juxtaposition von Trito-Äquivalenzen

Example:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 012 t 01 = | 01201 | = | 01221 | Repertoire: {0, ..., 4} | | | | |
| | 10 | | 13 | | | | | |
| | 02 | | 31 | Choice: | 01 | 12 | 23 | 34 |
| | 20 | | 14 ~~44~~ | | 02 | 13 | 24 | |
| | 03 | | 23 | | 03 | 14 | | |
| | 30 | | 32 | | 04 | | | |
| | 04 ~~40~~ | | 24 ~~42~~ | | | | | |
| | 12 | | 34 ~~43~~ | + permutations | | | | |

##### 2.2.3.1.3.2.2. Splitting

For Splitting of one or two summands cf. Kronthaler (1986, p. 73).

### 2.2.3.2. Trans-Subtraction ⌐

### 2.2.3.2.1. Juxtapositive t-Subtraction (partial subtraction)

### 2.2.3.2.1.1. Total juxtapositive t-Subtraction

Example: 0010 ⌐ 01 = 001001.

### 2.2.3.2.1.2. Teiljuxtapositive t-Subtraction

### 2.2.3.2.1.2.1. In normal form

Example:

0 0 1 0 2 2 ⌐ 0 1 0 2 = 0 2 2 2 ~ 0 1 1 1

### 2.2.3.2.1.2.2. In einer zur Normalform äquivalenten Form

Example:

0 0 1 0 2 2 ⌐ 0 1 1 2 = 0 0 1 2

### 2.2.3.2.2. Total-t-Subtraction

### 2.2.3.2.2.1. Canonical case: Normal form-Subtraction

Example:

0 0 1 0 2 2 ⌐ 0 1 0 2 = 02 ~ 01

### 2.2.3.2.2.2. t-Subtraction of equivalent forms

Example:

0 0 1 0 2 2 ⌐ 0 1 1 = 0 0 1

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