Multiple and Self-Modifying Logic Tables with Queries

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Abstract

For the maximum and minimum size of multiple logic tables, the size calculation and SQL access code is given. For the minimum size of multiple logic tables, the SQL access code is larger and more complex than that for the maximum size. The ratio of maximum to minimum size shows a size saving of at least T for the minimum number of tables. Formulae for determining the number of queries for multiple logic tables is discussed with the SQL code given. Self-modifying logic tables with SQL code is introduced for the first time.

Introduction

Multiple logic tables are useful for capturing business rules in accounting, manufacturing and artificial intelligence. A logic table is a process- by sub-process matrix where processes (P) specify which sub-processes (SP) are performed. The structure of a logic table is columns as P which return SP as rows based on logic switches (L) in P. The size of logic tables is determined by the number of multiple logic tables which are chained or connected. The number and type of queries of multiple logic tables is determined by the complexity level of the total number of possible process combinations.

1 Size of Multiple Logic Tables

1.1 Maximum Size of Multiple Logic Tables

\ Process Sub-process \	N	A	B	C	D
a	**Li**	x	x	x	x
b	x	**L2**	x	x	x
c	x	x	**L3**	x	x
d	x	x	x	**L4**	x
e	x	x	x	x	**L5**

Table 1.1: Maximum size of multiple logic tables

1.1.1 Calculation for Maximum Size of Multiple Logic Tables

For multiple logic tables, the maximum or uncompressed size is determined by:

$$(a + b + c + d + e) \times (N + A + B + C + D) \qquad \textbf{(1.1.1.1)}$$

If

$N = A = B = C = D = E$

and

$N = a = b = c = d = e$

and

for logic tables L1 … L5, the number of tables is $T = 5$

then

$5N \times 5N = 25N^2$

or

$TN \times TN = \underline{T^2}\underline{N^2}$ **(1.1.1.2)**

1.1.2 SQL Code to Access Minimum Size of Multiple Logic Tables

```
SELECT
     logic . type_acct_id,
     logic trans,
     logic type_acct_id
FROM
     logic,
     input_buffer ib
WHERE
     'x' <> substr( logic.trans, ib.type_sgl_id, 1)
AND
     ib.type_sgl_id = 9 ;
```

1.2 Minimum Size of Multiple Logic Tables

	N	A	B	C	D
Maximum of: a,b,c,d,e	**L1**	**L2**	**L3**	**L4**	**L5**

Table 1.2: Minimum size of multiple logic tables

1.2.1 Calculation for Minimum Size of Multiple Logic Tables

For multiple logic tables, the minimum or compressed size is determined by:

[Maximum value of (a,b,c,d,e)] x (N + A + B + C + D) **(1.2.1.1)**

If

$N = A = B = C = D = E$

and

$N = a = b = c = d = e$

and

for logic tables L1 ... L5, the number of tables is $T = 5$

then

$N \times 5 N = 25N^2$

or

$N \times TN = \underline{TN^2}$ **(1.1.1.2)**

1.2.2 SQL Code to Access Minimum Size of Multiple Logic Tables

```
SELECT
      logic.type_acct_id,
      logic. trans
      CASE
            WHEN
                  (
                        ib.type_sgl_id >= 1
                  AND
                        ib.type_sgl_id <= 4
                  THEN
                        logic .type_acct_id
            WHEN
                  (
                        ib.type_sgl_id >= 5
                  AND
                        ib.type_sgl_id <= 8
                  THEN
                        MOD( (FLOOR( logic.type_acct_id / 10)), 10)
            WHEN
                  (
                        ib.type_sgl_id >= 9
                  AND
                        ib.type_sgl_id <= 12
                  THEN
                        MOD( (FLOOR( logic.type_acct_id /10)), l0 + 4
            ELSE
                  NULL
      END
FROM
      logic,
      input_buffer ib
WHERE
      'x' <> substr( logic.trans, ib.type_sgl_id, 1)
AND
      ib.type_sgl_id = 9 ;
```

1.3 Relationship of Maximum to Minimum Size of Multiple Logic Table

The maximum size of a logic table is given by

$$(a + b + c + d + e) \times (N + A + B + C + D) \qquad \textbf{(1.2.1.1)}$$

and the minimum size of a logic table is given by

$$[\text{Maximum value of } (a, b, c, d, e)] \times (N + A + B + C + D) \qquad \textbf{(1.2.1.1)}$$

If the maximum value of (a, b, c, d, e) is arbitrarily chosen as e, then the minimum size of a logic table is given by

$$(e) \times (N + A + B + C + D) \qquad \textbf{(1.3.1)}$$

The ratio of maximum size to minimum size of logic table is given by

$$\frac{(a+b+c+d+e)\ \times\ (N+A+B+C+D)}{(e)\ \times\ (N+A+B+C+D)}$$

which reduces to

$(\underline{a+b+c+d)\,/\,(e)\quad +1}$ **(1.3.2)**

where e is the maximum value of (a, b, c, d, e).

If

$N = A = B = C = D = E$

and

$N = a = b = c = d = e$

and

for logic tables L1 … L5, the number of tables is T = 5

then

the maximum table size is given by T^2N^2 **(1.1.1.2)**

and

the minimum table size is given by TN^2 **(1.2.1.2)**

In this case, the ratio of maximum size to minimum size of logic table is given by

$T^2N^2 / TN^2 = \underline{T}$ **(1.3.3)**

Hence in this case T size units may always be saved by using minimum or compressed multiple tables.

2 Queries of Multiple Logic Tables

2.1 Number of Queries for Multiple Logic Tables

For multiple logic tables, the number of queries is determined from Table 2 by:

$N \times A \times B \times C \times D \times e$ **(2.1.1)**

If

$N = A = B = C = D = E$

and

$N = a = b = c = d = e$

and

for logic tables L1 … L5, the number of tables is T = *5*

then

$N \times N \times N \times N \times N \times N = N^6$ **(2.1.2)**

Hence the power of N is the number of tables plus one and given by

$\underline{N^{(T+1)}}$ (2.1.3)

2.2 SQL Code for Queries of Multiple Logic Tables

```
Insert transactions ('d') get logic 'd'
Update transactions ('0') update logic '0'

Insert transactions ('D') get logic 'D'
Update transactions ('d') update logic 'd'

Insert accounts                               }
Update balances                               } *
Update transactions ('D') update logic 'D'    }

* [repeat for the number of logic table combinations:
      ( d length) x (D width) x (e length) ]
```

3 Self-Modifying Logic Tables and Queries

3.1 Definition

A condition is anything returned from access of a certain part of the logic table.

If a condition arises as a result of accessing a logic table, then the logic table is updated.

Logic tables may self-build, self-modify, and self-delete themselves.

3.2 Static SQL Code for Queries of Self-Modifying Logic Tables

A logic string may be modified in two ways: a switch is changed or a switch is inserted. In either case, the pseudo code is basically the same as follows:

Read old string.
Make two parts of the old string as (1 … P-1) (P+1 … N).
Catenate new value at P as (1 … P-1) (P) (P+1 … N).
Write new string.

This is implemented using the SUBSTR function as follows:

```
UPDATE
     logic_table
SET
     logic_trans =
              substr( logic_trans. byte_i, byte_P_minus_i)
              || byte_P_switch
              substr( logic_trans, byte_P_plus_i,
                  byte_N_minus_P_plus_l)
WHERE
     logic_type_acct_id = some_row_number_value
```

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