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UMTS

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, UMTS, , /

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[a(j)]

UMTS(Universal Mobile Telecommunication System), ISDN(Integrated Service Digital Network), W-CDMA(Code Division Multiple Access), IMT-2000(CDMA 2000) (Turbo code)

1 dk Y1k (interleaver)(100) (constituent encoder)(102) Y2k
 dk (104) (106) dk Y2k
 2 Xk Y1k Y2k
 (104) (100) 2
 (104) (100)
 (Row) (Column)
 j, i, K R C (100)
 / (prime number; " ") p (primitive root) μ
 가 K= 40 R= 5, C= 8, p= 7, μ= 3
 (100) [1] 5x8

[1]

1	2	3	4	5	6	7	8
9	10	11	12	13	14	15	16
17	18	19	20	21	22	23	24
25	26	27	28	29	30	31	32
33	34	35	36	37	38	39	40

(100) [1]
 (100) (inter-row) [T(j)]
 K [

1
 T(j)=pat4 (40 k 159)

- =pat3 (160 k 200)
- =pat1 (201 k 480)
- =pat3 (481 k 530)
- =pat1 (531 k 2280)
- =pat2 (2281 k 2480)
- =pat1 (2481 k 3160)
- =pat2 (3161 k 3210)
- =pat1 (3211 k 5114)
- pat1= {19,9,14,4,0,2,5,7,12,18,10,8,13,17,3,1,16,6,15,11}
- pat2= {19,9,14,4,0,2,5,7,12,18,16,13,17,15,3,1,6,11,8,10}
- pat3= {9,8,7,6,5,4,3,2,1,0}
- pat4= {4,3,2,1,0}

(100) T(j) T(j) K가 "40" T(j) pat4가 j
 [2] , 4

, 1 0 , 3 3 , 0 1 , 2 4 2

$$[\begin{matrix} 2 \\ 33 & 34 & 35 & 36 & 37 & 38 & 39 & 40 \\ 25 & 26 & 27 & 28 & 29 & 30 & 31 & 32 \\ 17 & 18 & 19 & 20 & 21 & 22 & 23 & 24 \\ 9 & 10 & 11 & 12 & 13 & 14 & 15 & 16 \\ 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 \end{matrix}]$$

(100) (permutated prime integer sequence) [r(j)], (minimum prime integer sequence) [q(j)], (inter-row permutation basic sequence) [s(i)] [2]

$$g.c.d\{q(j), p-1\} = 1, q(j) > 6, q(j) > q(j-1), q=1,2,\dots,R-1, q(0)=1$$

(, g.c.d)
 $r[T(j)] = q(j), j = 0,1,\dots,R-1.$
 $s(i) = [\mu \times s(i-1)] \bmod p, i = 1,2,\dots,(p-2), s(0)=1$
 (100) / $U^j(i)$ [s(i)]
 [3]

$$1. U^j(i) = s\{[i \times r(j)] \bmod (p-1)\}, i=0,1,2,\dots,p-2, U(p-1)=0, U(p)=p \text{ (C=p)}$$

$$2. U^j(i) = s\{[i \times r(j)] \bmod (p-1)\}, i=0,1,2,\dots,p-2, U(p-1)=0, U(p)=p \text{ (C=p+1)}, K=C \times R, U^{r-1}(p) \text{ } U^{r-1}(0)$$

$$3. U^j(i) = s\{[i \times r(j)] \bmod (p-1)\} - 1, i=0,1,2,\dots,p-2, (C=p) \text{ } U^j(i) [4]$$

$$U^0(i) = s(17i \bmod 6) = \{s(0), s(5), s(4), s(3), s(2), s(1), 0, 7\}$$

$$= \{1, 5, 4, 6, 2, 3, 0, 7\}$$

$$U^1(i) = s(13i \bmod 6) = \{s(0), s(1), s(2), s(3), s(4), s(5), 0, 7\} = \{1, 3, 2, 6, 4, 5, 0, 7\}$$

$$U^2(i) = s(11i \bmod 6) = \{s(0), s(5), s(4), s(3), s(2), s(1), 0, 7\} = \{1, 5, 4, 6, 2, 3, 0, 7\}$$

$$U^3(i) = s(7i \bmod 6) = \{s(0), s(1), s(2), s(3), s(4), s(5), 0, 7\} = \{1, 3, 2, 6, 4, 5, 0, 7\}$$

$$U^4(i) = s(i \bmod 6) = \{7, s(1), s(2), s(3), s(4), s(5), 0, s(0)\} = \{7, 3, 2, 6, 4, 5, 0, 1\}$$

(100) $U^j(i)$ [2]
 [3] (intra-row)

$$[\begin{matrix} 3 \\ 34 & 36 & 37 & 34 & 35 & 36 & 33 & 40 \\ 26 & 28 & 27 & 31 & 29 & 30 & 25 & 32 \\ 18 & 22 & 21 & 23 & 19 & 20 & 17 & 24 \\ 10 & 12 & 11 & 15 & 13 & 14 & 9 & 16 \\ 8 & 4 & 3 & 7 & 5 & 6 & 1 & 2 \end{matrix}]$$

가 DSP

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2
C=p+1 K K=C*R 1 R, C, p, μ, TypeD가 (200) 2 TypeD
(inter-row permutation pattern) [T(j)], [s(i)], 가
(intra-row permutation pattern increment arrangement value) [incr(j)] (200)
[T(j)], [s(i)], 가 [incr(j)] (202) (
[T(j)] [1] 가 [incr(j)] [5] [s(i)] [2] .

5

$$\in cr(j)=r(j)\text{mod}(p-1), j=0,1,\dots,R-1$$

[5] (permuted prime integer sequence) [r(j)]
[2] [T(j)]
[TI(j)] , [r(j)] . [6]

6

$$r(j)=q[TI(j)], j=0,1,\dots,R-1$$

[q(j)] [2] , TI(j) [7]

7

$$TI(j)=\text{pat8}(40\ K\ 159\)$$

TI(j)= pat7 (160 K 220) TI(j)= pat5 (201 K 480) TI(j)= pat7 (481 K 530) TI(j)= pat5 (531 K 2280) TI(j)= pat6 (2281 K 2480) TI(j)= pat5 (2481 K 3160)
TI(j)= pat6 (3161 K 3210)
TI(j)= pat5 (3211 K 5114)
, pat5= {4,15,5,14,3,6,17,7,11,1,10,19,8,12,2,18,16,13,9,0}
pat6= {4,15,5,14,3,6,16,7,18,1,19,17,8,11,2,13,10,12,9,0}
pat7= {9,8,7,6,5,4,3,2,1,0}
pat8= {4,3,2,1,0}

(200) (202)
i,j i,j 0 j가 1 가 R-1 i가 1 가
, i가 C-1 .

$[i \times r(j)] \bmod (p-1)$, $[s(i)]$, $[a^{i(j)}]$

$$U^j(i) = s[a^{i(j)}], j=0,1,2,\dots,p-2$$

$a^{i(j)} = [i \times r(j)] \bmod (p-1)$
 0" 1 가 , j 가 [incr(j)] 가 [9]가 [a^{i(j)}]
)] [a^{i(j)}] [9]

$$a^{i(j)} = [a^{i-1}(j) + \text{incr}(j)] \bmod (p-1)$$

$j=0,1,2,\dots,R-1, i=1,2,\dots,p-2, a^0(j)=0$
 (j) 가 i [a^{i-1}(j)] j a^{i(j)} [a(j)](204) i,j (206)
 , i가 0 (206) j a(j) i가 0 p-2 가 [incr(j)]
 가 (206) j (a(j+1)) (206) j (200) s[a(j)] ((207)
 [s(i)] (208) [a^{i(j)}] (208) s[a(j)] ((207) [U^j(i)] i,j s[a(j)] [T(j)]
] (207) (xaddr) TypeD가 1 [10] [11]

$$U^j(i) = s[a(j)] (0 \leq i \leq p-2)$$

$U^j(i) = 0 (i = p-1)$,
 $U^j(i) = p (i = p)$,
 $i = 0,1,2,\dots,C-1, j = 0,1,2,\dots,R-1$
 TypeD가 1
 $U^j(i) = p (i = 0, j = R-1)$,
 $U^j(i) = 1 (i = p, j = R-1)$

$$\text{xaddr} = C * T(j) + Uj$$

(214) 3 (207) [a(j)] (204) (xaddr) 3
 [a(j)] (204) i가 0 2 (402) [a(j)] 0
 (206) j (200) i가 "0" [s(i)] 가 (206) j
 1가 (400)

$[a^{i-1}(j)]$. 1가 (400) 가
 $[incr(j)]$ j (200) 1가 (400) .
 1가 (400) 2가 (404) 가 $[a(j)]$ 가 $[incr(j)]$ 가 , 1가 (400)
 가 1 (408) 가 (406) [5] 가 . , 2가 (404) $[-(p-1)]$
 $[a(j)]$ 가 $[incr(j)]$ 가 1가 (p-1) $\{a(j)+incr(j)\}-(p-1)$
 $[a(j)]$ 가 $[incr(j)]$ 가 (p-1) (p-1) 1가 (p
 -1) 2가 (404) 2가 $\{a(j)+incr(j)\}$ (p
 -(p-1) (406) 1 (408) 2가 (404) 2가 (406)
 2가 (404) 가 1 (408) 1 (408)
 (400) 1가 a(j)+incr(j) 2가 (406) 2가 (404) 1가
 -1) (p-1) 가 가 "0" 2가 $\{a(j)+incr(j)\}-(p$
 가 (p-1) 가 가 "1" 1가 가 (p-1) 1가 (p-1) 1
 가 가 가 i 0 2 (408)
 $[a(j)]$ j (206) 2가 (200) 1 (402) $[s(i)]$ 가
 $[a(j)]$ (204) $[U^j(i)]$ $[s(i)]$
 [4] $U^0(i)$, j가 "0" i가 0 $[s(i)]$ $[a(j)]$ $[s(i)]$ 0
 i , , (206) $[a(j)]$ 0 . "0" j (" $[s(i)]$
 0") i가 1 가 (206) $[s(i)]$ 가 . , "0" j (" $[s(i)]$
 (400) 가 $[incr(j)]$ 5 가 . 1가 5 1 (408)
 가 2가 (404) 가 . 2가 (404) 1가 5
 -(p-1) , -6 가 -1 (406) , (406) 2가 가
 1 (408)가 1가 (400) 1가 1가
 가 . 1 (408) 1가 5가 2
 (402) $[a(j)]$ (206) .
 $[s(i)]$ i [2]
 (200) 가 $[incr(j)]$ μ , p,
 K, R, C, K, p,
 TypeD K
 $[T(j)]$ $[a(j)]$ (204) $[s(i)]$ $[T(j)]$ (212)
 (207) . $[a(j)]$ (204) 가
 (200) $[s(i)]$ (208) $[s(i)]$ (208) 가
 $s[a(j)]$ (207) 가 .
 $[s(i)]$ (208) $[a(j)]$ (204) 가
 $[U^j(i)]$, $[T(j)]$ (212) $[s(i)]$ (208)
 $s[a(j)]$ (214) 가
 (214) 가 .
 가 , 가 .

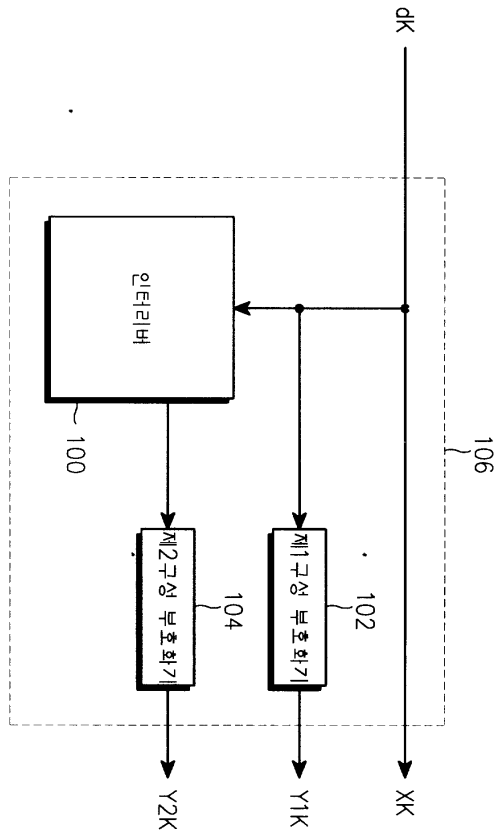
(57)

1. UMTS , , , , 가
 [incr(i)] 가 1가 1가 가 2가
 가 [a(j)] , [s(i)]
 , 가 UMTS
 2. 1 , , 가 가
 UMTS
 3. 1 , , / , ,
 UMTS 가
 4. 1 , , , 가 [incr(j)], [s(i)]
 , (TypeD), (K), (p), (μ), (R), (C),
 UMTS
 5. 2 , , [U^j(i)] [r(j)] [T(j)]
)] [Tl(j)] UMTS
 6. 2 , , , 가 [incr(j)]
 가 1가 1가 1가 - (p-1) 가 2가 2가 ,
 1가 1가 2가 2가 2가 1가 2가 ,
 2가 가 1 [s(i)] 2가 가 2가 가 1가
 가 가 [a(j)] , 1
 UMTS 가 [s(i)] 2 , , 1
 7. 1 , , 가 [incr(j)] , UMTS
 [12]

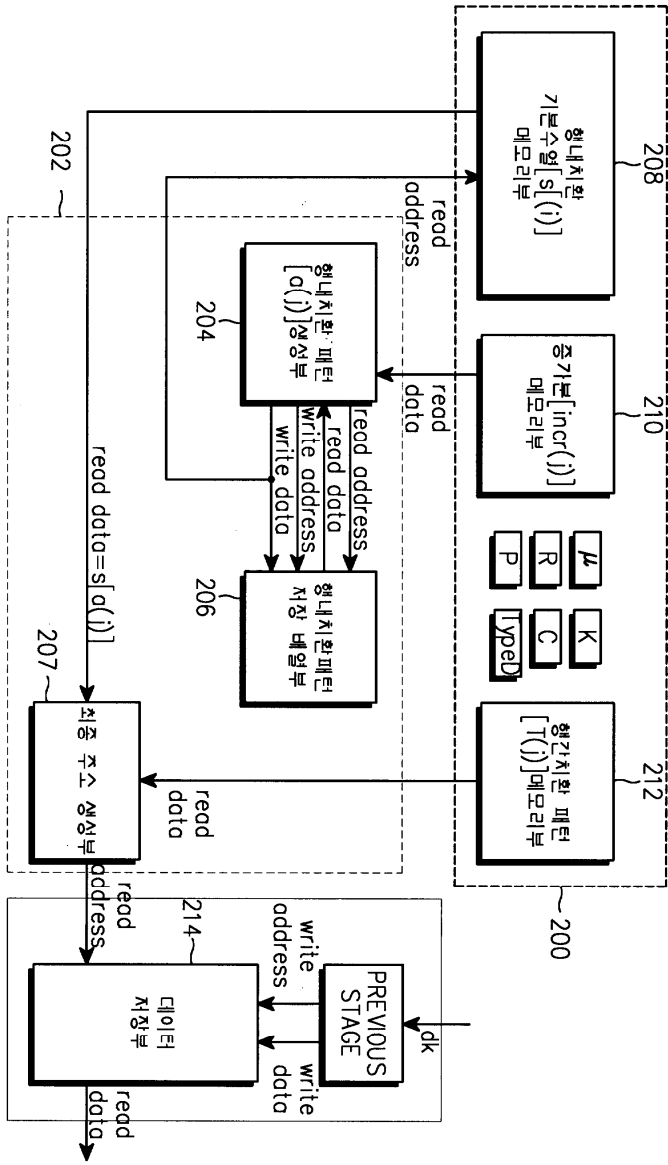
$$\in cr(j) = r^{Tl(j)} \text{mod}(p-1)$$

$r(j)$: , $incr(j)$: 가 , $Tl(j)$: , p : ,
 8.
 6
 2
 1가 가 UMTS
 9.
 가 $[T(j)]$ 가 $[a(j)]$ 가 $[incr(j)]$
 가 $[incr(j)]$
 $[s(i)]$
 $[U_j(i)]$ $[T(i)]$
 /
 10.
 가 $[T(j)]$ $[a(j)]$ 가 $[incr(j)]$
 $[s(i)]$
 11.
 가 2가 가 $[incr(j)]$ 가 1가 1가 $[s(i)]$
 $[U_j(i)]$
 $[T(i)]$
 /
 12.
 11
 13.
 14.
 15.

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