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(54) / /

2, 3, ..., 8 , 9 $\sum_{K=1}^8 Y_{K=1 \text{ 또는 } 0}$, K = 1, 2, 3, ..., 9 가 $\sum_{K=1}^8 Y_{K=1 \text{ 또는 } 0}$, K = 1, 2, 3, ..., 9 가

1,7), MTR=2 k 7 , 8/9 3 self - clocking 가 , 2/3 RLL(

1 / / .

2 8/9, MTR = 3, K = 7

3 2 8/9 MTR = 3, k = 7 decimal form .

4 MTR = 3, k 7 / 8 9
Look - up table .

/ PRML(Partial Response Maximum Likelihood; PRML .)
/ / .

()
가 .

(d, k) RLL (Run Length Limited) , " 1"

self - clocking " 0" d , k run length (d, k) .

" 1" " 0"

8/9(0,3) , 8/9(0,4/4) 1/2(2,7) , 2/3(1,7) ,
'd' '2' '1' '1' '1' '0' 'd' 2/3(1,7)
(code

) 가 , 8/9 RLL(0,3),
 8/9 RLL(0.4/4) 가 zero
 , 가 가 가 가
 , SNR , 가 , 가

channel channel channel 1

[1]

$$(1+D)^{n}, n=1,2,\dots \quad \text{또는} \quad (1-D)(1+D)^{n}, n=1,2,\dots$$

PRML precoding controlled ISI targ
 et response 2 Viterbi decoder .

[2]

$$d_k = a_k + a_{k-1}, \quad (\text{또는} \quad d_k = a_k - a_{k-2})$$

Channel n=1 PRML
 가 , ISI(InterSymbol Interference)가
 가 RLL(1,7) , zero ISI
 0.3) RLL(0.4/4) 가 , RLL(1,7)
 , 가 가 가 / 가 8/9 RLL(
 가 SNR , 가 가 가
 , 가 (rade off) 가
 , 가
 2/3 RLL(1,7) , , 8/9 RLL(0,3), 8/9 RLL(0,
 4/4) 가 SNR
 , 가 가
 ,
 Run(MTR) 2/3 RLL(1,7)
 SNR 2
 MTR

, MTR / 가 .

, PRML / 가

$X_{K=1 \text{ 또는 } 1}$, K = 1, 2, 3, ..., 8 , 9 $Y_{K=1 \text{ 또는 } 0}$, K = 1, 2, 3, ..., 9
가 ;
가 ;

, 3 .

, 7 .

9 , 4 8 ; 4 4 9 4
가 " " 8 ; , " " 가 8 가 4
9 .

9 9 8 $X_{K=1 \text{ 또는 } 1}$, K = 1, 2, 3, ..., 8 9 $Y_{K=1 \text{ 또는 } 0}$, K = 1, 2, 3, ..., 9 .

/ ;

; ;

;

;

;

(modulation codes) MTR K 2

MTR=3 k zeros run lengths , k

(gain control) , self - clocking k

(digital data magnetic recording) PRML (constraint) (disk memory devices) (d

(code constraint) ML detection PR (signaling system) 가

, MTR , k 8/9, MTR=3, k=7 가

8/9 3 (byte - oriented)

(minimum redundancy) 가 , 8/9

3 block look - up tables

1 / / , , ,

1 , 100 , 102 , 104

112 106 , 108 , 110 ,

user data (106) (100) user data (112)

(100)

(1001) (1003)

channels (1005) , (4)

(5) (106) (106)

(6) (7)

(112)

2 8/9 3 , K=7

, ML detection PR

가

Run 3 가 MTR 2 가 run

가 , 2/3 RLL(1,7), MTR=2 , 8/9 SNR

(Viterbi detector) 3 (path)

(detector) constraint가 7
 (complexity) self - clocking
 (gain control) k c

3

(MTR) (200) MTR = 3, k = 7
 8/9 8 - 9 - (bit codeword)
 257 , 8 9
 (read backward symmetry) (partition) 9
 가 8 가 8 9
 lock code 9 Y 3 . Y가 8/9 MTR=3;k=7 b

[3]

$$Y=[Y_1, Y_2, Y_3, Y_4, Y_5, Y_6, Y_7, Y_8, Y_9]$$

가 3 가 (201) , 8/9 MTR=3
 MTR run 9 4 가 2
 MTR=3 4 boolean 9

[4]

$$\overline{(Y_1, Y_2)} \overline{(Y_1, Y_2, Y_3, Y_4)} \overline{(Y_2, Y_3, Y_4, Y_5)} \overline{(Y_3, Y_4, Y_5, Y_6)} \overline{(Y_4, Y_5, Y_6, Y_7)}$$

$$\overline{(Y_5, Y_6, Y_7, Y_8)} \overline{(Y_6, Y_7, Y_8, Y_9)} \overline{(Y_7, Y_8, Y_9)} = 1$$

" " K = 7 (206) , k
 " " 가 5 4 " " run lengths 9 7 "
 " run length , 5 .

[5]

4 9 293 3 4
 9 257 . , 1 가 .
 " " (207) , 9 8
 , 8 4

4 9 4
 9 , 5 0 (208), , 4 4 5 9
 가 " 0" 4 4 가
 8 8 9 143 .

, 207 , 5 가 " 0" , 8 가 9
 .(210) , 207 8 9
 . , 28 - 143 9 가 " 1" 9
 9 210 8 9
 8 가 9 .

(Look - up table) Karnough Map .(212)

3 2 8/9 =3; k=7 decimal form .
 4 =3;k=7 / 8
 9 Look - up table .

non - zero ML detection PR (modulation codes)
 가 (gain control circuit)
 ML detector .

가 / , 2/3 RLL(1,7), MTR=2 / , 8/9 3
 , k 7 self - clocking

(57)

1.

9 $Y_{K=1 \text{ 또는 } 0}$, K = 1, 2, 3, ... , 9 $X_{K=1 \text{ 또는 } 1}$, K = 1, 2, 3, ... , 8

;

가

;

가

2.

1 , 3 .

3.

1 , 7 .

4.

1 ,
8 4 ; 4 9 4

9 가 " " ;
, " " " 가 8 가 4 4 8

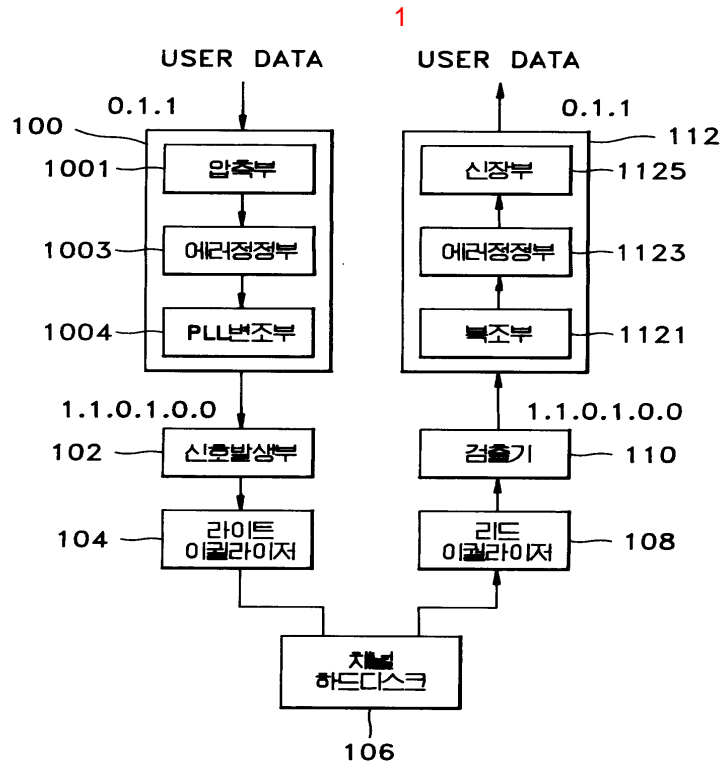
5.

9 8

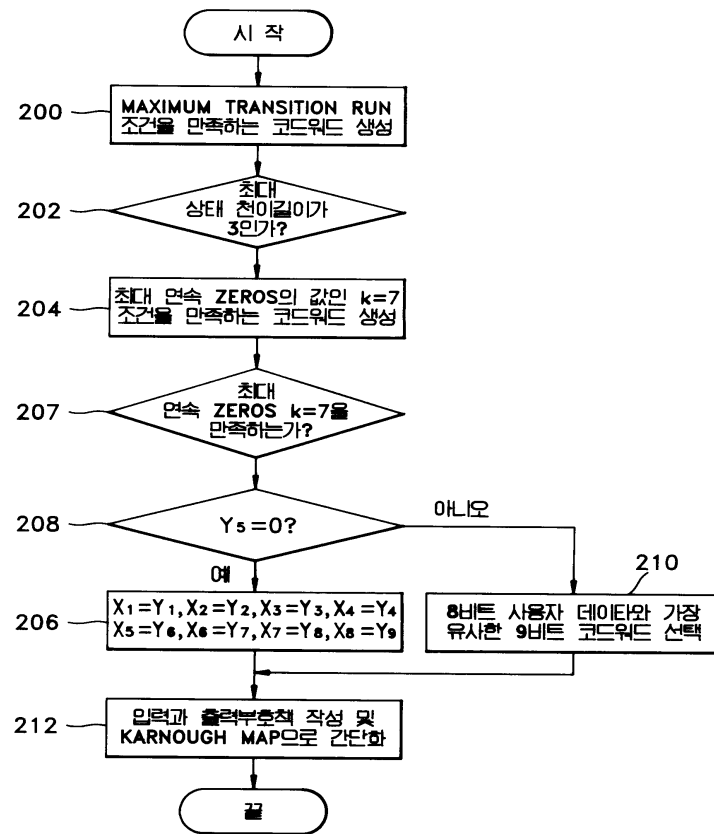
9 $\sum_{K=1}^9 Y_{K=1} \neq 0$, K = 1, 2, 3, ..., 9
8 $\sum_{K=1}^9 X_{K=1} \neq 0$, K = 1, 2, 3, ...,

6.

, ;
;
;
;
;
/



2



3

17	58	104	153	198	257	298	342
18	59	105	154	200	258	299	344
19	65	106	155	201	259	300	345
20	66	107	156	202	260	301	346
21	67	108	157	203	261	302	347
22	68	109	161	204	262	305	348
24	69	110	162	205	264	306	349
25	70	113	163	206	265	307	353
26	72	114	164	209	266	308	354
27	73	115	165	210	267	309	355
28	74	116	166	211	268	310	356
29	75	117	168	212	269	312	357
33	76	118	169	213	270	313	358
34	77	129	170	214	273	314	360
35	78	130	171	216	274	315	361
36	81	131	172	217	275	321	362
37	82	132	173	218	276	322	363
38	83	133	174	219	277	323	364
40	84	134	177	220	278	324	365
41	85	136	178	221	280	325	366
42	86	137	179	225	281	326	369
43	88	138	180	226	282	328	370
44	89	139	181	227	283	329	371
45	90	140	182	228	284	330	372
46	91	141	184	229	285	331	373
49	92	142	185	230	289	332	374
50	93	145	186	232	290	333	
51	97	146	187	233	291	334	
52	98	147	193	234	292	337	
53	99	148	194	235	293	338	
54	100	149	195	236	294	339	
56	101	150	196	237	296	340	
57	102	152	197	238	297	341	

4

00000000	000110001	00100100	001000100	01001000	010001000
00000001	000010001	00100101	001000101	01001001	010001001
00000010	000010010	00100110	001000110	01001010	010001010
00000011	000010011	00100111	001010110	01001011	010001011
00000100	000010100	00101000	001001000	01001100	010001100
00000101	000010101	00101001	001001001	01001101	010001101
00000110	000010110	00101010	001001010	01001110	010001110
00000111	000110010	00101011	001001011	01001111	010011101
00001000	000011000	00101100	001001100	01010000	010111000
00001001	000011001	00101101	001001101	01010001	010100001
00001010	000011010	00101110	001001110	01010010	010100010
00001011	000011011	00101111	001011101	01010011	010100011
00001100	000011100	00110000	001110100	01010100	010100100
00001101	000011101	00110001	001100001	01010101	010100101
00001110	000110011	00110010	001100010	01010110	010100110
00001111	000110100	00110011	001100011	01010111	010110110
00010000	000110000	00110100	001100100	01011000	010101000
00010001	000100001	00110101	001100101	01011001	010101001
00010010	000100010	00110110	001100110	01011010	010101010
00010011	000100011	00110111	001110110	01011011	010101011
00010100	000100100	00111000	001101000	01011100	010101100
00010101	000100101	00111001	001101001	01011101	010101101
00010110	000100110	00111010	001101010	01011110	010101110
00010111	000110110	00111011	001101011	01011111	010110111
00011000	000101000	00111100	001101100	01100000	011011000
00011001	000101001	00111101	001101101	01100001	011000001
00011010	000101010	00111110	001101110	01100010	011000010
00011011	000101011	00111111	000110101	01100011	011000011
00011100	000101100	01000000	010011000	01100100	011000100
00011101	000101101	01000001	010000001	01100101	011000101
00011110	000101110	01000010	010000010	01100110	011000110
00011111	000111011	01000011	010000011	01100111	011010110
00100000	001011000	01000100	010000100	01101000	011001000
00100001	001000001	01000101	010000101	01101001	011001001
00100010	001000010	01000110	010000110	01101010	011001010
00100011	001000011	01000111	010010110	01101011	011001011

4a

01101100	011001100	10010000	100111000	10110100	101100100
01101101	011001101	10010001	100100001	10110101	101100101
01101110	011001110	10010010	100100010	10110110	101100110
01101111	011011101	10010011	100100011	10110111	101101101
01110000	000111001	10010100	100100100	10111000	101101000
01110001	011100001	10010101	100100101	10111001	101101001
01110010	011100010	10010110	100100110	10111010	101101010
01110011	011100011	10010111	100110110	10111011	101101011
01110100	011100100	10011000	100101000	10111100	101101100
01110101	011100101	10011001	100101001	10111101	101101101
01110110	011100110	10011010	100101010	10111110	101101110
01110111	000111010	10011011	100101011	10111111	001010010
01111000	011101000	10011100	100101100	11000000	001010011
01111001	011101001	10011101	100101101	11000001	100010001
01111010	011101010	10011110	100101110	11000010	100010010
01111011	011101011	10011111	100111011	11000011	100010011
01111100	011101100	10100000	101011000	11000100	100010100
01111101	011101101	10100001	101000001	11000101	100010101
01111110	011101110	10100010	101000010	11000110	001010100
01111111	001010001	10100011	101000011	11000111	001010101
10000000	100011000	10100100	101000100	11001000	001011001
10000001	100000001	10100101	101000101	11001001	100011001
10000010	100000010	10100110	101000110	11001010	100011010
10000011	100000011	10100111	101010110	11001011	100011011
10000100	100000100	10101000	101001000	11001100	100011100
10000101	100000101	10101001	101001001	11001101	001011010
10000110	100000110	10101010	101001010	11001110	001011011
10000111	100010110	10101011	101001011	11001111	001011100
10001000	100001000	10101100	101001100	11010000	001110001
10001001	100001001	10101101	101001101	11010001	100110001
10001010	100001010	10101110	101001110	11010010	100110010
10001011	100001011	10101111	101011101	11010011	100110011
10001100	100001100	10110000	101110100	11010100	100110100
10001101	100001101	10110001	101100001	11010101	100110101
10001110	100001110	10110010	101100010	11010110	001110010
10001111	100011101	10110011	101100011	11010111	001110011

4b

11011000	000110101	11100110	010011010	11110100	010110101
11011001	100111001	11100111	010011011	11110101	010111001
11011010	100111010	11101000	010011100	11110110	010111010
11011011	010010001	11101001	101011001	11110111	011010001
11011100	010010010	11101010	101011010	11111000	011010010
11011101	010010011	11101011	101011011	11111001	011010011
11011110	010010100	11101100	101011100	11111010	011010100
11011111	010010101	11101101	010110001	11111011	011010101
11100000	010011001	11101110	010110010	11111100	011011001
11100001	101010001	11101111	010110011	11111101	011011010
11100010	101010010	11110000	010110100	11111110	011011011
11100011	101010011	11110001	101110001	11111111	011011100
11100100	101010100	11110010	101110010		
11100101	101010101	11110011	101110011		