

(, MPEG) (transcoding) (de
 scription) (transcoding hints metadata) ,
 , (session) , " GOP (group of pictures)"
 (, MPEG) , A/V
 / (, " A/V") A/V
 .
 , , A/V 가 가 .
 가 . A/V 가 , , A/V A/V
 .
 , MPEG (Moving Pictures Experts Group) A/V
 A/V , , ,
 , MPEG A/V MPEG A/V (transcoding) .
 :

W009838800A1: O.H. Werner, N.D. Wells, M.J. Knee: (Digital Compress
 ion Encoding with improved quantization), 1999, ;

US5870146: Zhu; Qin - Fan: (Device and method for digital
 video transcoding), 1999;

W009929113A1: Nilsson, Michael, Erling; Ghanbari, Mohammed: (Transcoding), 1999;

US5805224: Keesman; Gerrit J, Van Otterloo; Petrus J.: (Me
 thod and Device for Transcoding Video Signal), 1998;

W009943162AL Golin, Stuart, Jay: (Motion vector extrapolat
 ion for transcoding video sequences), 1999;

US5838664: Polomski; Mark D.: (Video teleconferencing system
 with digital transcoding), 1998:

W009957673A2: Balliol, Nicolas: (Transcoding of a data stream), 1999;

US5808570: Bakhmutsky; Michael: 가 2 -
(Device and Method for pair - matching Huffman - Transcoding and high performance variable length decoder with two - word bitstream segmentation which utilizes the same), 1998;

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W009923560A1: LUDWIG, Lester; BROWN, William; YUL, Inn, J.; VUONG, Anh, T.; VANDERLIPPE, Richard; BURNETT, Gerald; LAUWERS, Chris; LUI, Richard; APPLEBAUM, Daniel: 가
(Scalable networked multimedia system and application), 1999.

A/V
" SMPTE" (The Society of Motion Picture and Television) MPEG - 2
(327M - 2000) (macroblock) 256 가
(GOP , ,
) A/V
A/V 가 MPEG 256
가 (, 가) A/V

A/V
, A/V (, A/V) A/V
, A/V 가
, A/V

A/V -
(transcoding hints metadata representation)

A/V 가 2
A/V

(, A/V)

, : 1) A/V , 2) 가
가 () A/V ,

A/V , MPEG - 2 MPEG - 4 A/V (, - , - , - , -)

1 A/V 가 (transcoding system)

2 (Group of Pictures, " GOP")

3

4 3

5

6

7 (GOP)

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16

1 가 (100)
1 , A/V (102) A/V (103), A/V (1
06), (104), A/V (105)
A/V (103)
A/V , AV (103) DV(Digital Video) (111)
가 , MPEG - 4 (112) (10 kbit/s) MPEG - 4
s (" MP@ML") MPEG - 2 (101) 5 Mbit/
02) MPEG A/V (1

1 , A/V (102) 가 가 (113)
MPEG - 4 A/V PDA (personal digital assistant)(107),
A/V (108), A/V (console)(109), ITU - T (International Telecommunications U
nion Technical Standards Group) (110) , (113)
A/V . A/V (107, 108, 109, 110) (
) 가 (113)

PDA(107)
, A/V (106) , European 25 fps (frames pe
r second) 5 Mbit/s MPEG - 2 A/V (102) 720 x 480 pel
MPEG - 4 500 kbit/s 15 fps MPEG - 4 PDA(107) 352 x 240 pel
. A/V (106) A/V
A/V (107, 108, 109, 110) (105)
(101) (104)

1 (" 1 ") A/V (103) A
 /V (106) (" 2 ") (106)
 가 (113) .가 (113) , , DV
 (114) A/V (103) .

2 (201) A/V (202) , , GOP
 (interlace) (progressive) (20
 3) , , GOP , ,
 (207) A/V (201) A/V (202)
 , (203) . (207)
 가 (205) A/V (201) 1 (204) (206) A/V
 2 (208) A/V (209) . A/V (206)
 (205)

3 4 가 , 가 . MPEG -
 가 가
 () . ,
 , DCT -
 ,
 (tracking)

3 (,) (3
 01) (, GOP , , , ...)가 ,
 (302) , (, GOP ,
 가) . (303) (transcodin
 g metadata hints state) , M (I/P -
)

4 3 GOP , , , 가
 , GOP 가 , DC
 T (texture activity) (edge) 가 , 3
 3 4 ,
 " 3" (403) ,
 , " 2" (402)
 , " 1" (401) ,

A/V (crossfading) ,
 가 ,

5
 5 (500) A/V (501), (502),
 (503)

(504) , DCT - ,
 , P- B-
 (Intra - macroblock) 가 , B- P-
 I- . (Roy Wang, Thomas Huang: " MPEG

(Fast Camera motion Analysis in MPEG domain)" , IEEE International Conference on Image Processing, ICIP 99, Kobe, Japan, 1999 10) - DCT
 . P- B- , DCT - (DC 2AC) Shih - Fu Chang, D
 avid G. Messerschmid: " MC - DCT (Manipulation and Composition of MC - DCT c
 ompressed video)" , IEEE Journal on Selected Areas in Communications, vol. 8, 1996

Peter Ku
 hn: " (Method and Apparatus for compressed domain
 feature point registration and motion estimation)" , 1999 12 , PCT , AV
 MPEG - 1, MPEG - 2, MPEG - 4, ITU - T H.261, ITU - T H.263 DCT
 가 DV DCT -
 가 가 , Peter Kuhn: " MPEG - 4
 , VLSI (Algorithms, Complexity Analysis and VLSI Architectures for MPEG - 4 Motion E
 stimation)" , Kluwer Academic Publishers, 1999 . DCT - K.R. R
 ao, P. Yip: " - , (Discrete Cosine Transform - Algorithms, Advantag
 es, Applications)" , Academic Press 1990 - DCT - (p
 el domain ;) Bruce D. Lucas, Takeo Kanade: "
 (An iterative registration technique with an application to stereo vision)" , Intern
 ational Joint Conference on Artificial Intelligence, pp. 674 - 679, 1981

(505) (504)
 6 8 , M. Tekalp: " (Digi
 tal Video Processing)" , Prentice Hall, 1995

()
 - (interlaced - progressive conversion)
 GOP / (506) , K.R. Rao, P Yip
 : " - , (Discrete Cosine Transform - Algorithms, Advantages, Applic
 ations)" , Academic Press 1990 K.W. Chum, K.W. Lim, H.D. Cho, J.B. Ra: "
 (An adaptive perceptual quantization algorithm for video encoding)" , IEEE Transactio
 ns on Consumer Electronics, Vol. 39, No. 3, 1993 8 , DCT

(507) Peter Kuhn: "
(Method and Apparatus for compressed domain feature point registration and motion estimation)", PCT , 1999 12 (510)
(509) , (510)
6, 7, 8

(511) - (512) /
(513) , 15
(514) , 16
가

6 (601)
가 " frame" , " nframes"
(GOP, group of pictures) (602)
GOP 가 가 (603) /GOP가
, 7 (" "), (604)
(615) (604) " last_gop_start" 가 " new_gop_start"
(608, 609) " frame" 1 " last_gop_stop" " frame - 1"
(610) " last_gop_stop" 1 8
(611) (605), / (606), (607)
(612) 가
, " nframes" (GOP)
, GOP (" new_gop_start") , " nframes"
0 " frame" " new_gop_start" 가 (615)
(" ")
가 (614) 가 가 , (602)
가

7 GOP
(701) 6 " nframes" M (I/P) 가
, " " 가 (702) 가 1 가
(" "), (703) , " nframes" GOP " gop_min" 가
(702) 가 " " GOP (705) (703)
가 " " , GOP (705) (703) 가 " " (704)
04) , " nframes" GOP " gop_max" 가 (704)
가 " " , GOP (706) , 가

8 GOP A/V 가
DCT - / 가
A/V , A/V

sum", " new_seg" 가 . 8 , (801) " frame_no", " last_gop_start", "
 " sum" " new_seg" 0 . " frame no" " last_gop_start" 가 ,
 (" frame_no") 가 . (802) " sum" 가
 가 (" "), (803) " frame_no" 가 " last_gop_stop"
 (804) " sum" " summax" 1/8 가 (804)
 " summax" " last_gop_start" " last_gop_stop"
 . 200
 (804) 가 " " , 가 8 1 (806)
 (1)가 . , (805) " sum" " summax" 1
 /4 가 . (" "), (2) 1 (8
 07) (" ") (3) (1)가
 (808) , . (804, 805)

C - (pseudo C - code) MPEG - 7
 D DS가 .

9 A/V DS(901)
 . 9 DS(904) DS(902) A/V DS(901)
 (906) DS(904) , DS(907) DS(907)
 (906) . 14 - DS(909)
 DS(907) DS(907) 16
 DS(911) DS(908) , 14 -
 DS(910) , 16
 DS(912) DS(902) , DS(903)가
 DS(903) , 10 DS(905)가 .

10 DS(1001) , 11 DS(1
 002) , 12 DS(1003) . 가 ,
 DS(1001) 13 DS(1004) , 15
 가 DS(1005) .

11 A/V A/V
 (, 10 DS(1002)) . 11 ,
 :

* bitrate < int> , A/V .

* size_of_pictures < 2*int> , x y A/V .

* number_of_frames_per_second < int> , .

* pel_aspect_ratio < float> , .

* pel_colour_depth < int> , .

* usage_of_progressive_interlaced_format < 1 > , 가

* usage_of_frame_field_pictures < 1 > , .

* compression method < int> , , MPEG - 1, MPEG - 2, M
PEG - 4, DV, H.263, H.261 . ,
가 .

* GOP_structure I, P, B - (run length) . , MPEG - 2
I - , DV 가 .

12 A/V A/V
. 12 , :

* bitrate < int> , A/V .

* size_of_pictures < 2*int> , x y A/V .

* number_of_frames_per_second < int> , .

* pel_aspect_ratio < float> , .

* pel_colour_depth < int> , .

* usage_of_progressive_interlaced_format < 1 > , 가

* usage_of_frame_field_pictures < 1 > , .

* compression method < int> , , MPEG - 1, MPEG - 2, M
PEG - 4, DV, H.263, H.261 . ,
가 .

* GOP_structure I, P, B - . , GO
P 가 . GOP , I -

13 A/V A/V
(, 11 DS(1004)) . 13 ,
:

* use_region_of_interest_DS < 1 > , 가
가 .

* region_of_interest_DS가 , motion_trajectory_D shape_D (가
: boundary_box_D, MB_shape_D, shape_D)

. MB_shape_D (16x16) . Motion_traj
 ictory_D , region_of_interest_DS .
 region_of_interest_DS shape_D motion_trajectory_D 가 .
 , region_of_interest_DS) MPEG - 4 MPEG - 4
 MPEG - 4
 . region_of_interest_DS .

* use_editing_effects_transcoding_hints_DS < 1 > , 가
 가 가 .

* camera_flash 가 가 (entry) .
 , < int> Peter
 Kuhn: " MPEG - 4 , VLSI (Algorithms, Complecity Analysis an
 d VLSI Architectures for MPEG - 4 motion estimation)" , Kluwer Academic Publishers, 1999
 () / 가 , camera_flash
 2 , 2 (가 , 가)
 2 ,
 (" DS")

* cross_fading 가
 , 2 < int> .
 , /
 , 가 .
 , 가

*black_pictures 가
 , 가 .
 - DCT 가 , .

* fade_in cross_fading ,
 , (masking) , 가 ,

* fade_out , fade_in .

* abrupt_change (shot) < int > , 3
 . abrupt_change
 가 , A/V
 millisecond ,
 1

* use_motion_transcoding_hints_DS < 1 > , -

* number of regions - 가 .

* for_every_region < 1 > , 가 .
 (,)가 .
 , 가 .
 ()
 / (/) GOP (Group of Pictures)
 .

14 A/V () /
 (, 9 -
 DS (909, 910) . 14 ,
 :

* start_frame < int > , A/V .

* nframes < int > , A/V .

* I_frame_location A/V I- 가 가 .

* select_one_out_of_following < 2 > , 4가 I- .

* first frame < 1 > , (default) I- . 1 A/V
 A/V A/V P- B-

* List of frames A/V - . A/V
 - k , < k
 *int> .

* first_frame_and_every_k_frames < int > , 1 k A/V
 I- .

* no_I_frame < 1 > , A/V I- , A/V
 가 (-) .

* quantizer_scale < int> , A/V .
 * target_bitrate < int> , A/V .
 * target_min_bitrate < int> , A/V ().
 * target_max_bitrate < int> , A/V ().
 * use_transcoding_states < 1 > , 가 A/V .
 * transcoding_state_nr < int> , .
 가 , 16 가 .
 * add_new_transcoding_state < 1 > , 가 .
 가 . add_new_transcoding_state 가 " " , .
 가 .
 * remove_transcoding_state 가 .
 가 , (:< int>)가 .
 * use_encoding_complexity_description < 1 > , 15 .
 15 A/V A/V , .
 * use_feature_points < 1 > , 가 .
 *select_feature_point_method < 2 > , .
 * number_of_new_feature_points 3 .
 , < nframes*int> . (metric) .
 * feature_point_metrics < int> : , , , .
 * use_equation_description - < int> .
 * use_motion_description < 1 > , - .
 * select_motion_method < 4 > , .
 * param_k_motion < nframes*k*int> , k .

* X_I top, X_P top, X_B top (field_vbv_complexities < int> , 12).

* X_I bot, X_P bot, X_B bot (field_vbv_complexities < int> , 12).

, , 가 , 가 , . , .

(57)

1.

/ / : (transcoding target bitstream parameters) ;

(transcoding hints metadata) ;

;

A/V (segments) ;

A/V ;

A/V , / .

2.

1 ,

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2 ;

2 ;

2 ;

2 (pel) (aspect ratio) ;

2 ;

2 (progressive format) ;

2 (interlaced format) ;

2 ;

2 (hold) ;

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3.

2 ,

MPEG (Moving Pictures Expert Group)

, / .

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ITU - T (International Telecommunications Uni

on Technical Standards Group)

/ .

5.

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1 GOP

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1 1 ;

1 / (texture/edge) ;

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(parametric motion model)

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MPEG - 4

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A/V
(temporal segments)

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26.

24 ,

A/V
tial segments)

1 , / (spa

27.

24 ,

A/V
2 2 , / 1 GOP (extrapolate) 2 GOP

28.

24 ,

A/V 2 , / 1 2

29.

28 ,

A/V , / 2 1 1

30.

24 ,

A/V , / 2 1 1

31.

30 ,

A/V 1
2 , /

32.

30 ,

A/V 1
2 , /

33.

30 ,

A/V 1
2 , / 1

34.

30 ,

A/V 1
2 (de - interlacing) , / 1

35.

24 ,

A/V 1
2 , /

36.

24 ,

A/V 1
2 , /

37.

24 ,

A/V 1
2 , / 1

38.

24

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A/V
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52.

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GOP

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(description) ;

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A/V

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A/V

A/V

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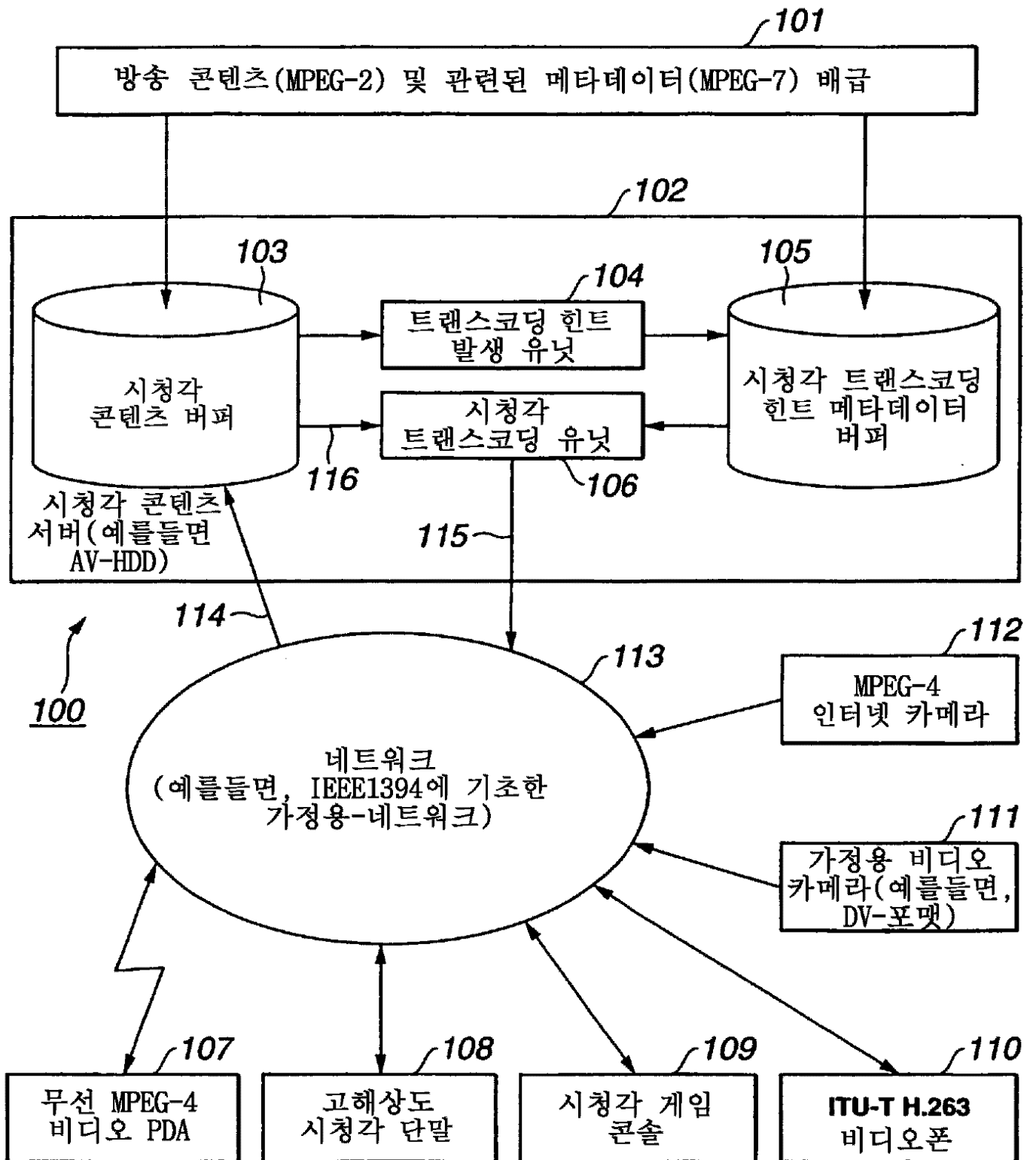
;

, /

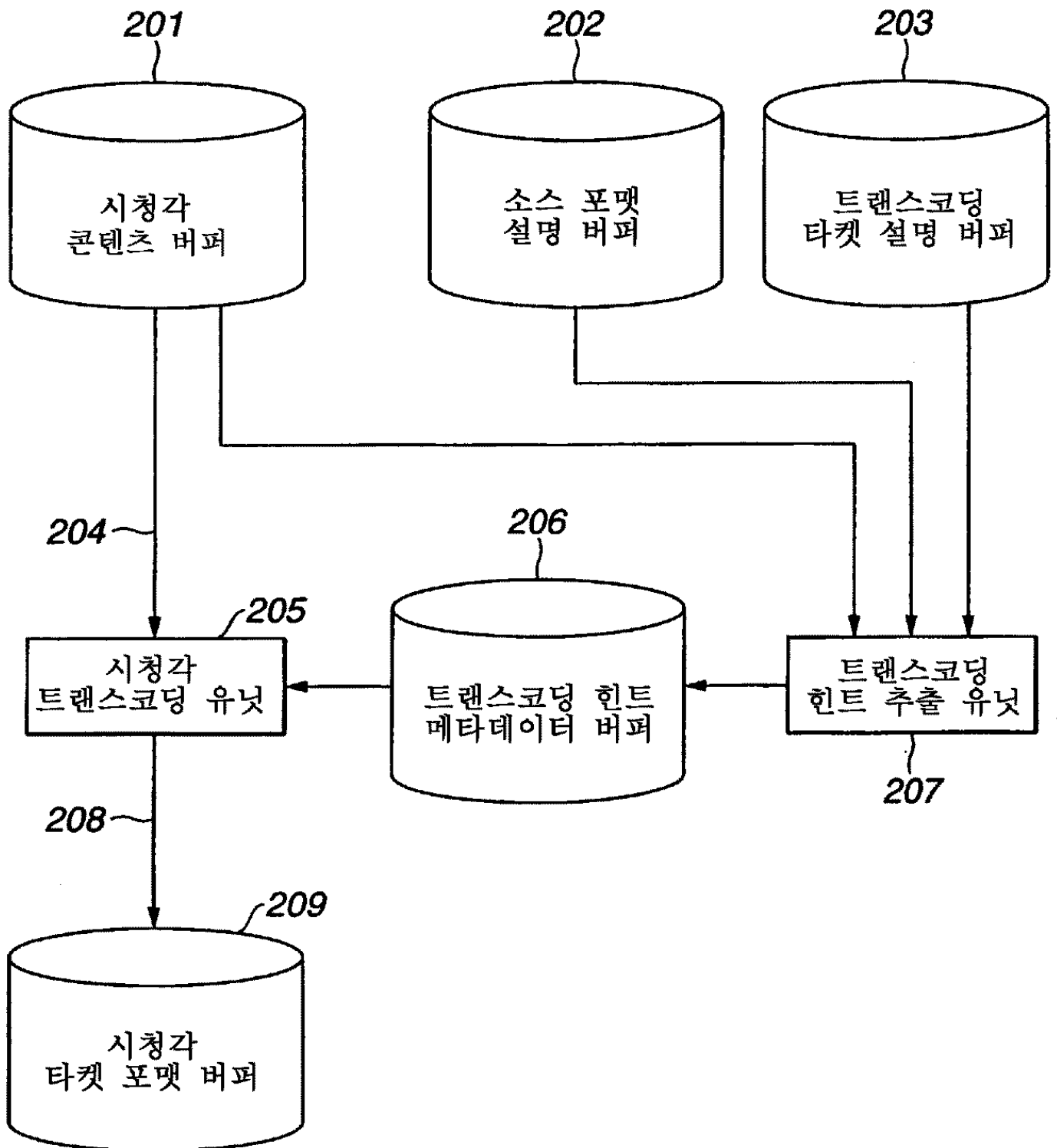
,

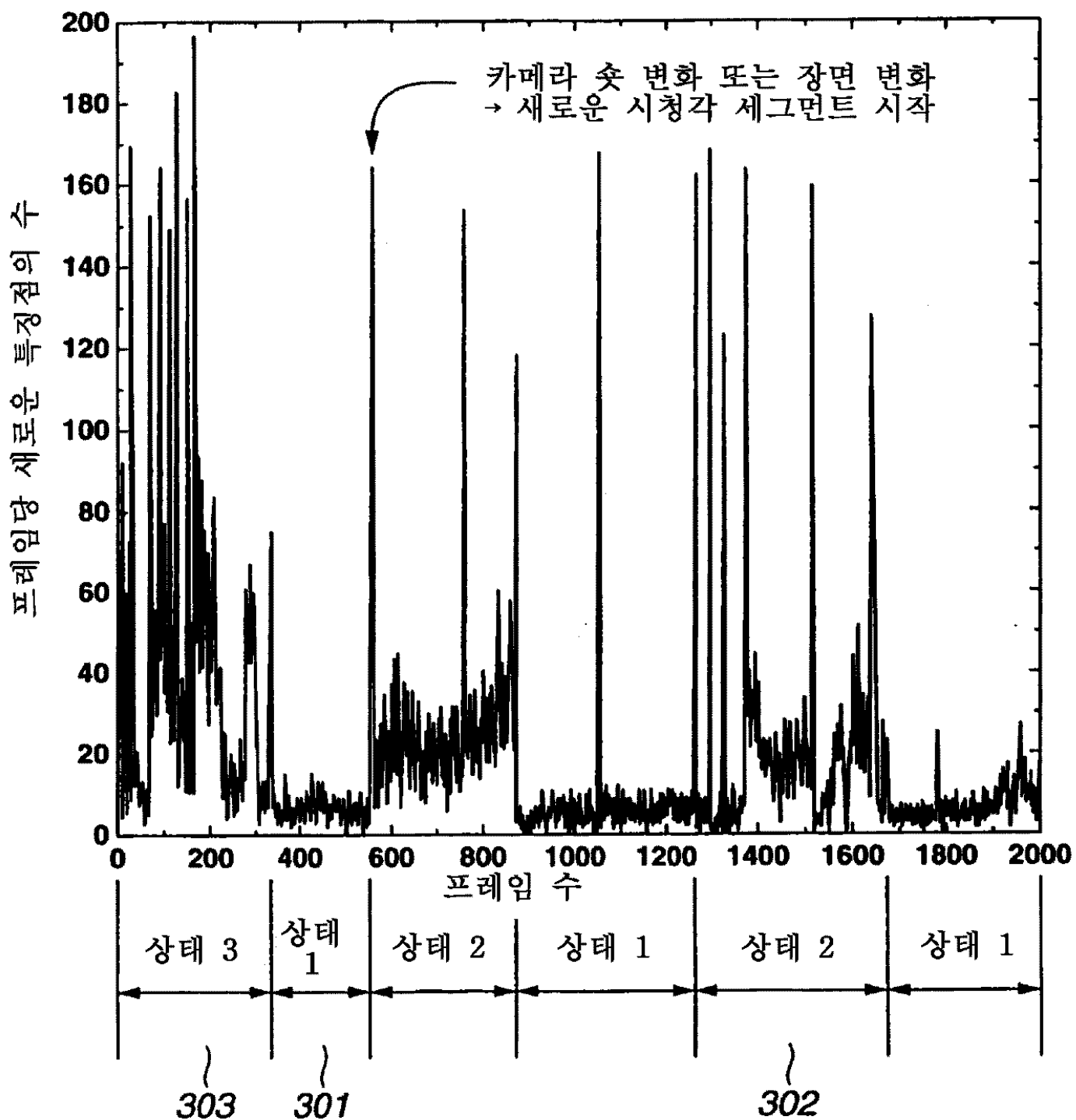
,

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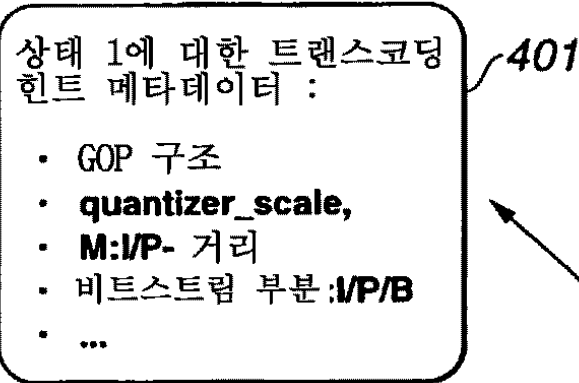


2

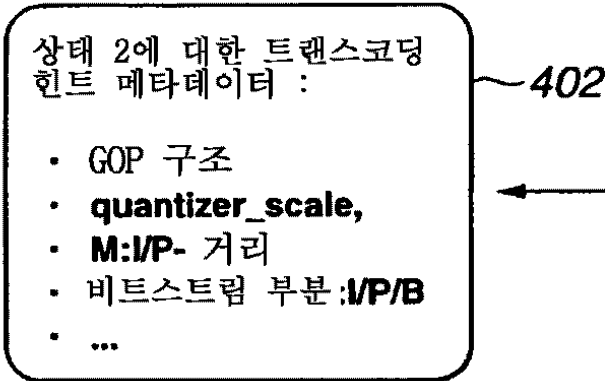




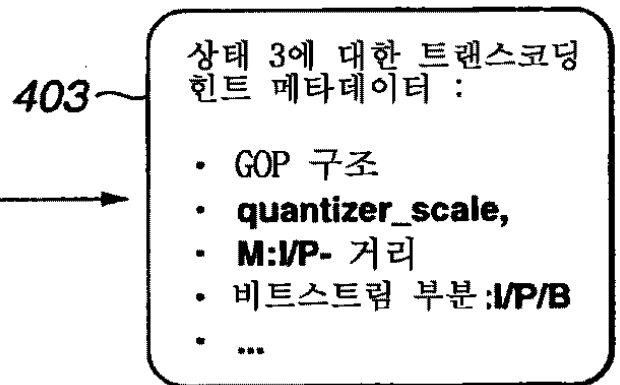
트랜스코딩 힌트 상태 1:
"낮은 장면 액티비티"

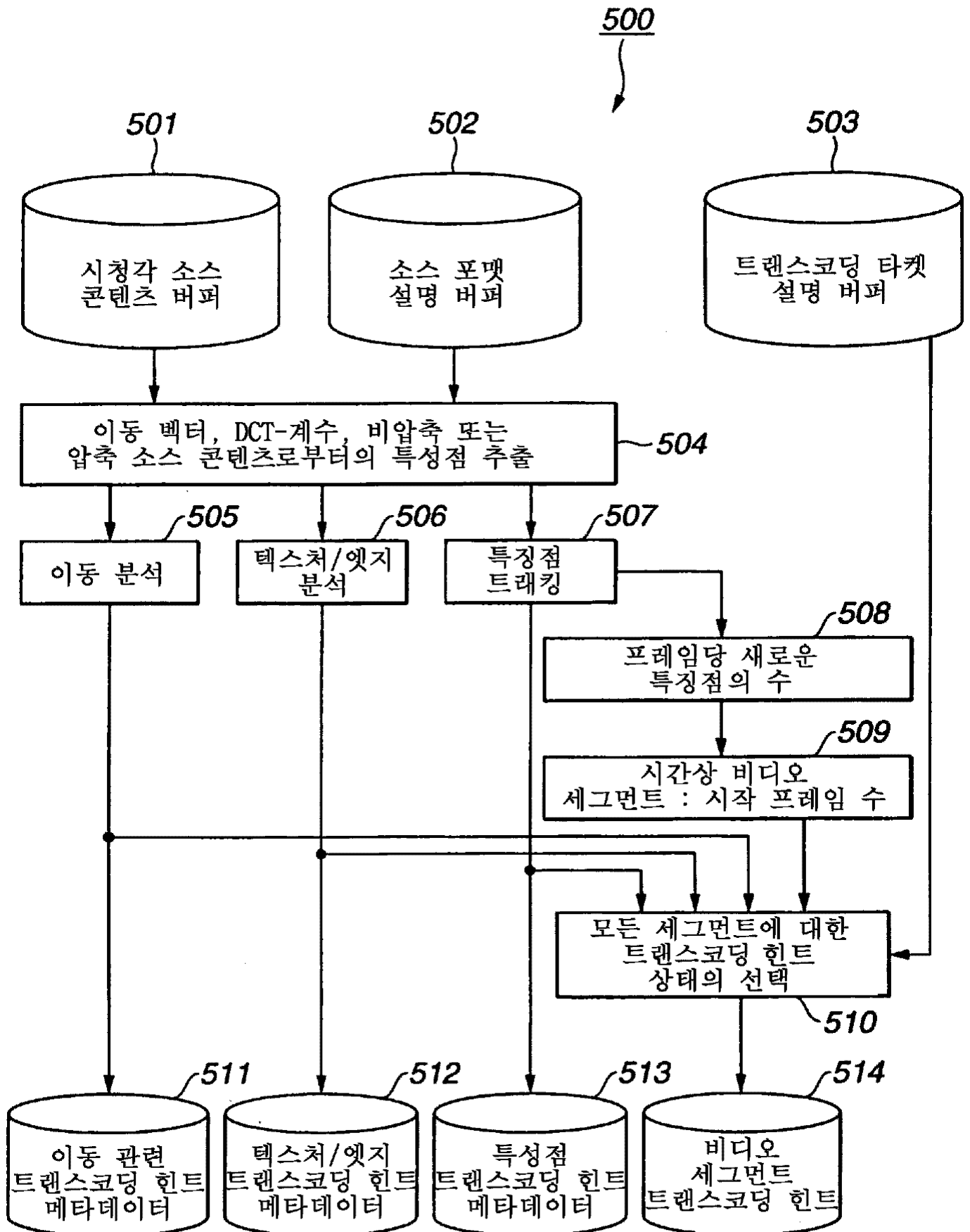


트랜스코딩 힌트 상태 2:
"매체 장면 액티비티"

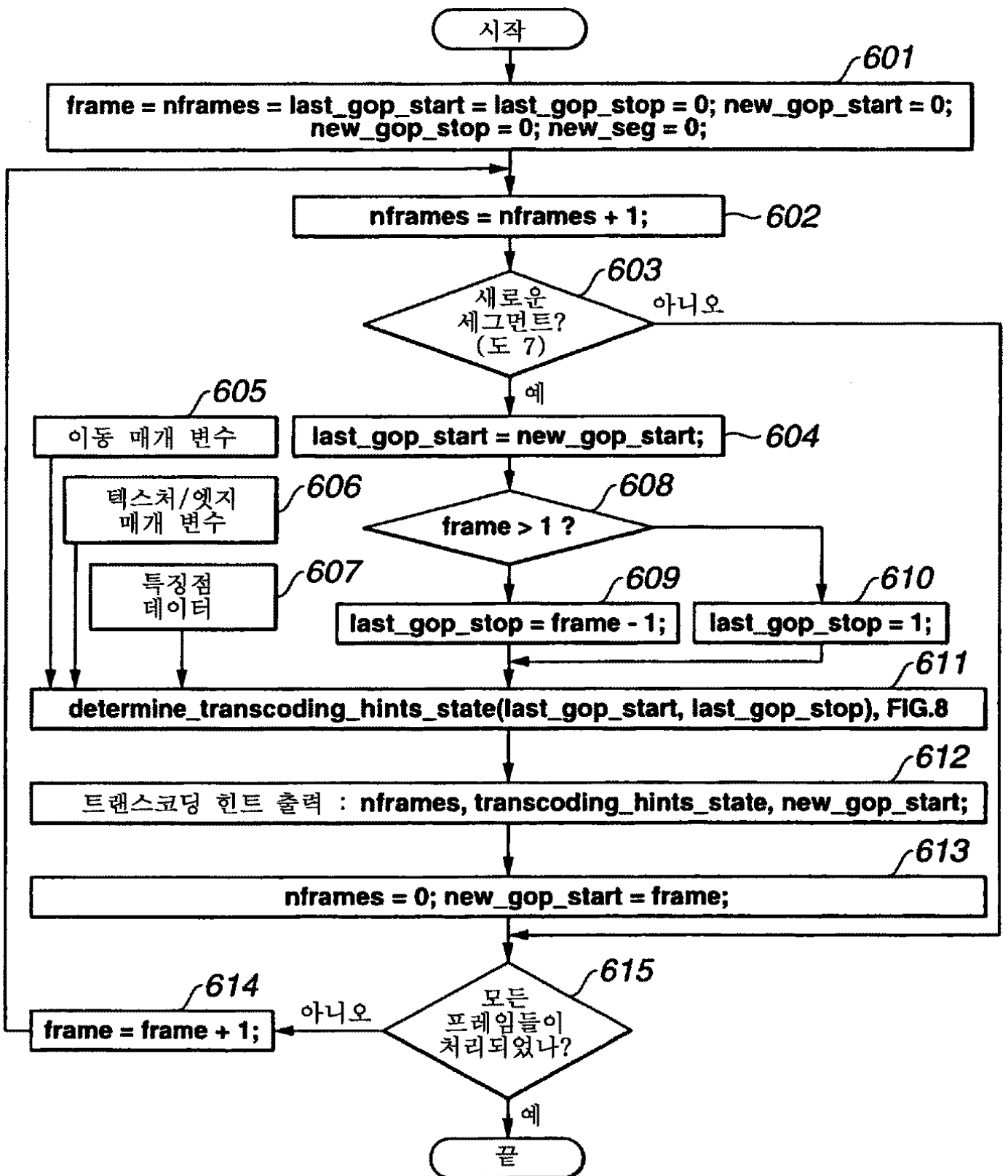


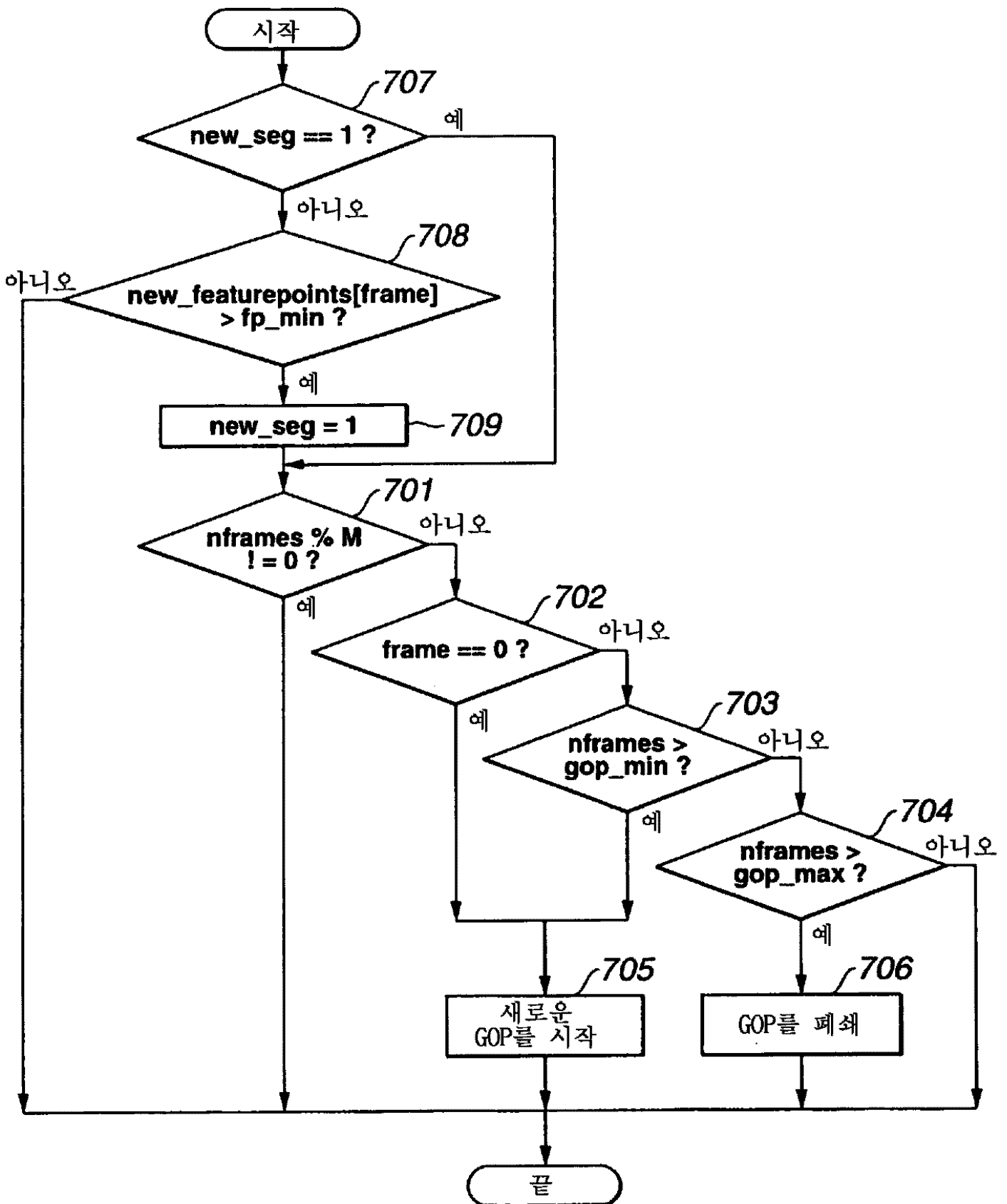
트랜스코딩 힌트 상태 3:
"높은 장면 액티비티"





6





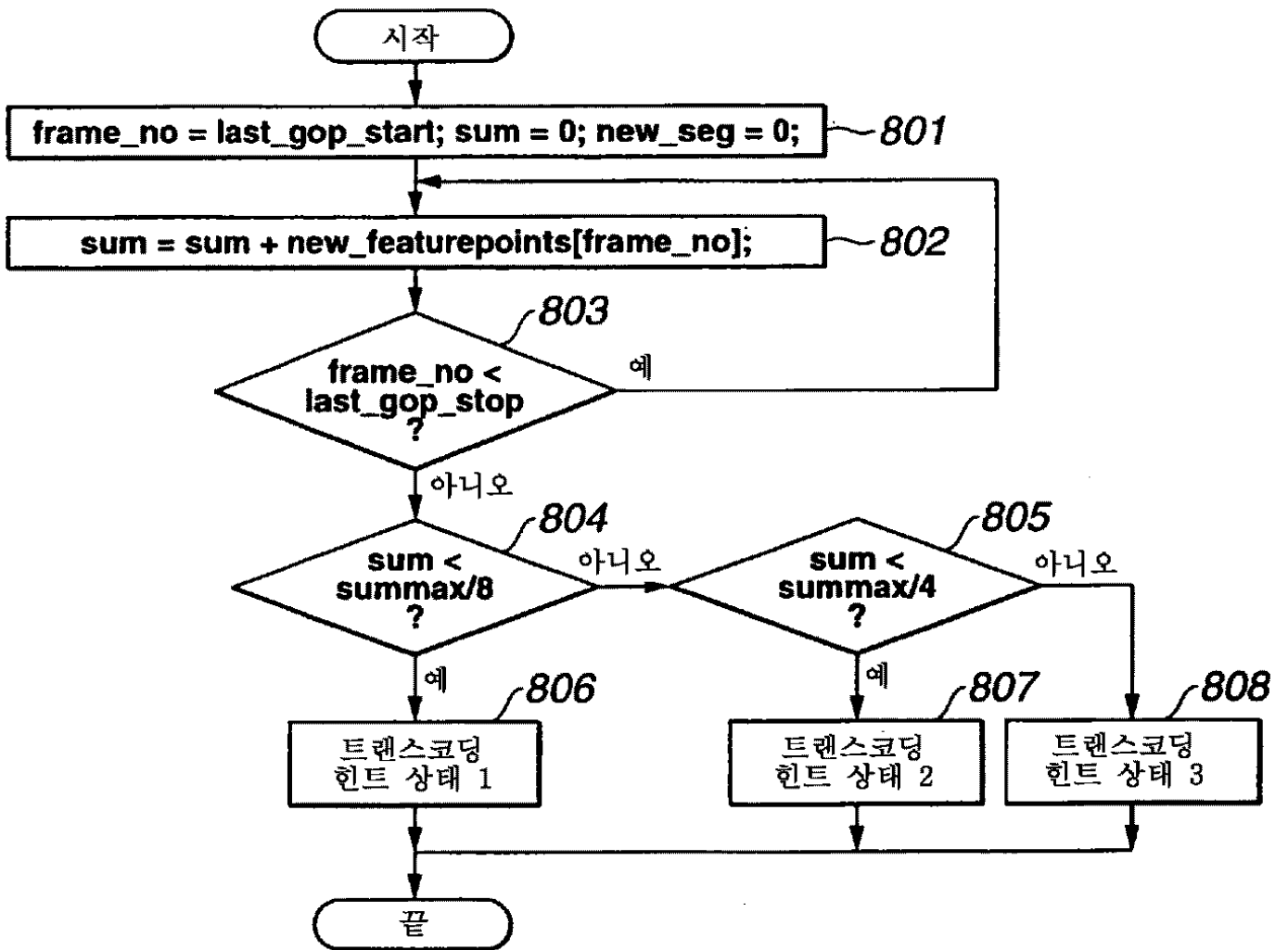
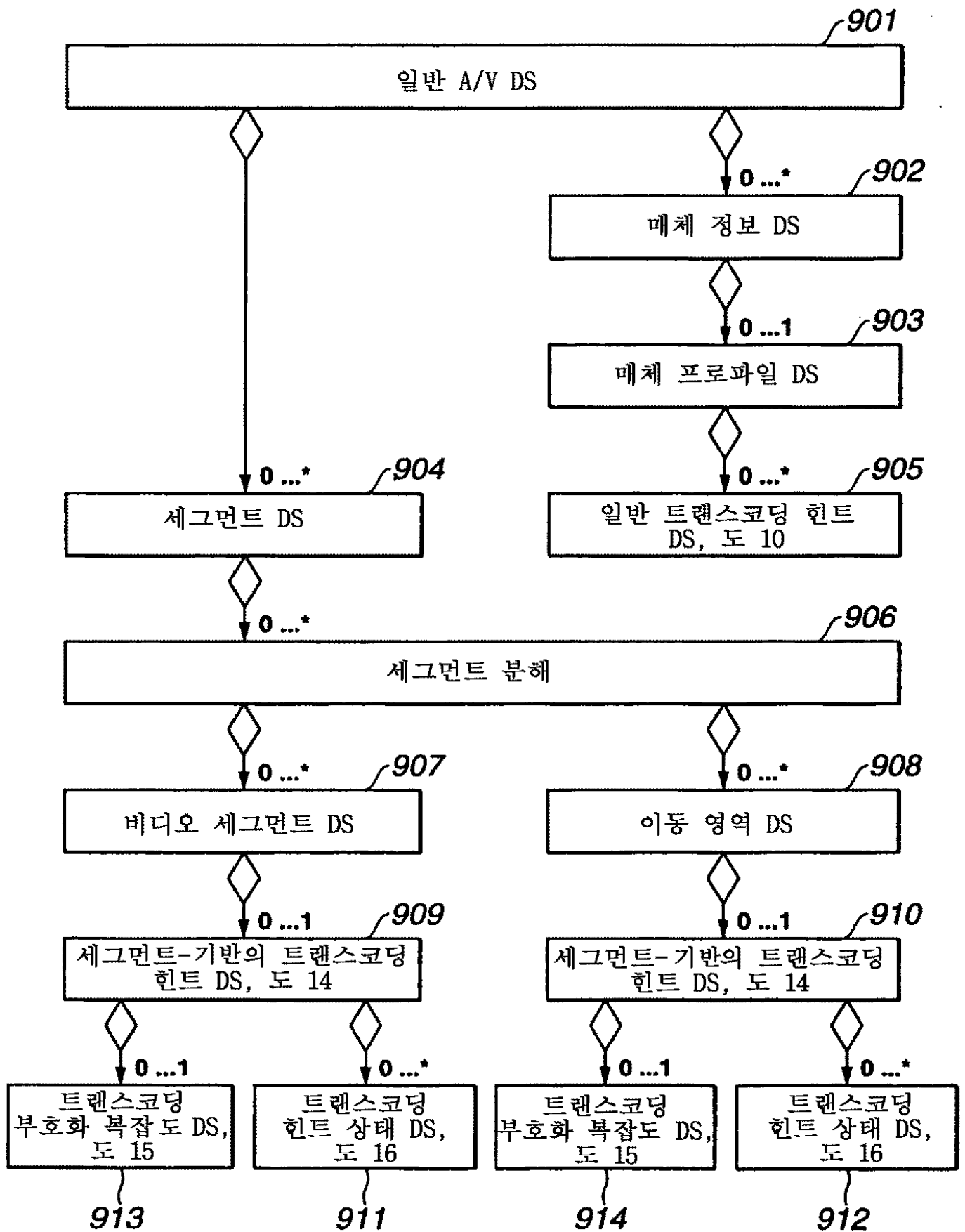
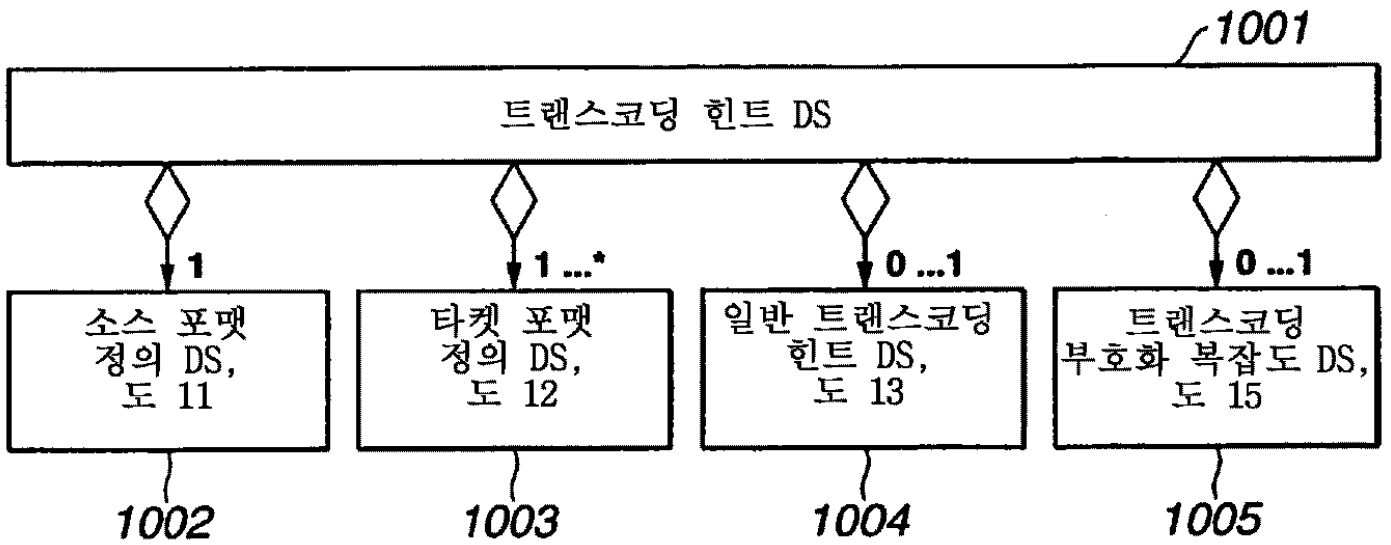


도표 1 : 트랜스코딩 힌트 상태 도표(실례)

상태	M	bitrate_fraction_for_I	bitrate_fraction_for_p
1	5	0.8	0.15
2	4	0.85	0.1
3	3	0.9	0.05



10



11

- 1: bitrate <int>
- 2: size_of_pictures <2*int>
- 3: number_of_frames_per_second <int>
- 4: pel_aspect_ratio <float>
- 5: pel_colour_depth <int>
- 6: usage_of_progressive_interlaced_format <1 bit>
- 7: usage_of_frame_field_pictures <1bit>
- 8: compression method <int>
- 9: one out of list {MPEG-1, MPEG-2, MPEG-4, DV, H.263, H.261, }
- 10: { further parameters for compression method }
- 11: GOP_structure (Runlength coding)

12

- 1: **bitrate** <int>
- 2: **size_of_pictures** <2*int>
- 3: **number_of_frames_per_second** <int>
- 4: **pel_aspect_ratio** <float>
- 5: **pel_colour_depth** <int>
- 6: **usage_of_progressive_interlaced_format** <1 bit>
- 7: **usage_of_frame_field_pictures** <1bit>
- 8: **compression_method** <int>
- 9: **one_out_of_list** {MPEG-1, MPEG-2, MPEG-4, DV, H.263, H.261, }
- 10: { further parameters for compression method }
- 11: **GOP_structure** (Runlength coding)

13

- 1: **use_region_of_interest_DS**: <1bit>
- 2: **region_of_interest DS**:
- 3: **shape_D**: select one or {boundary_box_D, MB_shape_D, shape_D}
- 4: **motion_trajectory_D**
- 5:
- 6: **use_editing_effects_transcoding_hints_DS**: <1bit>
- 7: **camera_flash** {frame1, frame2, framek} <k*int>
- 8: **cross_fading** {(start_frame, end_frame), ... } <k*(<int>, <int>)>
- 9: **black_pictures** {(start_frame, end_frame), ... } <k*(<int>, <int>)>
- 10: **fade_in** {(start_frame, end_frame), ... } <k*(<int>, <int>)>
- 11: **fade_out** {(start_frame, end_frame), ... } <k*(<int>, <int>)>
- 12: **abrupt_change** {frame1, frame2, framek} <k*int>
- 13:
- 14: **use_motion_transcoding_hints_DS**: <1 bit>
- 15: **number_of_regions**: <int>
- 16: **for_every_region**:
- 17: **is_region_rectangular_shaped (y/n)**: <1bit>
- 18: **if_arbitrarily shaped**: use region D for this region
- 19: **describe parametric object motion for this region**

- 1: **start_frame** <int>
- 2: **nframes** <int>
- 3: **I_frame_location**:
- 4: **select_one_out_of_the_following**: <2 bit>
- 5: **first frame** (default)
- 6: **list of frames** {frame1, frame2, , framek} <k*int>
- 7: **first_frame_and_every_k_frames** <int>
- 8: **no_I_frame**
- 9: **quantizer_scale** <int>
- 10: **target_bitrate** <int>
- 11: **target_min_bitrate** <int>
- 12: **target_max_bitrate** <int>
- 13: **use_transcoding_states** (y/n) <1 bit>
- 14: **transcoding_state_nr** <int>
- 15: **add_new_transcoding_state** (y/n) <1bit>
- 16: **if yes**: {list of parameters}
- 17: **remove_transcoding_state** (y/n) <1bit>
- 18: **if yes**: state_nr <int>
- 19: **use_encoding_complexity_description** (y/n) <1 bit>
- 20: **if yes**: encoding_complexity_description_scheme

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1: use_feature_points (y/n) <1bit>
2:   select_feature_point_method <2 bits>
3:     number_of_new_feature_points <nframes * int>
4:     feature_point_metrics {mean, max, min, var, stddev} <5* int>
5: use_equation_description (y/n) <1bit>
6: use_motion_description (y/n) <1bit>
7:   select_motion_method <4 bits>
8:     param_k_motion <nframes * k * int>
9:     motion_metrics {min, max, sum, var, stddev} <5*int>
10:    block_motion_field < nframes*int*size_x*size_y / (m*m) >
11: use_texture_edge_metrics (y/n) <1bit>
12:   select_texture_edge_metrics <4 bits>
13:     DCT_block_energy <size_y*size_x*nframes*int/64>
14:     DCT_block_activity <size_y*size_x*nframes*int/64>
15:     DCT_energy_metric {mean, min, max, sum, var, stddev} <6*int>
16:     DCT_activity_metric {mean, min, max, sum, var, stddev} <6*int>

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1: M: VP distance <int>
2: bitrate_fraction_for_I <float>
3: bitrate_fraction_for_P <float> /* bitrate_fraction of B is rest to 100 % )
4: quantizer_scale_ratio_I_P <float>
5: quantizer_scale_ratio_I_B <float>
6: if_frame: /* see target format transcoding hints */
7:   X_I, X_P, X_B <3*int> /* frame_vbv_complexities */
8: if_field:
9:   X_I_top, X_P_top, X_B_top <3*int> /* field_top_vbv_complexities */
10:  X_I_bot, X_P_bot, X_B_bot <3*int> /* field_bottom_vbv_complexities */

```