

教 育 學 碩 士 學 位 論 文

가

2002年 8月

釜慶大學校 教育大學院

電算教育專攻

李 相 華

教育學碩士學位論文

가

指導教授 金榮鳳

論文 教育學碩士學位論文 提出

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李相華 教育學碩士 學位論文 認准

2002年 6月 22日

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A study on the shot change detection using a variable length frame skip method

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*Graduate School of Education
Pukyong National University*

Abstract

A scene change detection method using a histogram is to make the histogram of colors or gray scale values and then detect shot boundaries by comparing the histogram difference between adjacent frames. This method, however, is inefficient for long videos that relatively have a few shot boundaries. In order to reduce the execution time, several methods have been proposed to search scene change points by skipping frames with an interval of a constant-length or a variable length.

In this thesis, we survey and propose an algorithm with skipping variable length frames on the educational videos. The experimental results help us to find an optimal weighted value among several weighted values.

•

- 가 .
- , , 가 .
- (contents-based retrieval) 가 .
- [1].
- (frame) .
- [2].
- (indexing)
- 가
- [3].

(pixel)

,

[4],

[5],

[7]

.

(histogram comparison)

,

,

가

[6].

,

,

가

가

.

가

.

가

.

,

가

.

가

가

가

. 가

가 가

가

가 .

가

가

1 가 ,

1/2

0 < < 1

가 ()

가 ,

.

2

,

가

. 3 가

4

, 5

.

2.1

A. (Pixel)

(pixel differences)

가

$$DP_i(k, l) = \left\{ \begin{array}{l} 1 \quad \text{if } |p_i(k, l) - p_{i+1}(k, l)| > t \\ \text{otherwise} \end{array} \right\} \quad (1)$$

p_i i , (k, l) , t

B.

(Histogram comparison)

[4]. 가

가

가 [6].

$$SD_i = \sum_{j=1}^N |H_i(j) - H_{i+1}(j)| \quad (2)$$

$H_i(j)$ i j . SD_i 가

C.

(motion vector)가

(panning)

(zooming)

가 [5].

MAD(Mean Absolute Difference) MSE(Mean

Square Error)

D.

MPEG

[7]. MPEG

DCT

가 DCT

, DCT

DCT

DCT

가

가

[7].

2.2

[8].

가

A.

가

가

< 1 >

(L = 4)

(D)가

(T)

D > T



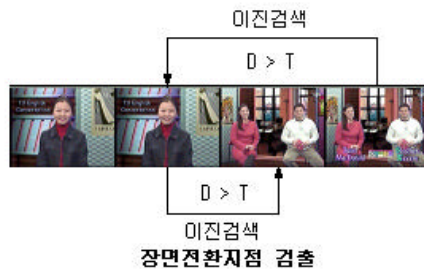
D :

T : ()

D < T :

D > T :

(a) (L = 4)



(b) ()

1

가

1/2

가

D > T

가 가

[8].

B. 가

가

가

. 가

(3)

$$Length = W \cdot Min_Unit \cdot Frame_per_sec$$

(3)

Length :

Min_unit : 가

Frame_per_sec :

W : 가

$$: W = W + I$$

$$: W = W \cdot I/2$$

< 2 > 가 .

Min_unit Frame_per_sec 1 가

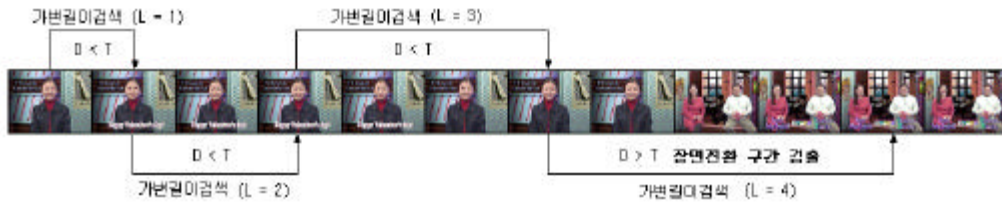
1 (D)

(T) (D)가 가 (W) 가

가 . D > T

가

[8].



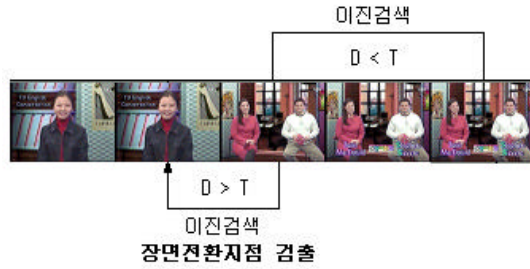
D :

T : ()

D < T :

D > T :

(a) 가 (= 1)



(b) ()

2 가

. 가

가

가 가 가

가 1/2

[8]. 가

.

3.1 가

< 3 > .

가

가

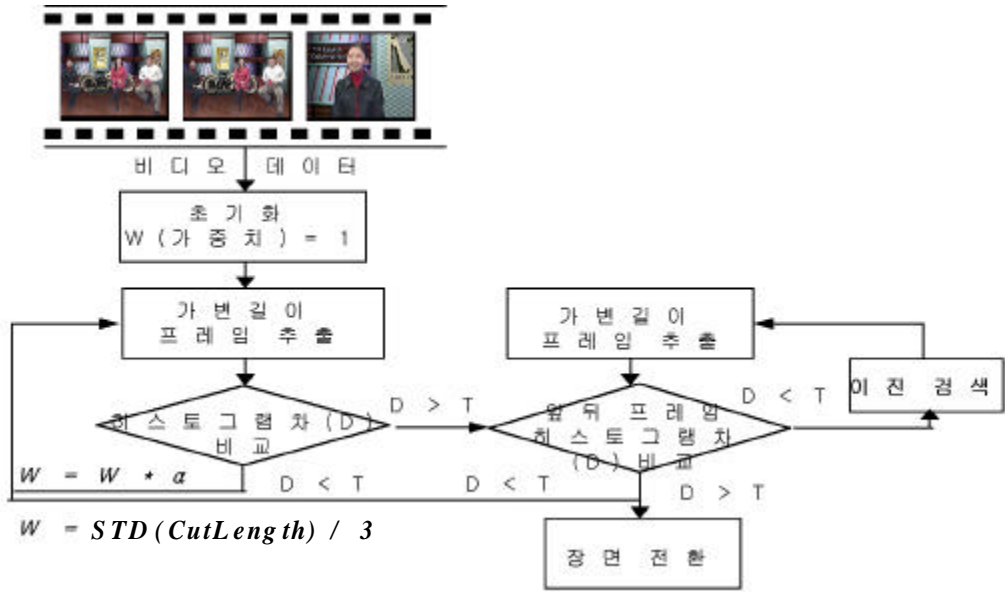
. 가 가

가 , 가

[8].

가 0 1 가

()



D :

T : ()

D < T :

D > T :

STD(CutLength) :

(a)



(b)

3 가

(가) .
(4) .
 W ($W = 1$) ,

$$Length = W \cdot Min_Frame \quad (4)$$

Length :

Min_Frame : 가

W : 가

$$: W = W \cdot$$

$$: W = STD(CutLength) / 3$$

Min_Frame

가

.

,

.

TV

38

30

.

100

W

가

(STD(CutLength))

Length

(t)

(t + Length)

(D)

. D가

(T)

가

(W)

Length

(T)

(30000)

D가

(T)

[t, t + Length]

1/3

가

1/3

가

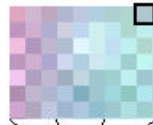
1/3

i 번째 프레임



(a)

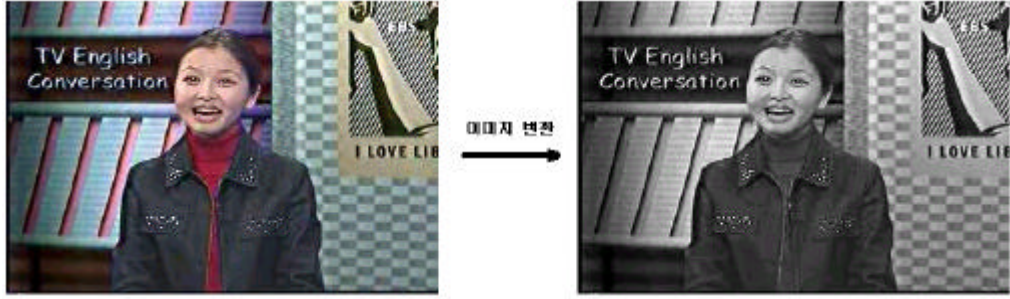
픽셀값 #B0 C6 CE 에서
각각 R G B 값 추출



(b)

RGB

(5)



(c) 24 Color Gray Scale

4 Gray Scale Image

RGB (5) Gray Scale .

$$\begin{aligned}
 I &= 0.299 \times R + 0.587 \times G + 0.114 \times B \\
 &= 0.299 \times B0 + 0.587 \times C6 + 0.114 \times CE \\
 &= 0.299 \times 173 + 0.587 \times 198 + 0.114 \times 206 \\
 &= 191.437 \quad 191
 \end{aligned}$$

RGB Color B0C6CE Gray Scale 191 가

3.3

Gray Scale

Gray Scale Level

256

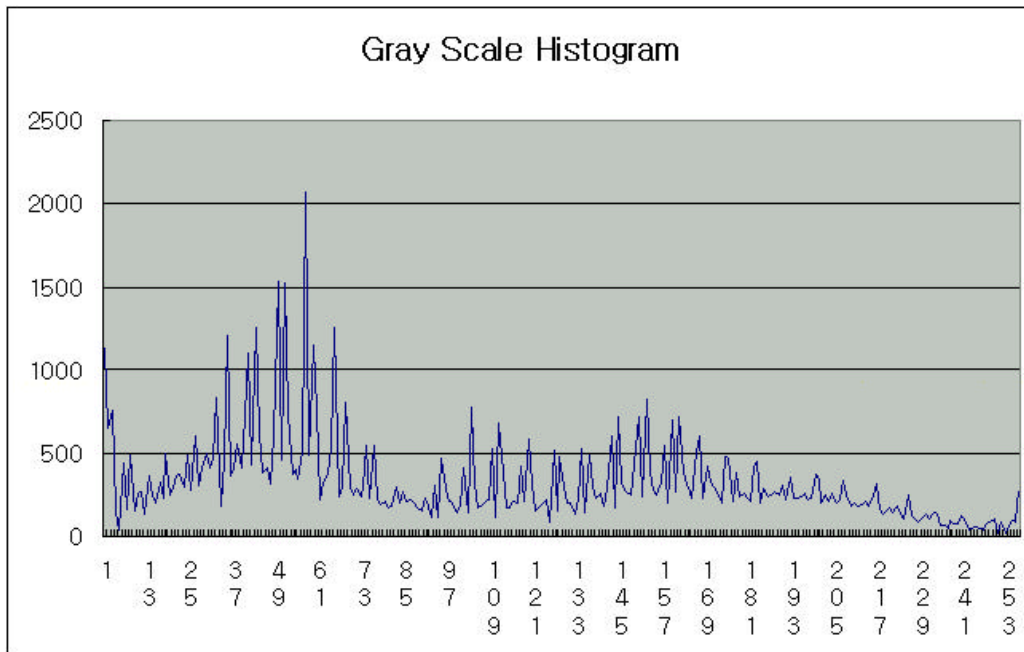
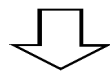
Level

< 5> Gray Scale

가

가

가



5 Gray Scale

3.4

(D)가 (T)

가
 가
 가
 가

$O(\log_2 n)$

$\log_2 n + 1$ [9].

가 $O(n)$

가 [9].

< 6 >

$1/2$

(D)

$D > T$

$1/2$

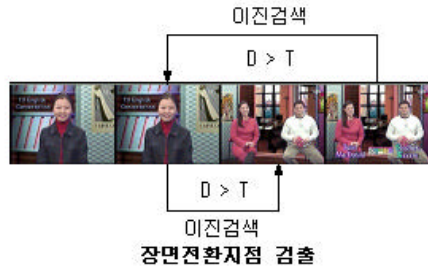
$1/2$

< 6 (a) >, $D < T$

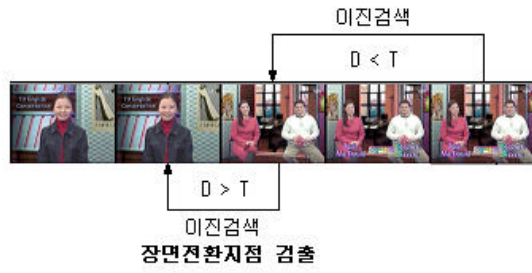
$1/2$

< 6 (b) >.

가



(a) 1/2



(b) 1/2

6

Visual Basic 6.0

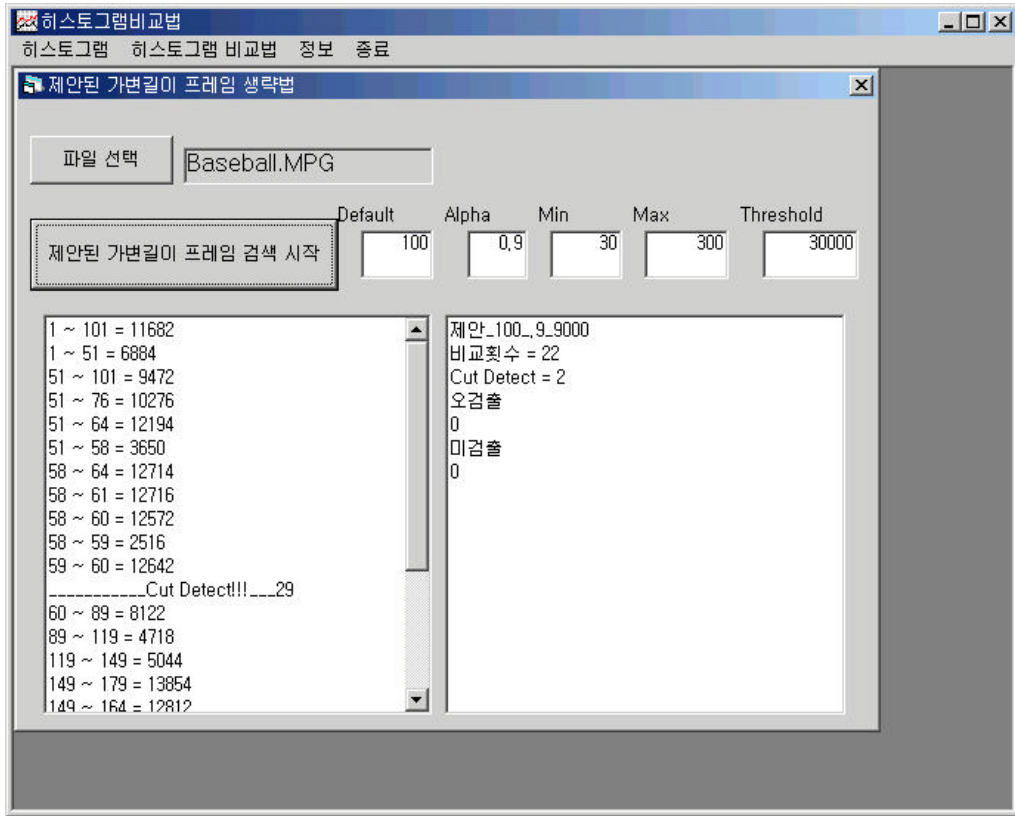
7 , 1
 Baseball TV

1

Baseball (Mpeg)	160 × 112	189	2	00:06
(Mpeg) ¹	352 × 240	16298	62	18:04
(Mpeg) ²	352 × 240	15356	57	17:04
(Mpeg)	352 × 240	9000	65	10 : 00

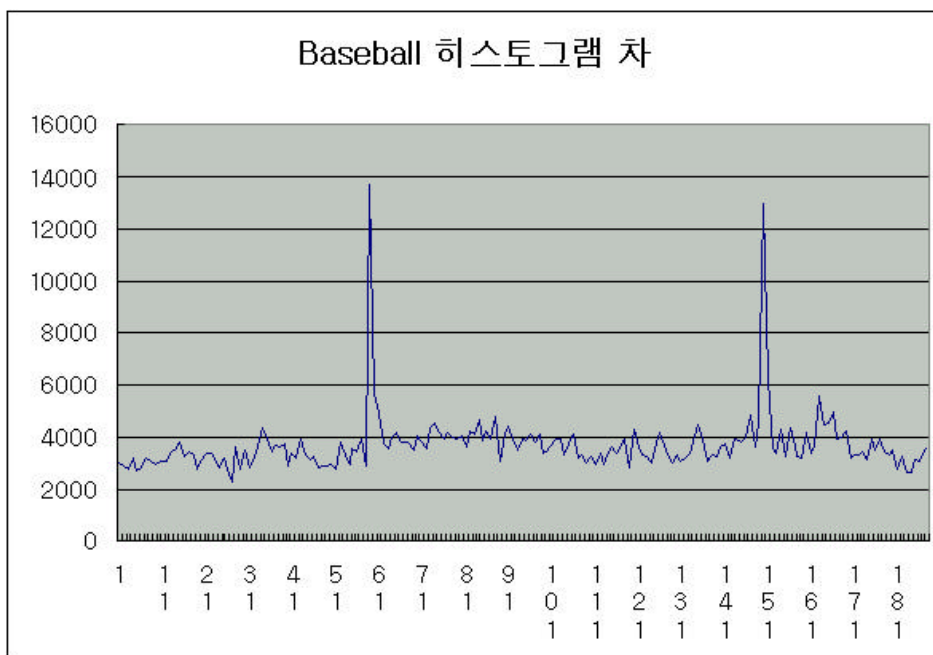
8, 9,

10, 11 .





(a) Baseball

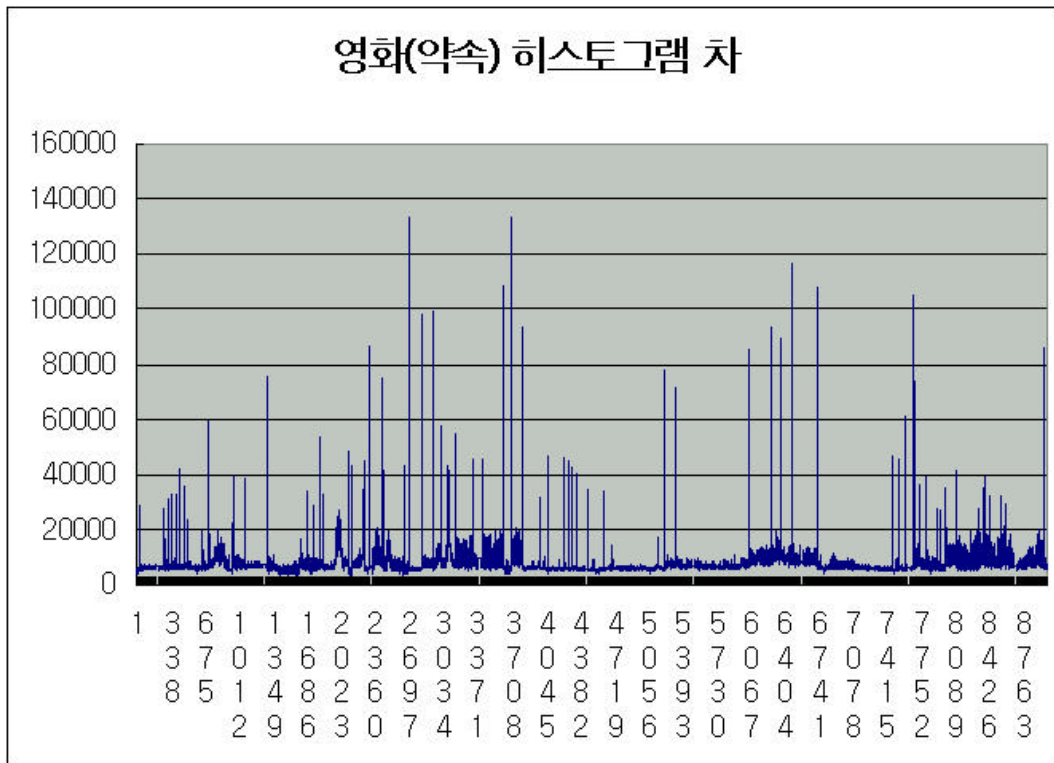


(b) Baseball

8 Baseball



(a) ()



(b) ()

11 ()

가

.

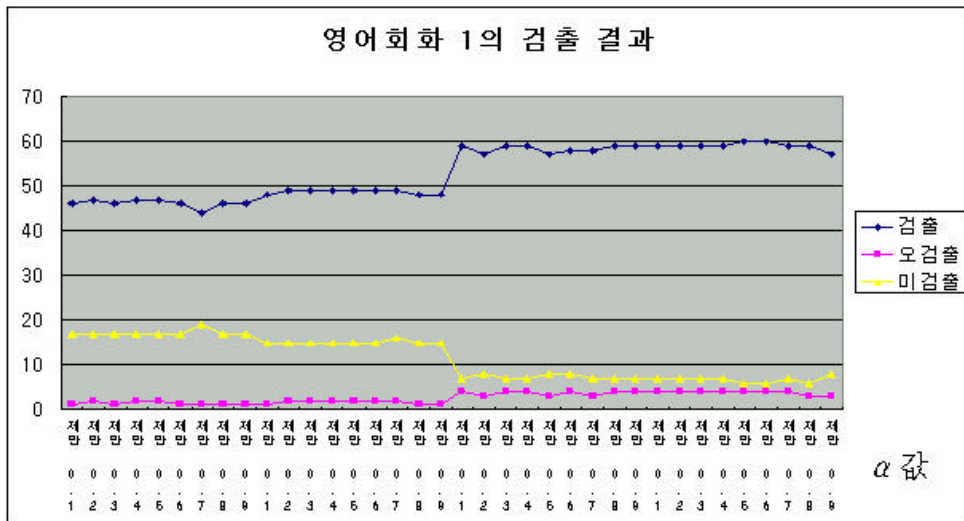
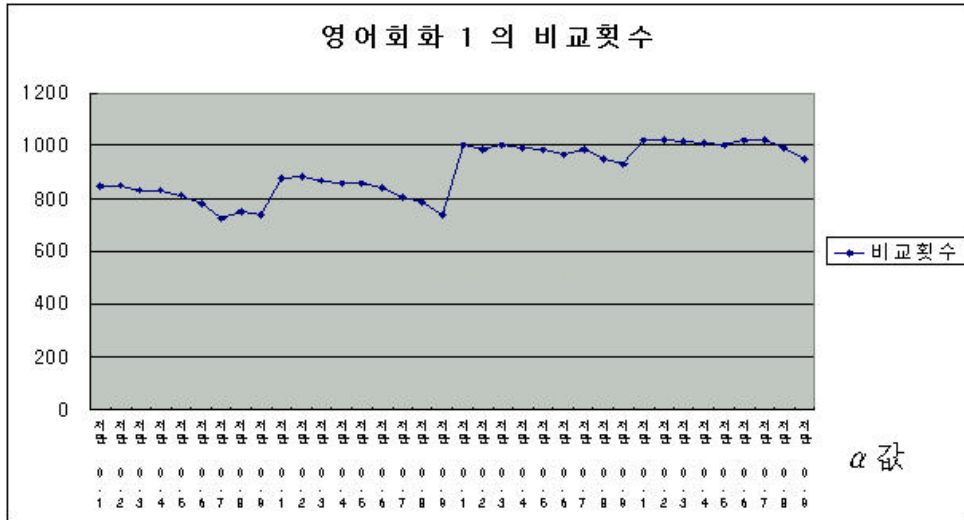
1, 1/2, 1/3, 1/4 가

, 1/3 가

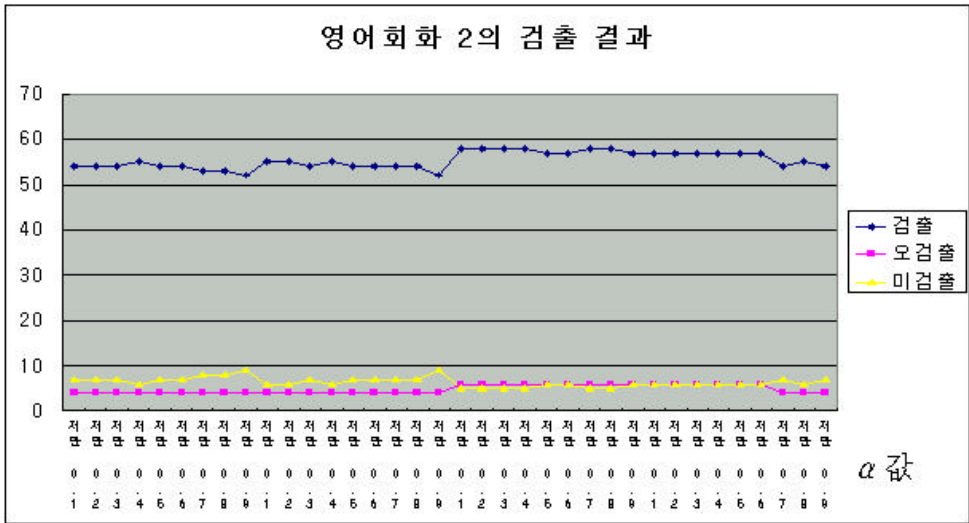
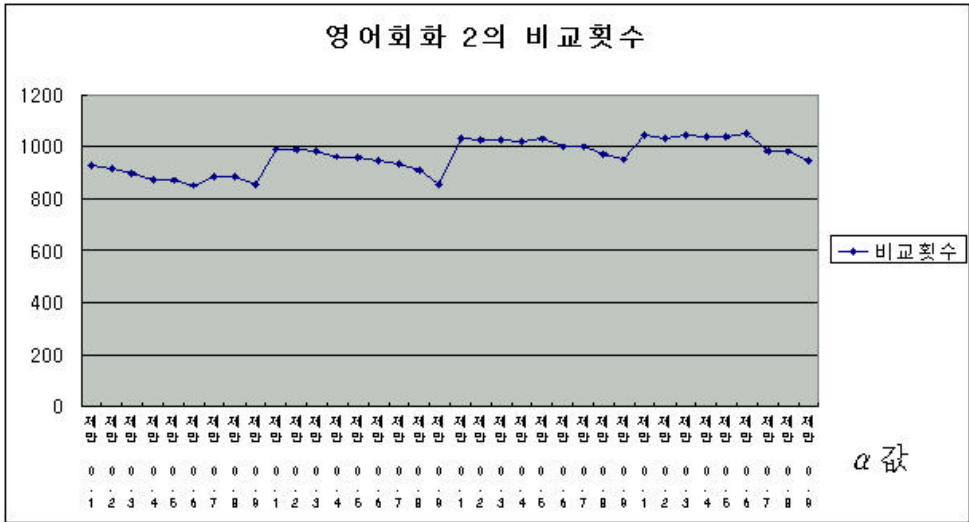
, 가 .

< 12> 1, < 13> 2, < 14> ()
가

, 1, 1/2, 1/3, 1/4 .



12 TV 1 가



13 TV 2 가

가 , 가
 가 가
 2, 3, 4, 5 .

2 Baseball

동영상종류	검색방법	비교횟수	검출	오검출	미검출	Precision	Recall	Error
Baseball	한프레임씩	188	2	0	0	1.000	1.00	0.00
	고정10	30	2	0	0	1.000	1.00	0.00
	고정20	19	1	0	1	1.000	0.50	0.50
	고정30	22	2	0	0	1.000	1.00	0.00
	고정40	14	1	0	1	1.000	0.50	0.50
	고정50	21	2	0	0	1.000	1.00	0.00
	고정60	24	2	0	0	1.000	1.00	0.00
	고정70	24	2	0	0	1.000	1.00	0.00
	고정80	16	1	0	1	1.000	0.50	0.50
	고정90	21	2	0	0	1.000	1.00	0.00
	고정100	23	2	0	0	1.000	1.00	0.00
	가변	20	2	0	0	1.000	1.00	0.00
	제한 0.1	21	2	0	0	1.000	1.00	0.00
	제한 0.2	21	2	0	0	1.000	1.00	0.00
	제한 0.3	21	2	0	0	1.000	1.00	0.00
	제한 0.4	21	2	0	0	1.000	1.00	0.00
	제한 0.5	21	2	0	0	1.000	1.00	0.00
	제한 0.6	21	2	0	0	1.000	1.00	0.00
	제한 0.7	22	2	0	0	1.000	1.00	0.00
	제한 0.8	23	2	0	0	1.000	1.00	0.00
	제한 0.9	21	2	0	0	1.000	1.00	0.00

3 1

동영상종류	검색방법	비교횟수	검출	오검출	미검출	Precision	Recall	Error
영어회화 1	한프레임*	16297	68	9	3	0.868	0.95	0.19
	고정10	2039	66	7	3	0.894	0.95	0.16
	고정20	1322	65	7	4	0.892	0.94	0.18
	고정30	1082	64	7	5	0.891	0.92	0.19
	고정40	985	61	4	5	0.934	0.92	0.15
	고정50	932	61	3	4	0.951	0.94	0.11
	고정60	904	64	7	5	0.891	0.92	0.19
	고정70	829	56	2	8	0.964	0.87	0.16
	고정80	845	57	4	9	0.930	0.85	0.21
	고정90	864	59	3	6	0.949	0.90	0.15
	고정100	838	59	3	6	0.949	0.90	0.15
가변	759	52	3	13	0.942	0.79	0.26	
제한 0.1	1001	59	4	7	0.932	0.89	0.18	
제한 0.2	985	57	3	8	0.947	0.87	0.18	
제한 0.3	1000	59	4	7	0.932	0.89	0.18	
제한 0.4	992	59	4	7	0.932	0.89	0.18	
제한 0.5	982	57	3	8	0.947	0.87	0.18	
제한 0.6	965	58	4	8	0.931	0.87	0.19	
제한 0.7	987	58	3	7	0.948	0.89	0.16	
제한 0.8	950	59	4	7	0.932	0.89	0.18	
제한 0.9	930	59	4	7	0.932	0.89	0.18	

4 2

동영상종류	검색방법	비교횟수	검출	오검출	미검출	Precision	Recall	Error
영어회화 2	한프레임*	15355	61	9	5	0.852	0.91	0.25
	고정10	1915	58	6	5	0.897	0.91	0.19
	고정20	1260	58	6	5	0.897	0.91	0.19
	고정30	1071	57	6	6	0.895	0.89	0.21
	고정40	984	58	6	5	0.897	0.91	0.19
	고정50	948	57	6	6	0.895	0.89	0.21
	고정60	873	54	4	7	0.926	0.88	0.19
	고정70	853	54	4	7	0.926	0.88	0.19
	고정80	829	52	4	9	0.923	0.84	0.23
	고정90	882	57	6	6	0.895	0.89	0.21
	고정100	884	56	6	7	0.893	0.88	0.23
가변	849	54	4	7	0.926	0.88	0.19	
제한 0.1	1034	58	6	5	0.897	0.91	0.19	
제한 0.2	1023	58	6	5	0.897	0.91	0.19	
제한 0.3	1026	58	6	5	0.897	0.91	0.19	
제한 0.4	1021	58	6	5	0.897	0.91	0.19	
제한 0.5	1029	57	6	6	0.895	0.89	0.21	
제한 0.6	998	57	6	6	0.895	0.89	0.21	
제한 0.7	997	58	6	5	0.897	0.91	0.19	
제한 0.8	973	58	6	5	0.897	0.91	0.19	
제한 0.9	950	57	6	6	0.895	0.89	0.21	

5 ()

동영상종류	검색방법	비교횟수	검출	오검출	미검출	Precision	Recall	Error
영화(약속)	한프레임씩	8999	67	12	10	0.821	0.85	0.34
	고정10	1421	65	10	10	0.846	0.85	0.31
	고정20	1126	64	10	11	0.844	0.83	0.32
	고정30	965	60	9	14	0.850	0.78	0.35
	고정40	975	61	10	14	0.836	0.78	0.37
	고정50	956	57	12	20	0.789	0.69	0.49
	고정60	892	57	9	17	0.842	0.74	0.40
	고정70	702	56	9	24	0.839	0.66	0.51
	고정80	905	52	10	18	0.808	0.70	0.43
	고정90	930	54	12	23	0.778	0.65	0.54
	고정100	887	53	12	24	0.774	0.63	0.55
가변	854	52	9	22	0.827	0.66	0.48	
제한	0.1	996	59	9	15	0.847	0.77	0.37
	0.2	976	57	9	17	0.842	0.74	0.40
	0.3	990	59	12	18	0.797	0.72	0.46
	0.4	976	57	9	17	0.842	0.74	0.40
	0.5	982	57	9	17	0.842	0.74	0.40
	0.6	1015	59	9	15	0.847	0.77	0.37
	0.7	1003	59	11	17	0.814	0.74	0.43
	0.8	972	57	11	19	0.807	0.71	0.46
	0.9	993	61	12	16	0.803	0.75	0.43

15, 16, 17, 18

60 가

0.8 가가

	Baseball(mpeg) 189 Frame 2 Cut				1(mpeg) 16298 Frame 62 Cut				2(mpeg) 15356 Frame 57 Cut				(mpeg) 9000 Frame 65 Cut			
60	24	2	0	0	904	64	7	5	873	54	4	7	892	57	9	17
가	20	2	0	0	759	52	3	13	849	54	4	7	854	52	9	22
0.8	23	2	0	0	950	59	4	7	973	58	6	5	972	57	11	19
가 0.8 (%)	115	100	-	-	125	113	133	53	114	107	150	71	113	109	122	86

가

가

,

= 0.8

가

.

가

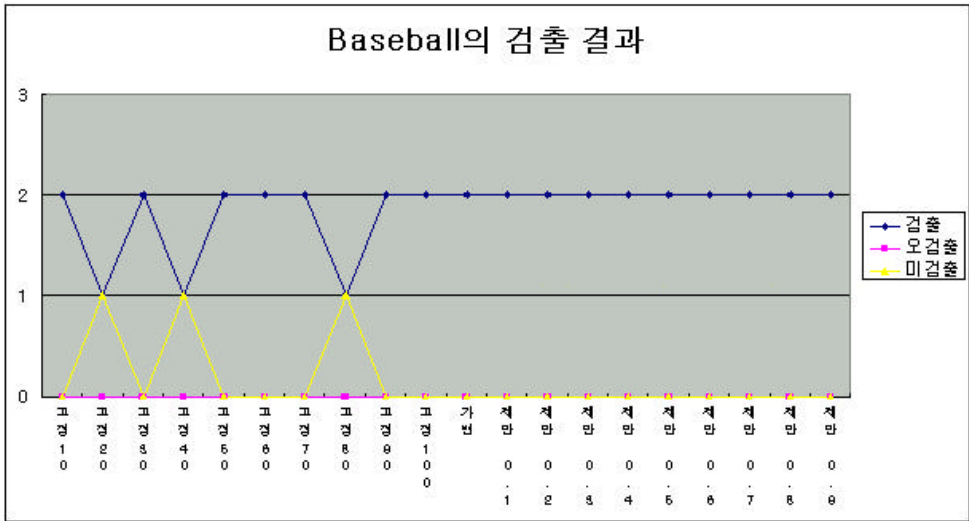
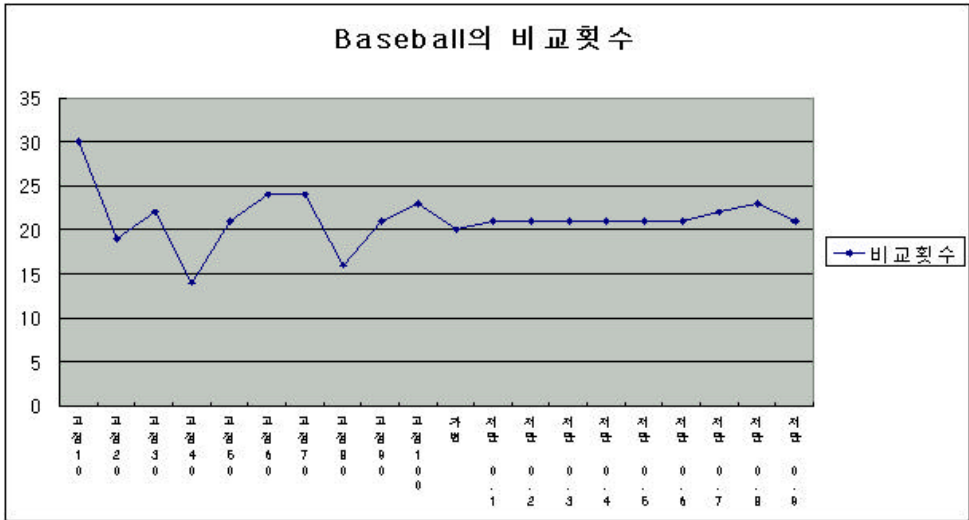
10%

,

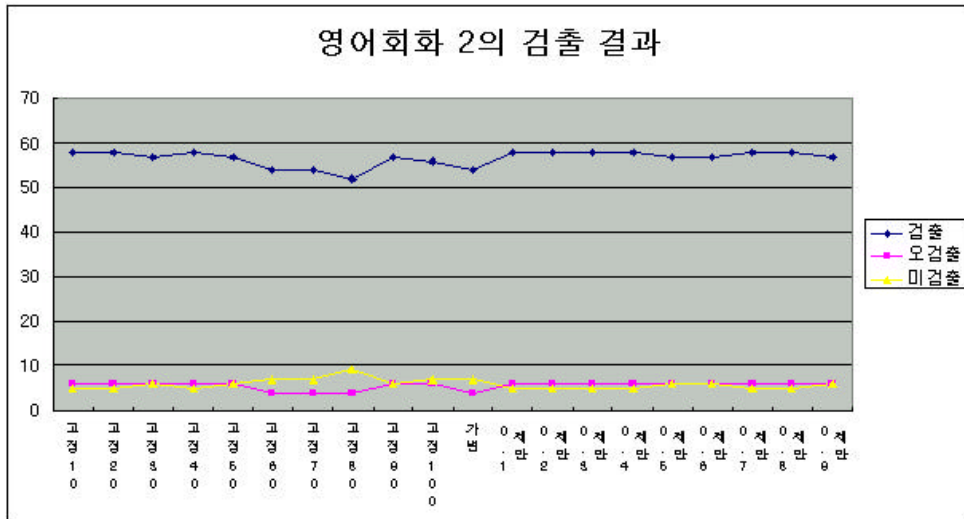
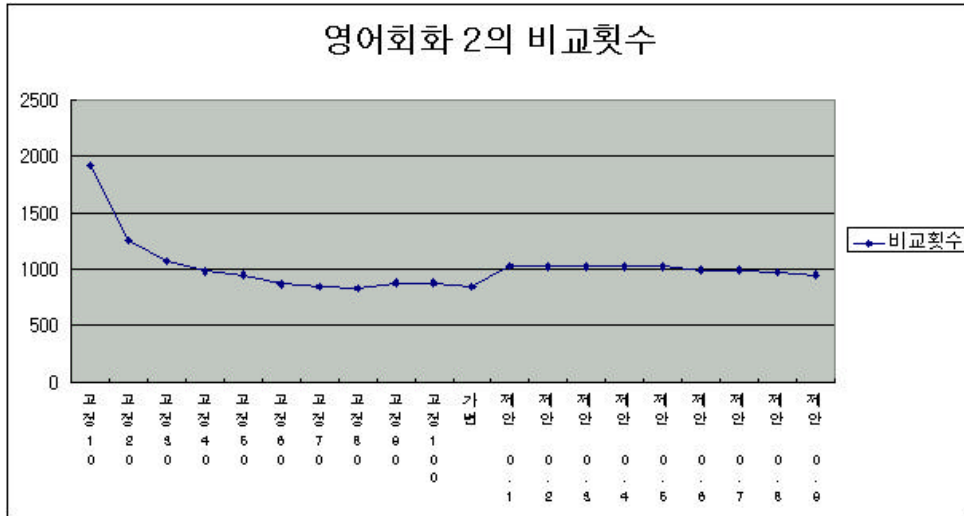
30%

가

.



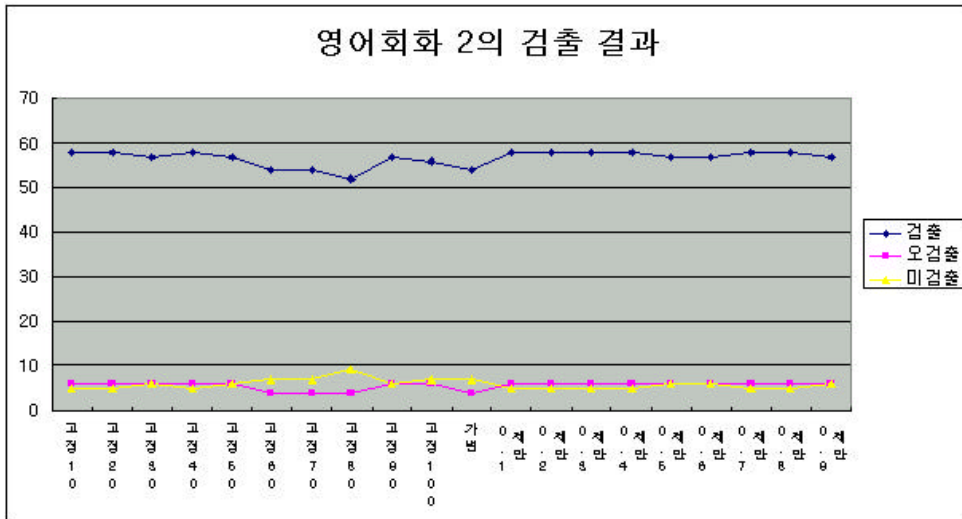
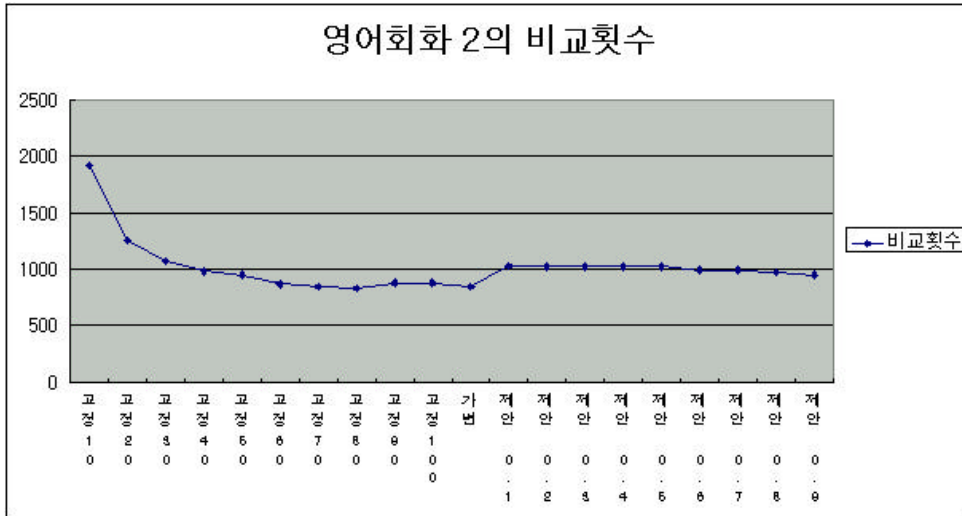
15 Baseball
(189 Frame, 2 Cut)



17 2
 (15356 Frame, 57 Cut)

가

, 가 ,



18 ()
(9000 Frame, 65 Cut)

가

, 가 ,

, .

[]

[1] John S. Boreczky and Lawrence A. Rowe, "Comparison of video shot boundary detection techniques", in Storage & Retrieval for Image and Video Databases , Proc. of SPIE 2670, pp.170-179, 1996

[2] , " ", , pp. 1-7, 2000

[3] 가 , , "MPEG ", , 6 4 , pp 1-2, 1999

[4] H. J. Zhang, C. Y. Low, S. W. Smoliar, and J. H. Wu, "Video parsing, retrieval and browsing: an integrated and content-based solution", in Proc. of ACM Multimedia 95, pp. 15-24, 1995

[5] , , " ", (C), 3 2 , pp. 221-230, 1997

[6] , , , " ", , 15 , 9 , pp. 10-18, 1997

[7] , , "MPEG ", 가 , 26 2 , 1999

[8] , , , "가 ", 가 Vol 28,

No.2, pp. 268-270

[9] , “C ”, , pp.290-294 ,
1993

