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(12) (A)

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(21) 10-2008-0098860
(22) 2008 10 08
2008 10 08

(71)
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(72)
940
103-1004
3 4 405
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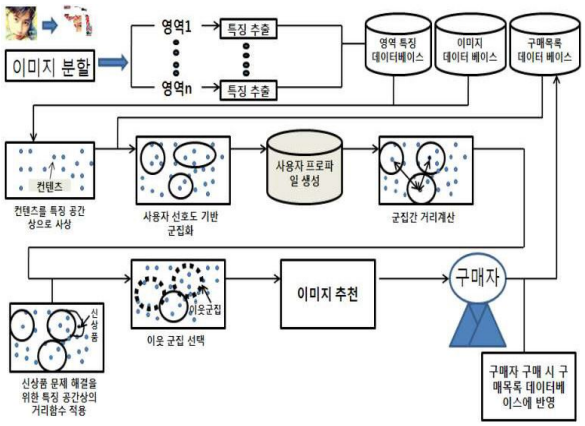

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(1) ;

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(a)

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(a) ,

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(b) , , , 2

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[0001] ,
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[0002] ,
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LCD , ,
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[0003]
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[0004] (Knowledge Discovery Technology)
, (Cross Sell)
. ,
(Collaborative Filtering; ‘CF’) Amazon.com,
CDNow e- .

[0005] CF
. CF , , 3
. (1) CF n m
, m x n - P . ,
, P i j P_{ij} i j 1 0
. (2) CF
- P i j

(Neighborhood) . (Pearson Correlation), (Cosine Projection) . (3) λ . (Most-frequent Item Recommendation) . λ .

[0006] , .

[0007] , .

[0008] , ,

[0009] (1) ;

[0010] (2) .

[0011] , (1) ,

[0012] (a) ;

[0013] (b) ;

[0014] (c) .

[0015] , (a) , , .

[0016] , (b) , , , 2 , , .

[0017] , (c) , , , , , .

[0018] , (2) ,

[0019] (d) ;

[0020] (e) .

[0021] , (d) ,

[0022] ;

[0023] ;

[0024] ;

[0025] .

[0026] , , ;

[0027] , .

[0028] , (e) .

[0029] , , , ,

[0030] (a) ;

[0031] (b) ;

[0032] (c) ;

[0033] (d) ;

[0034] (e) .

[0035] ,

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[0036] , .

[0037]

.

[0038] , (sparsity) CF

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. - (Sparse Matrix) ,

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[0039] ,

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[0040] , (content-based filtering)

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[0041] , (Information Retrieval)

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[0042] 1

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CF (model building phase) (image recommendation phase)

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[0043] , ,

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. CF

FBCF(Feature Based Collaborative Filtering)

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[0044]

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[0045] ,

, P R

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. p R^p

$x_i=\{x_{i1}, x_{i2}, , x_{ik}\}$, i=1, …, N

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. a

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. , c

a .

k- . c a T^2_{ca}

c $H=\{h_1, h_2, …, h_L\}$, c H L .

x c

PLS(c, x) k $R=\{X_1', X_2', …, X_k'\}$.

[0046] 2

. 2 ,

, DB (S201),

(S202), (S203),

(S204),

(S205), (S206),

(S207), (S208),
(S209),
(S210), (S211),
(S212) .

[0047]

(1)
(2)
. S201 ~ S203 .

[0048] S201 , DB .

.
,
. Normalized cuts
. Normalized cuts ,
,
. 3
Normalized cuts . 3 SKT
Normalized cuts
, . ,
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[0049] S202 , S201
. S202 ,
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.
, .
. , ,
S201 , , 2 , ,
. , ,
(region) , .

. ,
.

[0050] RS, , 2
. RS H W A ,
. RS A (W H)
. (scale invariance)
. x_{cm}, y_{cm}
, x_{loc}, y_{loc} x_{cm}, y_{cm} . 2
. N x y 2
1 .

1

$$(2\text{차 모멘트})_x = \frac{1}{(W/2)}\sqrt{\frac{\sum_{n=}^{} (x_1 - x_{cm})^2}{N}}, \quad (2\text{차 모멘트})_y = \frac{1}{(H/2)}\sqrt{\frac{\sum_{n=}^{} (y_1 - y_{cm})^2}{N}}$$

[0051]

[0052] Compactness . , . (convexity) . (convex hull) . 2 .

2

[0053] Compactness = A/P^2 , Convexity = A/A_{hull}

[0054] . L*a*b 6 . . (scale) , 2 .

[0055] S203 , . . . , , , , , . , a , , , . UP ={ C_1, C_2, …, C_k} . , C_i i {x_{i1}, x_{i2}, …, x_{in}}={{x_{j11} x_{j12}, …, x_{j1m}}, {x_{i21}, x_{i22}, …, x_{i2m}}} . n_i i , {x_{i11}, x_{i12}, …, x_{i2m} } x_{i1} . C_i x_i, S, y . 3 .

3

$$\vec{X} = (X_1, \Lambda, X_p) \in R^p \qquad S_i = \sum_{k=1}^{r} v_k (X_k - \bar{X})(X_{ik} - \bar{X}_i)'$$

[0056]

[0057] . . . x . x 4 .

4

$$(\bar{X} - \bar{X})'\left(\frac{1}{n}S\right)^{-1}(\bar{X} - \bar{X}) < \frac{(n-1)p}{(n-p)}F_{p,n-p}(\alpha)$$

[0058]

[0059] α . , 100(1-α)%(95~99%) , $F_{p, n-p}(\alpha)$ p, n-p . α , . (outlier) . i C_i n_i, $\bar{x}_i = \sum_{x \in Ci} x/ni$, $Si = \sum_{x \in Ci} (x-\bar{x}_i)(x-\bar{x}_i)^T$, C_i C_j $S_{pij} = (S_i + S_j)/(n_i + n_j - 2)$.

[0060] Hotelling T_{ij} . C_i C_j 5 .

5

$$T_{ij}^2 = \frac{n_i n_j (n-2)}{(n+n_j)^2}(m_i - m_j)' S_p^{-1}(m_i - m_j)$$

[0061]

[0062] , (2) S204~S212 , (d) (S204~S208, S210~S212) (e) (S209) .

[0063] S204 .

[0064] S205 . S210 ~ S212 , , . (rating) . (virtual rating) . , , . .

[0065] S210 ~ S212 4 . 4 . 4 ‘ 1’, ‘ 2’ ‘ 3’ . ' 1' , ‘ 2' . ‘ 3' . S205

, g $C_1, \ldots, C_g$
x_{new} (S210). , (effective radius)
' 3 ' (S211),
(S212) ( ) . C_i
6 .

6

$$\hat{d}_i(x_{new}) = -\frac{1}{2}(x_{new} - \bar{x}_i)' S_{pooled}^{-1}(x_{new} - \bar{x}_i) + \ln(w_i)$$

[0066]

[0067] 6 w_i i , .

[0068] $d_1(x_{new})$, $d_2(x_{new})$, , $d_g(x_{new})$ C_k , x_{new}
7 .

7

$$(x_{new} - \bar{x}_k)' \left(\frac{1}{n} S\right)^{-1} (x_{new} - \bar{x}_k) < \frac{(n-1)p}{(n-p)} F_{p,n-p}(\alpha)$$

[0069]

[0070] , . , p, n-p α F .

[0071] S206 ~ S208
, 5 . S206
, S207 S206 . S208 ,
. 5
.

[0072] 5
. CF Cosine Person
, .
. ' A ', ' B ', ' C ' 2 C_1, C_2, C_3
.
(cluster) . 5 , ' A ' 5 16 . ' A ' ' B ' 4 , ' A ' ' C ' 3 , ' A ', ' B ' ' C ' 3 .
,
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.

5 . c a . k- . , c a T^2_{ca} (S206), c $H=\{h_1, h_2, \ldots, h_L\}$, c H T^2_{ca} L (S207). L . , c $H=\{h_1, h_2, \ldots, h_L\}$, c H (S208).

[0073] S209 , S208 , . S208 (Most-frequent Item Recommendation) k $R=\{x_1, x_2, \ldots, x_k\}$. x c (PLS: Purchase Likeness Score) 8 .

8

$$PLS(c,x) = \frac{\sum_{a \in H} H_x \times sim(c,a)}{\sum_{a \in H} sim(c,a)}$$

[0074]

[0075] 8 a H , sim(c, a) x , 9 .

9

$$sim(c,a) = \frac{MAX_{u,w \in H}[d(u,w)] - d(c,a)}{MAX_{u,w \in H}[d(u,w)] - MIN_{u,w \in H}[d(u,w)]}$$

[0076]

[0077] 9 c a , . u, w H .

[0078] 6 . 6

(601), (602), (603), (604), (605) .

[0079] SKT(SK Telecom) . 25,680 , 5,326 476 . ID, , ID , ID, , ,

ID, ,
. ID
ID, 6 , 6 ,
8 . 2004 6 8 .
SKT
40 .

[0080] Color, Shape Texture .
hit ratio . hit ratio .
hit ratio .
(hit ratio) .
hit ratio , Color, Shape Texture
.
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[0081] 7 . 7
, FBCF CF .
FBCF CF 250% .
FBCF 10 100 700% .
157% .
FBCF
. .
10 .

10

[0082] Hit ratio= Metric hit/Metric Recommendation

[0083] 8 . 8
.
. CF 400% .
CF .

.
. 7 8 CF FBCF
hit ratio .
.
, .

[0084] 9
. CF
. FBCF
. 9
, (new item hit ratio) 11 .

11

[0085] New item hit ratio = Metric hit / Metric Recommendation

[0086] 9 FBCF-TEXTURE FBCF-SHAPE CF FBCF-COLOR . CF FBCF-TEXTURE 80% . 9 CF FBCF . ' 3 ' .

[0087] 10 . FBCF CF . CF . CF FBCF .

[0088] , .

[0089] 1 .

[0090] 2 .

[0091] 3 Normalized cuts .

[0092] 4 .

[0093] 5 .

[0094] 6 .

[0095] 7 .

[0096] 8 .

[0097] 9 .

[0098] 10 .

[0099] < >

[0100] S201: DB

[0101] S202:

[0102] S203:

[0103] S204:

[0104] S205:

[0105] S206:

[0106] S207:

[0107] S208:

[0108] S209:

[0109] S210:

[0110] S211:

[0111] S212:

[0112] 601:

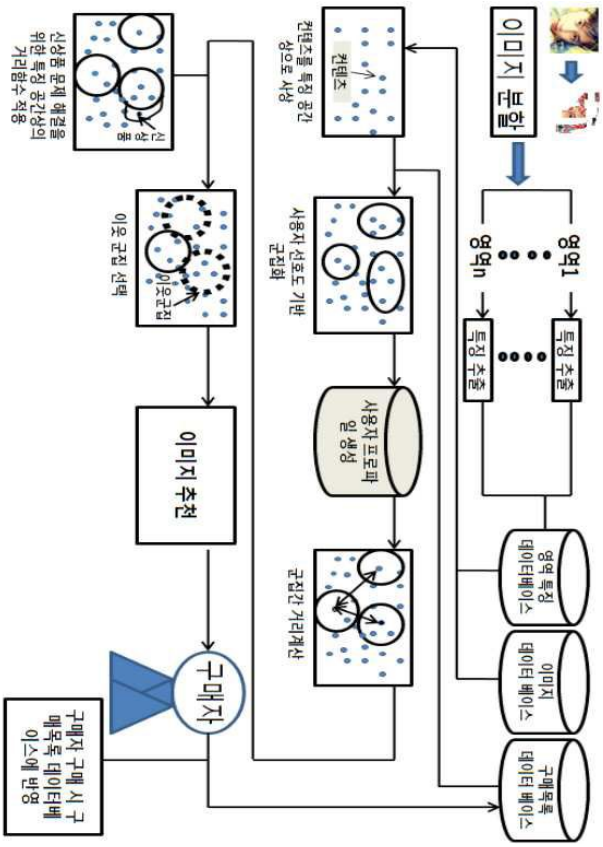
[0113] 602:

[0114] 603:

[0115] 604:

[0116] 605:

1



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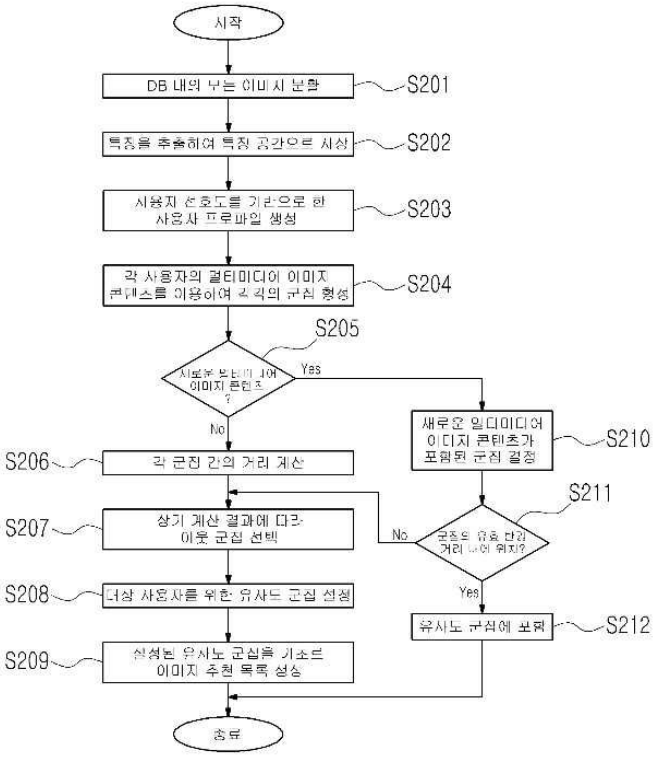
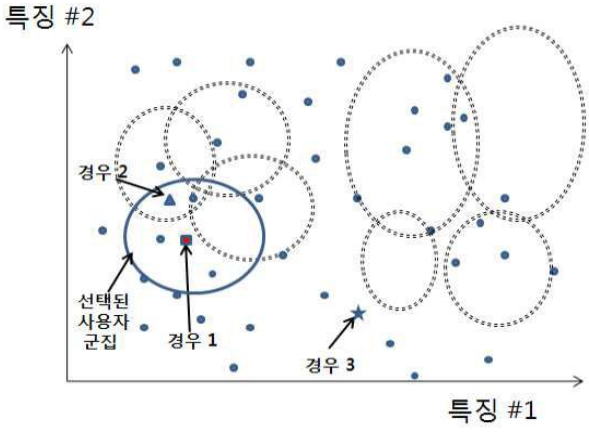
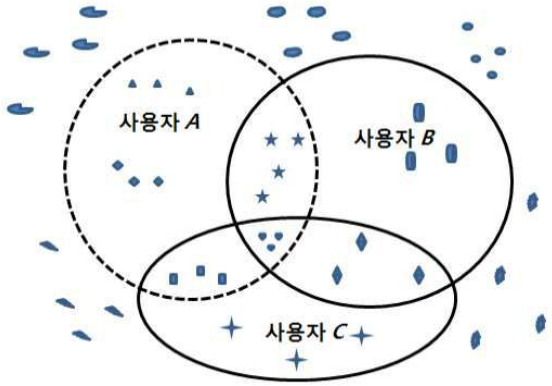

시작
DB 내의 모든 이미지 분할
S201
특징을 추출하여 특징 공간으로 사상
S202
사용자 선호도를 기반으로 한 사용자 프로파일 생성
S203
각 사용자의 멀티미디어 이미지 콘텐츠를 이용하여 각각의 군집 형성
S204
S205
Yes
No
새로운 멀티미디어 이미지 콘텐츠가 포함된 군집 결정
S210
S206
각 군집 간의 거리 계산
S207
상기 계산 결과에 따른 이웃 군집 선택
S211
No
Yes
S208
S212
유사도 군집에 포함
S209
종료

3

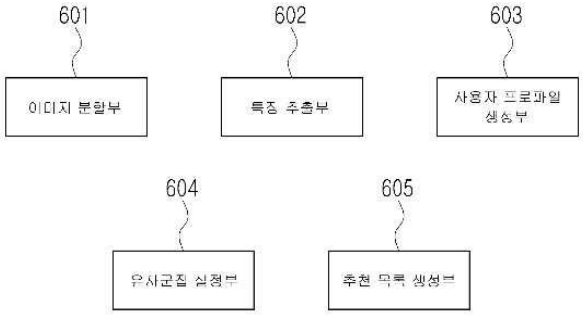
4



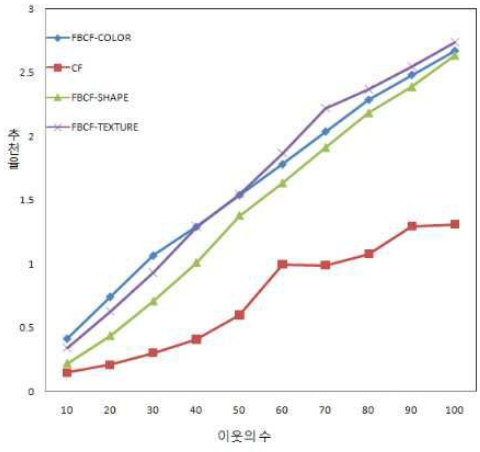
5


사용자 A
사용자 B
사용자 C

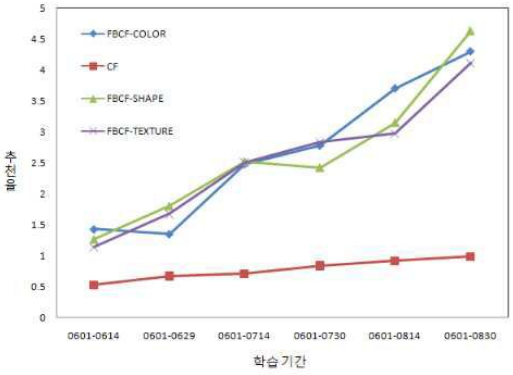
6


601
이미지 분할부
602
특징 추출부
603
사용자 프로파일 생성부
604
유사군집 설정부
605
추천 목록 생성부

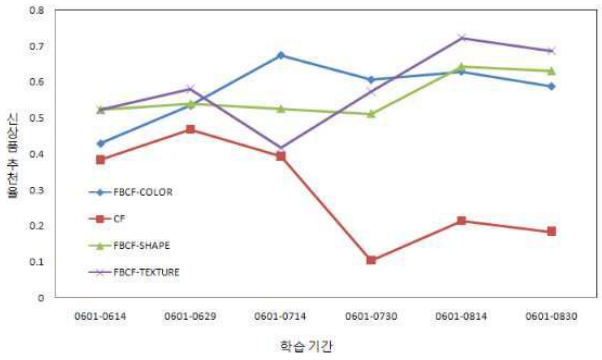
7


FBCF-COLOR
CF
FBCF-SHAPE
FBCF-TEXTURE
추천 RMSE
이웃의 수
0
0.5
1
1.5
2
2.5
3
10
20
30
40
50
60
70
80
90
100

8


FBCF-COLOR
CF
FBCF-SHAPE
FBCF-TEXTURE
0601-0614
0601-0629
0601-0714
0601-0730
0601-0814
0601-0830
학습기간

9


FBCF-COLOR
CF
FBCF-SHAPE
FBCF-TEXTURE
0601-0614
0601-0629
0601-0714
0601-0730
0601-0814
0601-0830
학습기간

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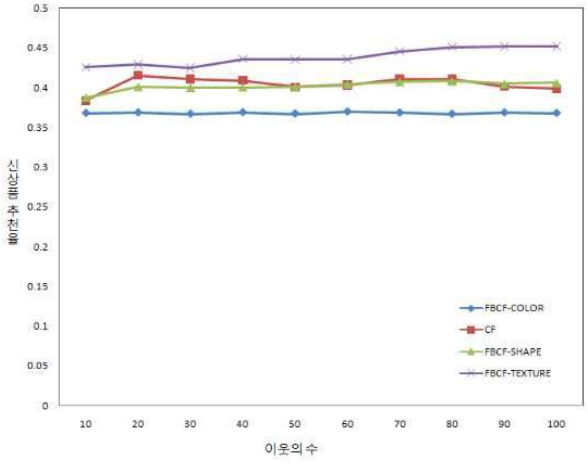
FBCF-COLOR
CF
FBCF-SHAPE
FBCF-TEXTURE
이웃의 수