

.

가

2D - Gel

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1		
2	1	
3		
4	3	
5		2
6		
7		
8	SVM/GA	
9	SVM/GA	
10		26
11		48

< >

10 :		102 :
104 :		106 :
108 :		110 :
112 :	114 :	
116 :	210 :	
212 :		214 :
220 :		222 : GA
224 : SVM		230 :
232 :		234 :

가

( 2D-Gel )

DNA 가 가  
 (BT) (IT) 가 가  
 가 가가 가  
 DNA 가  
 . 1~2 가  
 가  
 가  
 가  
 , RARISH, Christopher, Richard PCT/AU0  
 1/00877(2001.7.19) (marker)  
 가 (profile) 가  
 가 가  
 , YIP, Tai-Tung PCT/US01/28133(2001.9.7) (SELDI)  
 Emanuel F. Petricoin (Lancet, 359;572-577, 2002) (SELDI-TOF)  
 (SELDI-TOF MALDI-TOF) 1  
 (factor)  
 2  
 2D-Gel ( 2D-Gel )  
 2D-Gel 2 가

가 .

2

가

(fuzzy rule)

가

2

가

2

가

2

가

2

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가 가

가 .

가

가

가 가

가

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2

( ),

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가

가

(GA)"

가

x

x

f(x)

가

가 , 가  
, 2 가 , 가  
가 , 가 가  
" (SVM)" 가  
(feature space)  
( ) 가  
가  
가  


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1  
4), 16) (106), (108), (10), (110), (112), (102), (114) (10 (1  
(102) N ( , 20 ) N ( , 20 ) 가  
(112) ( 5 ) , 2  
(116)  
(102) , SVM,  
( , ) 가  
(102)  
2  
(104) (102) 가  
(116)  
(106) ( (

114) 가 가 가 , 가  
(108) (10) (110)  
(10) 가 (116)  
2 1 (102)  
(210), (210)  
(220) (210) (230)  
(210) (212) (214) (212)  
2 (noise filtering), (image enhancement), (ortho-projecti

on), (edge) , 2 (optimal thresholding) ,  
 (214) (214) 가 .  
 (220) (210) , GA(Genetic Algorithm) (222) SVM (224) (210) , SVM  
 (224) ( ) GA (222) , SVM (224)  
 가 , SVM (224)  
 GA (220) GA 5 20  
 (230) 가 (가 ,  
 ), (232) 2 , (232) (243) ,  
 (232) , (234) (230) 가  
 , 가 ( ) ;  
 ( ) .

, FPGA, ASIC  
 가 가 ( : S1)  
 3 , 4 3  
 가  
 (Support Vector Machine) 가 ,  
 가 ,  
 (S101) 2D-Gel (102) 2 (112)  
 ( , ) (116) (S102) 4 6  
 2D-Gel 1 (IEF, isoelectric focusing), 2D-Gel (SDS-PAGE) 2 가  
 2D-Gel 5 2D-Gel 가 가 5  
 가 2

가 (intensity), (size) 가  
 (new spot) 가  
 ( , , 2 )  
 ( , , 5 )

67 (pI)

[ 1 ]

스팟 번호	질량(kDa)	등전점(pI)	4319	42.9	5.59
106	20.2	4.60	4321	47.1	5.63
204	27.4	4.57	4401	48.2	5.40
406	52.8	4.58	4601	74.0	5.43
1109	15.7	4.87	5108	26.2	5.76
1303	41.0	4.82	5122	21.0	5.71
1311	39.9	4.89	5303	42.9	5.71
1318	38.4	4.99	5304	39.3	5.71
2105	20.0	5.04	5305	40.9	5.71
2114	25.8	5.22	5313	40.7	5.85
2115	16.2	5.19	5314	41.8	5.88
2204	32.9	5.07	5405	50.6	5.73
2301	41.0	5.02	5406	56.2	5.75
2309	46.4	5.13	5408	52.2	5.75
2316	42.1	5.21	5409	47.7	5.76
2318	44.8	5.21	5417	54.3	5.68
2705	138.3	5.03	6113	20.5	6.05
3104	17.8	5.23	6115	21.0	6.08
3106	24.9	5.23	6204	35.5	5.92
3110	22.8	5.29	6231	33.9	6.08
3113	25.8	5.32	6302	42.5	5.89
3119	21.0	5.39	6305	47.1	5.97
3306	40.7	5.23	6306	39.4	5.98
3402	51.2	5.22	6307	45.6	5.99
3421	57.3	5.23	6308	37.7	5.99
3514	62.7	5.38	6309	41.6	6.03
4110	25.7	5.49	6310	46.3	6.04
4123	17.7	5.50	6311	44.6	6.04
4215	28.6	5.51	6312	45.6	6.08
4302	39.4	5.42	6403	52.0	5.89
4311	40.7	5.50	6418	53.1	6.05
4313	37.3	5.53	7307	38.0	6.12
4318	44.9	5.59	7312	42.7	6.14
			7314	44.1	6.18

, 2

(spot) (Support Vector Machine; , SVM ),

가

1 가



$\sum_{n=1}^{67} C_n$

4

(S201), (S202~S204)

가

(S205~S207)

(S201)

(212)

2

(214)

2

가 .

, GA(Genetic Algorithm) (S202), SVM (S205), SVM

(S202) GA (222) (S204) GA

24) GA , SVM (S203) SVM (2

가 (S204). SVM ,

6 (100) (200) (300),

5 100 (400) 1 ( ) 5 SVM (

500) , n 가 , GA (600, 700)

7 1 , 2 3 ,

가 ,

(S205), (S205) (S206) (232) (S207)

(S026) 가 (234)

가 , 가

가 N ( , 20 ) N ( , 20 )

( ) ,

2 가 ,

8 가 ( ;S1) 30

2D 가 SVM/GA 2D 30

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( ; S2)

(S104). (112) (S103) (102) 2D-Gel

, 2 ,

(S105) (S106) (114)

(S107). (S105) (104) (106)

(116) ,

2 ,

, SVM



SVM , , SVM N , , 가 , SVM , , 가 9 ) ( 33 , 35 ) (S1) ( ;S2 (116)

< 1> 30 , 33 35 30 2 94.11%, 100%, 88.5 7% 26 26 1 6 7 10

가 , 가

가 ,

가

(57)

1. ; 2
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3 ;

13.  
12 , , , , , , ,

14.

12 , 1 1 .

**15.**

12 14 ,

1 2 ,

**16.**

12 14 ,

3

**17.**

12 14 ,

3 ;

2 ;

**18.**

12 14 ,

3

**19.**

12 14 ,

1 2 2 , ,

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2 ;

**20.**

19 ,

1 ,

2 ;

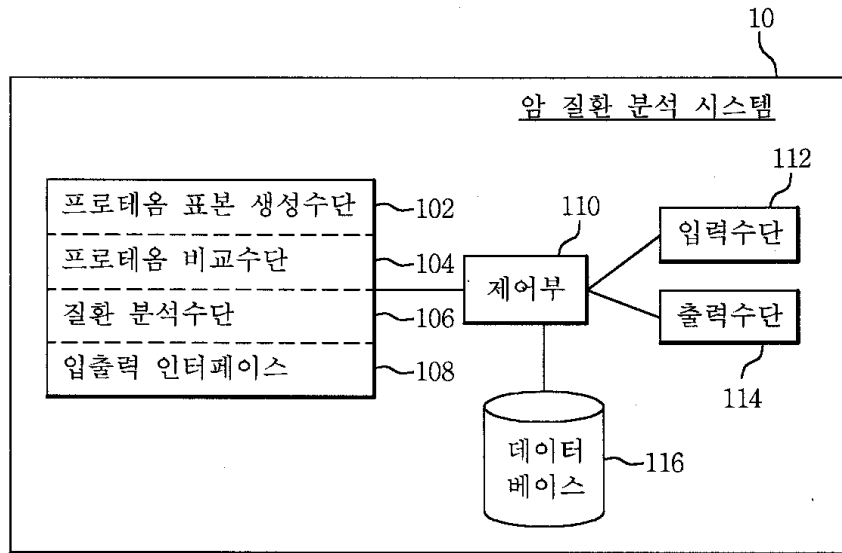
**21.**

1 1

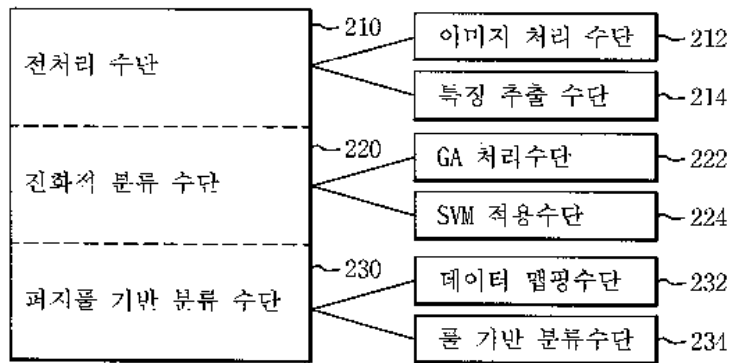
**22.**

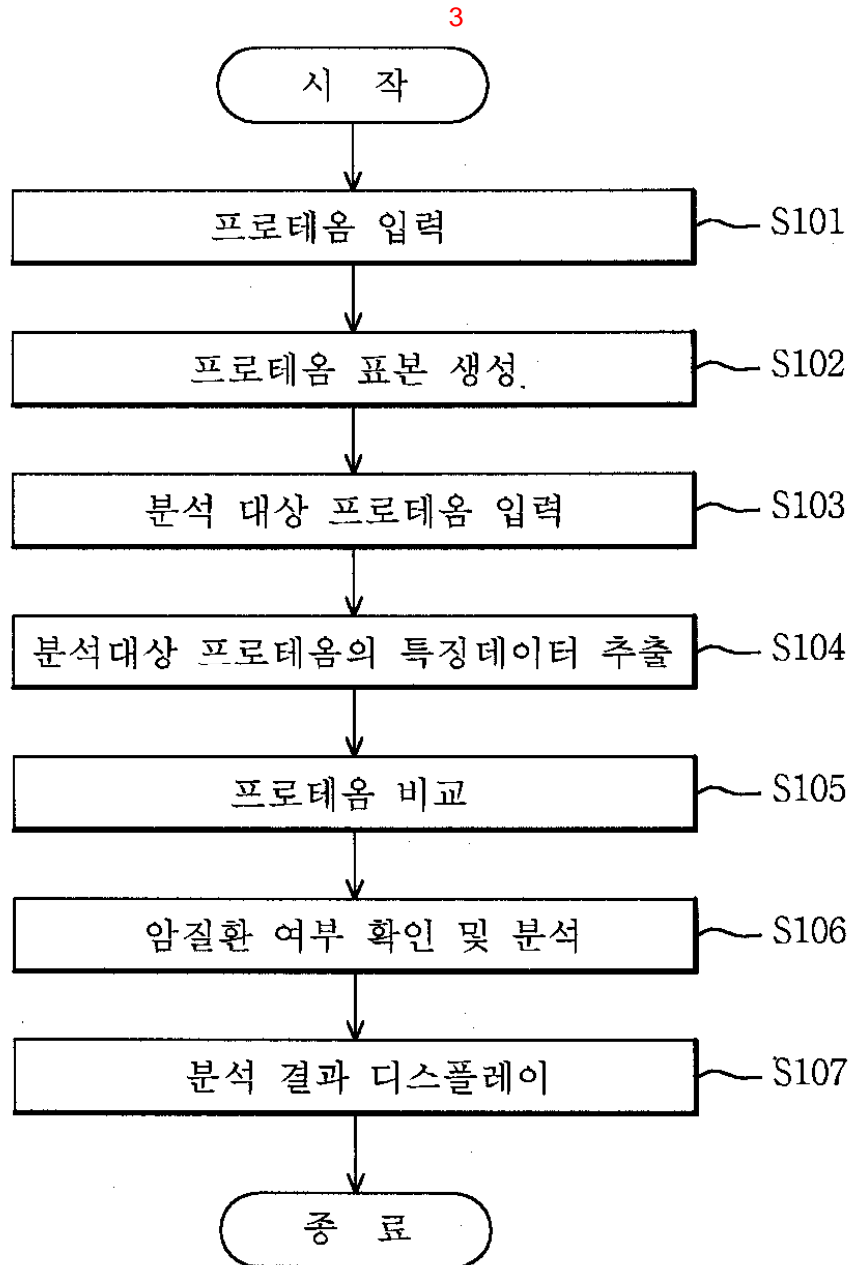
21 , , , , , , , , , , , , ,

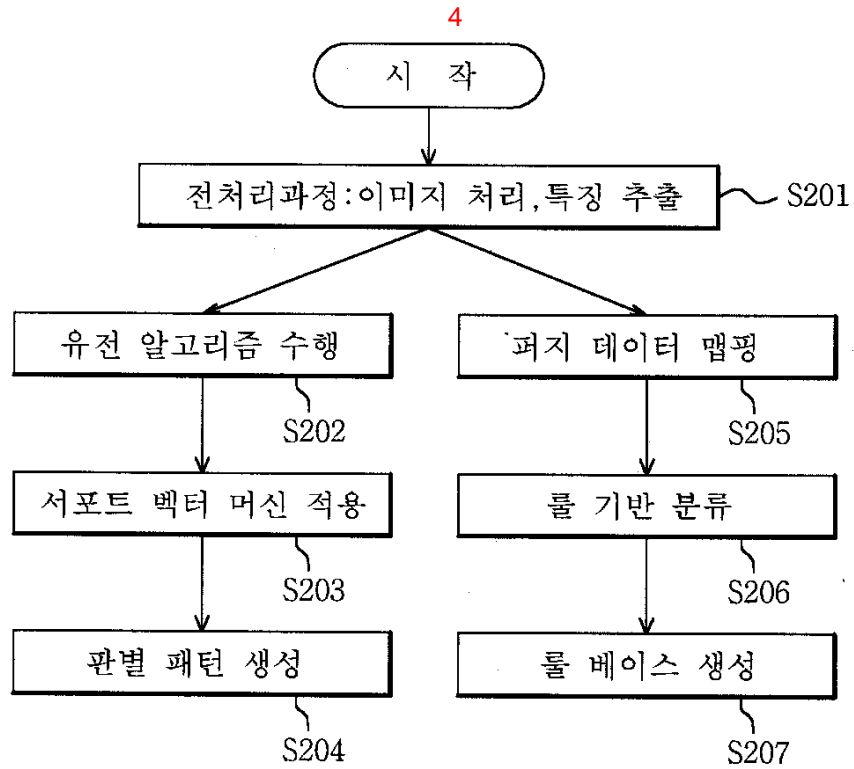
1



2

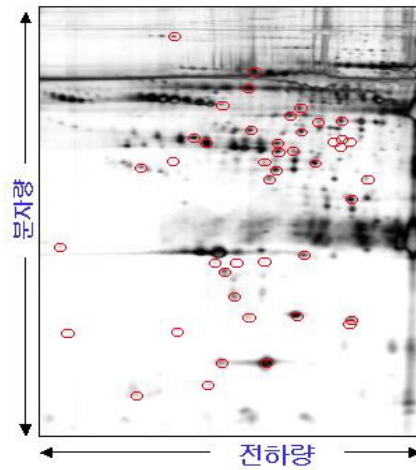




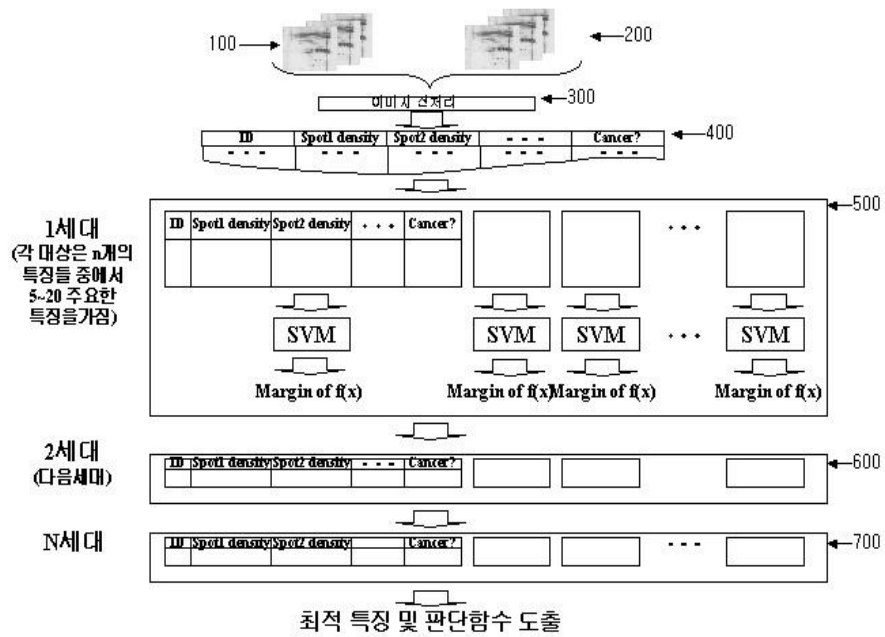


5

## 혈청 프로테옴 이미지

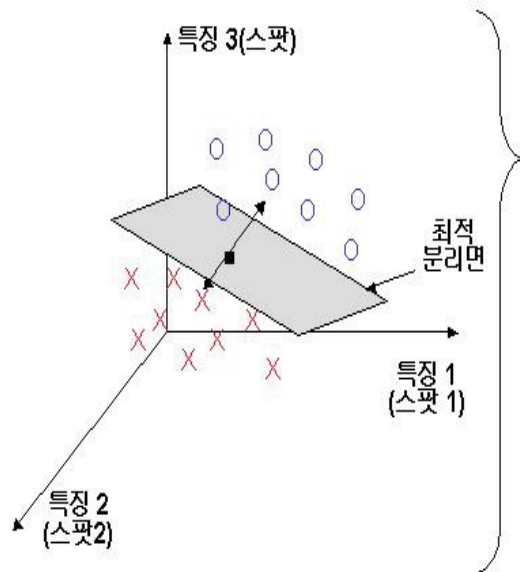


6

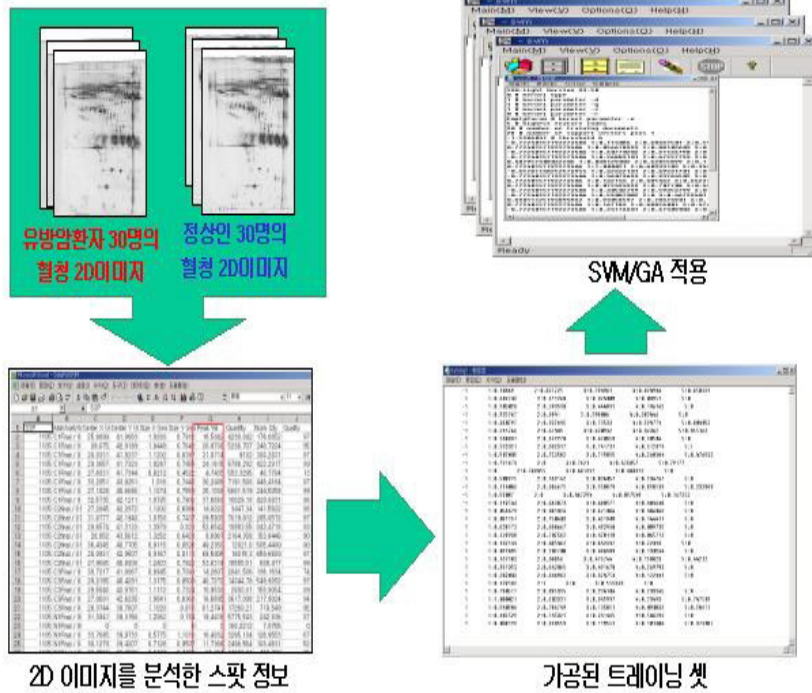


7

# Support Vector Machine

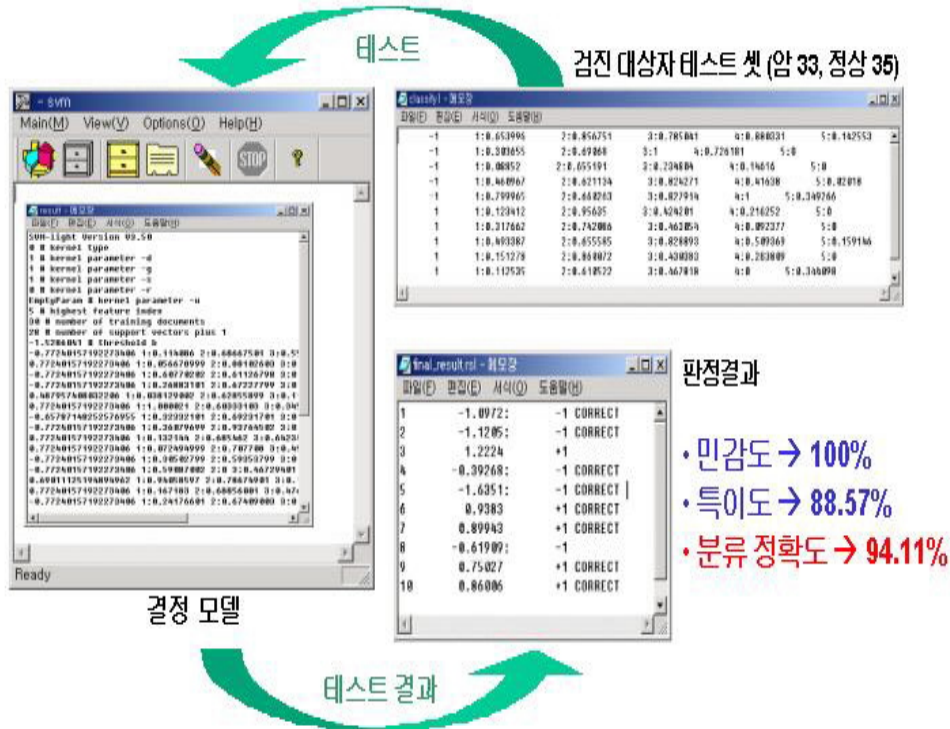


● SVM/GA를 이용한 유방암 진단 - 트레이닝 단계





● SVM/G를 이용한 유방암 진단 -테스팅(판별)



10

번호	Value	결과
34	0.128898	CORRECT
35	0.152850	CORRECT
36	0.140676	CORRECT
37	0.471308	CORRECT
38	0.028647	CORRECT
39	0.228874	CORRECT
40	0.428242	CORRECT
41	0.285080	CORRECT
42	0.026667	CORRECT
43	0.396419	CORRECT
44	0.208644	CORRECT
45	0.370373	CORRECT
46	0.180048	CORRECT
47	0.088871	CORRECT
48	0.250786	CORRECT
49	0.222000	CORRECT
50	0.080510	CORRECT
51	0.548522	CORRECT
52	0.741443	CORRECT
53	0.157827	CORRECT
54	0.041818	CORRECT
55	0.038834	CORRECT
56	0.210711	CORRECT
57	0.250144	CORRECT
58	0.124807	CORRECT
59	0.385226	CORRECT
60	0.186409	CORRECT
61	-0.109483	CORRECT
62	0.052921	CORRECT
63	0.155490	CORRECT
64	0.356410	CORRECT
65	0.025654	CORRECT
66	-0.956264	CORRECT
67	0.247211	CORRECT
68	-0.242207	CORRECT

번호	Value	결과
1	-0.028898	CORRECT
2	-0.062831	CORRECT
3	-0.070359	CORRECT
4	-0.142060	CORRECT
5	0.402804	CORRECT
6	-0.065808	CORRECT
7	-0.254305	CORRECT
8	-0.549400	CORRECT
9	-0.088596	CORRECT
10	0.111672	CORRECT
11	-0.207110	CORRECT
12	0.026887	CORRECT
13	-0.168822	CORRECT
14	-0.444805	CORRECT
15	0.070969	CORRECT
16	-0.113657	CORRECT
17	0.356620	CORRECT
18	-0.033568	CORRECT
19	-0.102226	CORRECT
20	0.002592	CORRECT
21	-0.196809	CORRECT
22	0.070104	CORRECT
23	-0.062887	CORRECT
24	-0.114122	CORRECT
25	0.308866	CORRECT
26	-0.072279	CORRECT
27	0.063012	CORRECT
28	-0.015894	CORRECT
29	-0.001598	CORRECT
30	0.240725	CORRECT
31	-0.551444	CORRECT
32	0.101061	CORRECT
33	-0.050204	CORRECT