

1, 2, 3, 4
가 1234
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A Control method of Left-Right directions by analyzing EEG Signals

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BCI(Brain Computer Interface) 가
BCI
BCI2000 BCI
가 가
BCI 가
BCI

Keyword : , EEG, BCI(Brain Computer Interface)

1. BCI2000 가

(EEG)

2. BCI2000

가
BCI
가
Wadsworth ,
Fraunhofer, Graz BCI
competition I, II, III International BCI meeting
BCI(Brain Computer Interface) DB ,
BCI
BCI2000 BCI2000[1]
BCI R&D

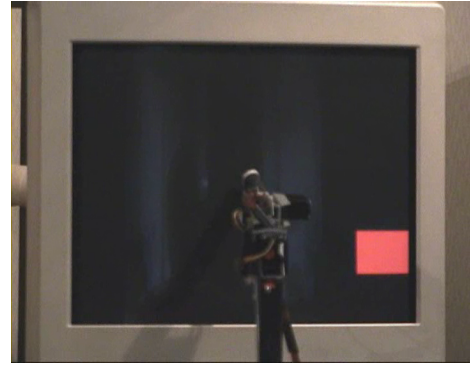
1 BCI2000

10

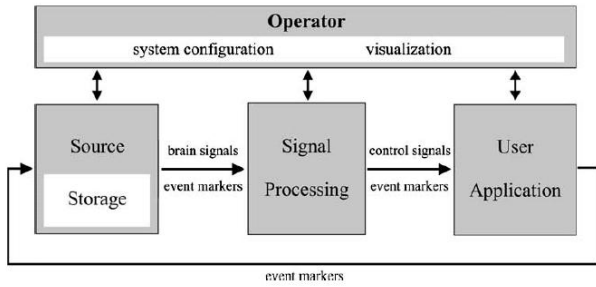
PSD,

ERD/ERS

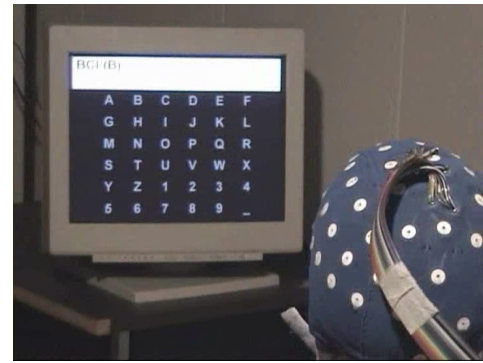
Speller



(c) 2D Robotic Arm



1. BCI2000



(d) P300



(a) 2D Cursor Control

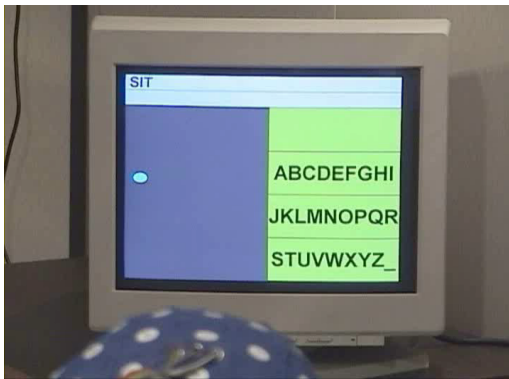
2. BCI2000

2 BCI2000

(a)

4

(b)



(b) (Speller)

(c) (a)

가

가

(d) ERD

P300

3.

가 α , β

가 .

가 가 . case

1 2

가

(case 3)

P300

(case 4)

가

3.1

[4].

가

0.5 - 50Hz

가

가

가

가

1

δ , θ , α , β

θ , α , β

[2].

- Case 1. 1: <-> 2:
- Case 2. 1: <-> 2:
- Case 3. 1: <-> 2:
- Case 4. 1: <-> 2:



3.

1.

δ (delta)	0.5 ~ 3 Hz	(slow)
θ (theta)	4 ~ 7 Hz	
α (alpha)	8 ~ 13 Hz	(fast)
β (beta)	14 ~ 30 Hz	
γ (gamma)	30 Hz	

가

α

β 가 .

[3].

◦ α (8 ~ 13 Hz):

“

10 ~ 50 mV .”

3.2

◦ β (14 ~ 30Hz):

“

가 .”

C3, C4

4

C3, C4

가

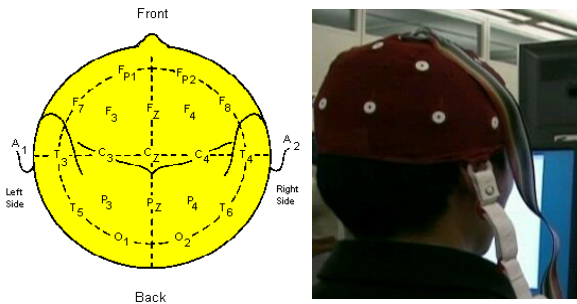
μV

ms

deflection

[5]. P300 ERP

- Amplitude: 3 ~ 20 μV
- Latency: 200 ~ 700 ms
- Scalp distribution: Fz < Cz < Pz



4.

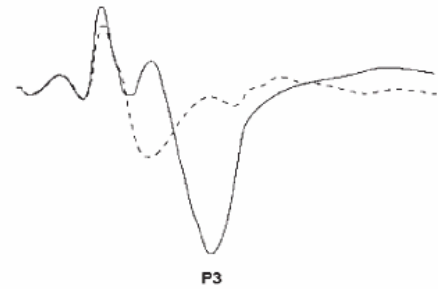
6 P300

P300

300ms

5

가



6. P300

C3 C4

70%

P300

가

. 2

2 (d) Wadsworth

P300

6 x 6

' B '

가

6

30

disable

가

가 36

. 36

가

가

' B '

P300

5.

3.3 P300 ERP

P300 ERP

가

가

(Cz)

' B '

가

7

7 (a).

(가
가
가

P300

가 가

P300

2(d) P300

P300

가

가 5

36

36

()

가

Cz

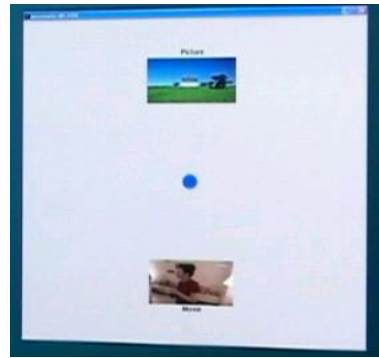
P300

If(fabs(P_baseline - P_now)) < criterion
then direction= Down
else direction= Up
end

가 가
가

P300

가



(a) ()

criterion

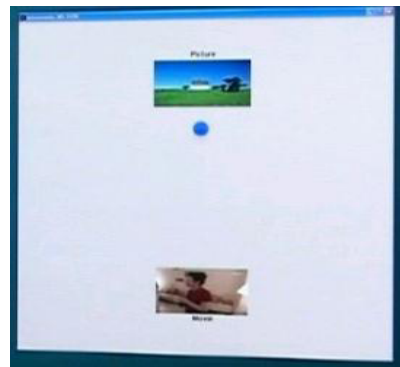
criterion

가

가

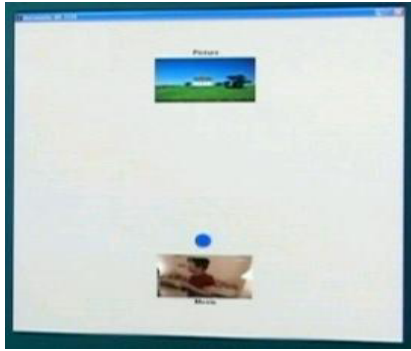
7 (a)

가



(b)

가



(c)

7. P300

4.

가 . 2 가 BCI2000
 2 4 .

References

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