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Discriminating Different Patterns of EOG Signal by Using Adaptive Resonance Theory Networks

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Abstract

The difference in potential between the cornea and the posterior pole of the eye is known as the corneoretinal potential. Movement of the eye causes changes in the corneoretinal potential. These suggest the possibility of using the EOG signals to detect and track the eye movements. Recently, the detection of the eye movement has formed the foundation of much research in the area of human-computer communication. A new method of tracking and detecting the eye movement is developed here. It is based upon the measurements of the EOG signal. For this purpose, different kinds of eye movements, horizontal, vertical, and diagonal movements were considered. There is considerable overlap among the EOG patterns corresponding to these movements. This overlap degrades the performance of the classifiers. To overcome this problem, a dynamic classifier based upon the neural network is presented. We employ adaptive resonance theory (ART) for discriminating different patterns of the EOG signal. The results of this analysis show that through the use of the ART-networks accurate detection of the eye movement is obtained.

Key words: Electrooculogram, EOG, Adaptive resonance theory, Neural networks, Eye movement.

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4- Adaptive Resonance Theory (ART)

1- Electrooculogram
 2- Amyotrophic Lateral Sclerosis
 3- Cursor

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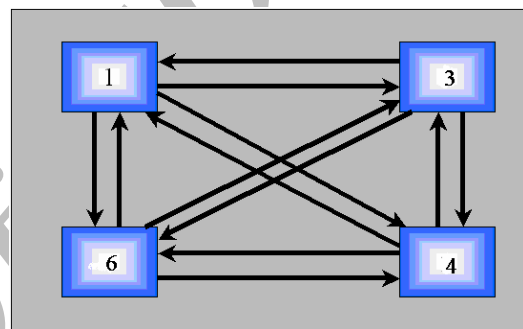
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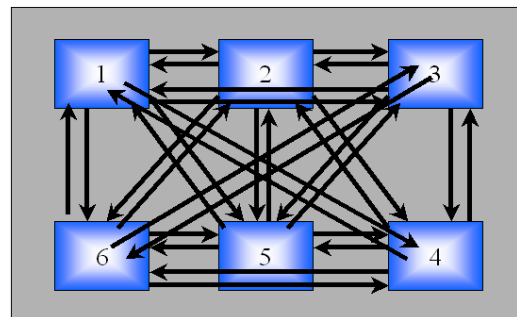
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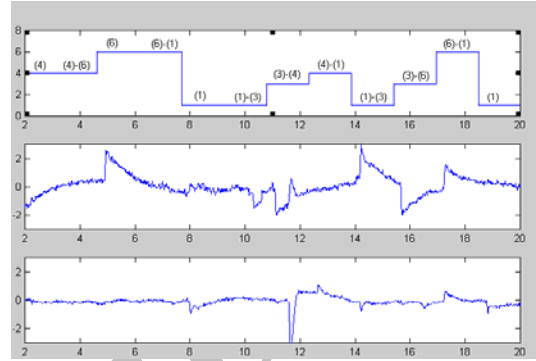
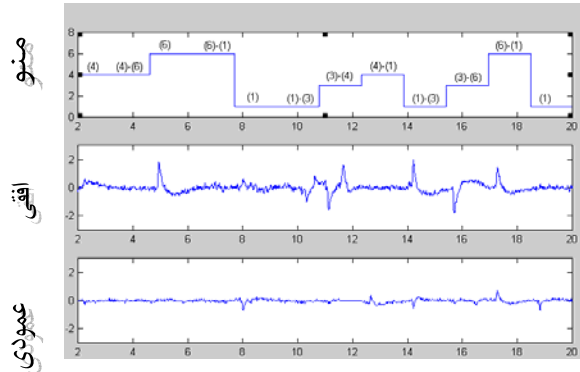
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- 1- Mean
- 2- Variance
- 3- Sharpness
- 4- Singular Value



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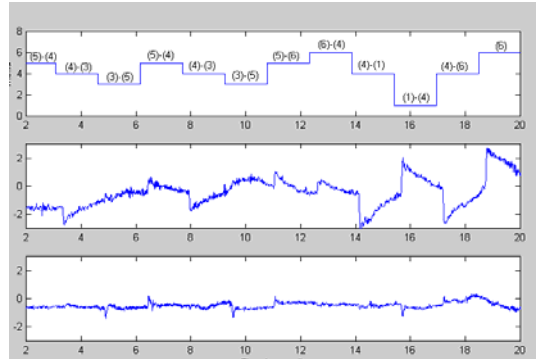
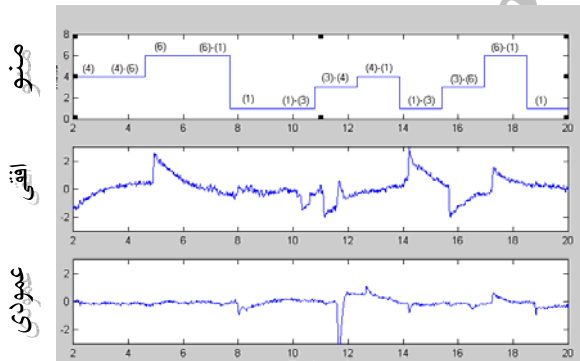
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$$t_j = \sum_{i=1}^m w_{ij} \cdot i_i \quad ()$$

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$$W_J = (w_{1J}, \dots, w_{mJ})$$

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$$X \wedge Y = \min\{x, y\} = (x_1 \wedge y_1, \dots, x_m \wedge y_m)$$

$$v_i = \sum_{j=1}^n u_j \cdot w_{ji} \quad ()$$

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