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EMG PATTERN CLASSIFICATION USING HIERARCHICAL NETWORK BASED ON BOOSTING APPROACH

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Abstract. *This paper proposes a new electromyogram (EMG) pattern classification method using probabilistic neuralnetworks based on boosting approach* [1]. *Since the proposed method automatically constructs a suitable classification network from measured EMG signals, there is no need to set the structure of network in advance. To verify the feasibility of the proposed method, phoneme classification experiments are conducted using EMG signals measured from mimetic and cervical muscles. In these experiments, the proposed method achieved high classification rates.*
Keywords: Pattern classification, Probabilistic neural network, Electromyogram, EMG signals

1. **Introduction.** Electromyograms (EMG) pattern classification has been used to devise elaborate human-machine interfaces for people with physical disabilities [2, 3]. Generally, such pattern classification is performed by estimating the relationship between the EMG signals as feature vectors and the corresponding intentions as class labels. For general pattern classification problems, various soft computing approaches, such as fuzzy inference and self organizing maps (SOM) and so on, have been proposed [3-7], and in recent years, EMG pattern classification methods using various types of classifiers have also been proposed [8-11]. In particular, neural networks (NN) have been demonstrated as a promising classification tool, since their learning ability allows them to find optimum non-linear relationships between classes and feature patterns from data sets [8, 11-13]. However, to effectively use NNs as the classifiers for applications, several fundamental problems, such as the choice of network structure, learning convergence and local minima, must be solved.

A probabilistic neural network (PNNs), which estimates the probability density function of patterns, has been proven to be an efficient and important method for pattern classification. In particular, Tsuji et al. proposed a feedforward PNN, a log-linearized Gaussian mixture network (LLGMN) based on the Gaussian mixture model (GMM) and a log-linear model [14]. The LLGMN has been successfully applied to pattern classification of bioelectric signals, such as electromyograms [15] and electrocardiograms [14, 16],