MEDICAL IMAGE RECOGNITION OF THE BRAIN BY REVISED GMDH-TYPE NEURAL NETWORK ALGORITHM WITH A FEEDBACK LOOP

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Abstract. *In this paper, a revised Group Method of Data Handling (GMDH)-type neural network algorithm with a feedback loop identifying sigmoid function neural network is applied to the medical image recognition of the brain. This revised GMDH-type neural network algorithm automatically selects the structural parameters such as the number of neurons in each layer, the number of feedback loops and the useful input variables using Akaike's Information Criterion (AIC) or Prediction Sum of Squares (PSS) criterion. It is shown that this revised GMDH-type neural network is a very useful method for the medical image recognition because the neural network architecture is automatically organized so as to minimize AIC or PSS criterion.*
Keywords: GMDH, Neural network, Sigmoid function, Medical image recognition

1. **Introduction.** Recently, 3-dimensional medical images which are generated using the Multi-detector-row Computed Tomography (MDCT), Magnetic Resonance Imaging (MRI) and so on are used in the clinical diagnosis of the disease and Computer Aided Diagnosis (CAD) systems using MDCT or MRI images are developing [1]. But, it is very difficult to extract and display accurately the 3-dimensional medical images of the organ which is the interest region of the diagnosis by the computer [2]. The image characteristics of the 3-dimenisonal medical images generated using MDCT or MRI are different each other and furthermore these image characteristics are also different for many kinds of the organs. When we apply the conventional neural network trained using back propagation to the medical image recognition using 3-dimensional medical images, it is very difficult to find the optimum neural network architecture fitting the characteristics of the medical images. In this paper, a new revised Group Method of Data Handling (GMDH)-type neural network algorithm is applied to the medical image recognition and the 3-dimensional image of the objective organ is recognized accurately and extracted by the revised GMDH-type neural network.

The GMDH-type neural network algorithms have been proposed in our early works [3,6]. In this paper, a new revised GMDH-type neural network algorithm with a feedback loop identifying sigmoid function neural network is applied to the medical image recognition of the brain and the 3-dimensional brain images are automatically extracted and displayed. The 3-dimensional images used in this paper are the MRI image of the