

INTELLIGENT HUMAN-MACHINE VOICE COMMUNICATION SYSTEM

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In the future, speech unquestionably will become the primary means of communication between humans and machines. New applications of artificial neural networks are capable of recognizing human speech and analyze the meaning of the recognized text. The condition of the effectiveness of two-way human-machine voice communication is to apply the mechanisms of command verification and correctness. In this paper there is a review of the selected issues on recognition and safety estimations of voice commands in natural language given by the operator of the technological device. A view is offered of the complexity of the recognition process of the operator's words and commands using neural networks made of a few layers of neurons. There is also an intelligent system of two-way voice communication between the technological device and the operator presented, which consists of the intelligent mechanisms of operator identification, word and command recognition, command syntax and result analysis, command safety assessment, technological process supervision as well as operator reaction assessment. The paper presents research results of speech recognition and automatic command recognition as well as command safety estimation with artificial neural networks.

Key words: speech, voice communication, command recognition, artificial intelligence, artificial neural networks, human machine interface

1. Intelligent two-way speech communication

According to the new conception [1, 2, 4], the intelligent layer of two-way voice communication of the technological device with the operator, is equipped with the following intelligent mechanisms: operator identification, recognition of words and complex commands, command syntax analysis, command result analysis, command safety assessment, technological process supervision, and also operator reaction assessment. If the operator is identified and authorized by the intelligent speech communication layer between the technological device and the operator (Fig. 1), a produced command in continuous speech is recognized by the speech recognition module and processed to the text format. Then the recognized text is analyzed with the syntax analysis subsystem. The processed command is sent to the word and command recognition modules using artificial neural networks to recognize the command, which next is sent to the effect analysis subsystem for analyzing the status corresponding to the hypothetical command execution, consecutively assessing the command correctness, estimating the process state and the technical safety, and also possibly signalling the possible error caused by the operator. The command is also sent to the safety assessment subsystem for assessing the grade of affiliation of the command to the correct command category and making corrections. Next the command execution subsystem signalizes commands accepted

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