DECISION SUPPORT SYSTEM FOR CONTROLING CARBON FIBER CAPACITY WHILE MANUFACTURING OF COMPOSITE MATERIALS

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Manufacturing fluoroplastic composites based on polytetrafluoroethylene [1] with given characteristics requires the development and application of automated systems that implement methods of machine learning and pattern recognition. Consider the problem of quality control of mills operating through recognition of medium length carbon fibers capable of learning through decision support system (DSS).

Input mathematical description of the classifier has the form of a training matrix of the whole numbers representing image brightness of chopped carbon fibers. At the stage of training it is necessary to find the informationally best partitioning of feature space into classes and to make a reliable decision as to whether the tested image belongs to a certain class of the class recognition alphabet formed at the stage of learning.

One way of solving this problem is to create a DSS using extreme intellectual information technology (IEIT), based on the maximization of system information capacity by applying more information restrictions [2].

The multidimensional training matrix was formed by the discrete values of the colour components of each pixel of carbon fiber images, which are divided into three classes "Norm", "Smaller than normal" and "Bigger than normal". Information extreme learning algorithms DSS lie in the iterative procedure of finding the global maximum information Kulbaks criterion in the working (allowable) area of determining its role in the restoration of optimal container three recognition classes. To improve the accuracy of the images in the learning process there was carried out optimization of both geometrical parameters of DSS functioning and the system of control tolerances for signs of recognition.

Optimization of control tolerances was made by the parallel and serial algorithms. After optimization values of information functional efficiency criterion increased on each step and for all recognition classes.

According to the results of physical modeling using the full exam DSS probability of correct decision making while recognizing the images of the given above three classes of fibres is equal to 0.9.

Further development of the system is the optimization the functioning of other parameters, such as optimizing the dictionary of recognition features.

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