Zastosowanie teorii logiki rozmytej do badania wpływu jakości papieru na proces drukowania

Application of the theory of fuzzy logic to study the impact of paper quality on the printing process

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W artykule określono możliwości zastosowania teorii logiki rozmytej do oceny wpływu jakości papieru offsetowego – jako jednego z ważnych czynników – na proces drukowania. Wybrano zbiór zmiennych lingwistycznych, które identyfikują parametry wpływające na jakość papieru. Przedstawiono zbiór zmiennych lingwistycznych oraz ich wpływ na jakość papieru w odniesieniu do takich parametrów papieru, jak m.in. gramatura, gęstość, białość, wytrzymałość na zginanie. W oparciu o równania logiki rozmytej uzyskano przewidywane wartości poziomu oceny jakości papieru dla wybranych danych początkowych.
Słowa kluczowe: jakość papieru, drukowanie, logika rozmyta

The feasibility of usage of fuzzy logic usage for the anticipation of evaluation of offset paper quality as one of the important factors of the printing process has been substantiated. The set of linguistic variables which identify the factors of influence on the paper quality has been selected. The term sets of volumes of linguistic variables within the limits of which the membership functions in relation to paper grammage, paper density, paper tensile strength and whiteness of each paper side have been designed. Based on the fuzzy logic equations, which are constructed with the defuzzification process, the anticipated value of the paper quality level for the selected initial data has been obtained.
Keywords: paper quality, printing, fuzzy logic

Introduction

The printing process gives the perfection of design phases and preprinting processing of editions. It materializes the author's idea in the form of finally formed printing products. On the one hand, the printing process accumulates quality indicators of a copy, on the other hand, it demonstrates the level and the quality of printing itself. It is worth noticing that in order to obtain the proper quality a significant part of control procedures is made before printing: providing a choice of appropriate materials, operating modes of the printing press, technological parameters with the required characteristics.

The next phase is the quality control of proof prints, which takes into account the decision to finish the printing process or its repeat with modified parameters. As is known [2, 3, 5, 7], the control is carried out with using visual, electronic tools and statistical methods, which stipulates the involvement of experienced experts, electronic measurement tools, experimental data that is processed with methods of probability and mathematical statistics. As initial data is unknown, it is difficult to predict where the repetition of these control options will stop, because only the descriptive or numerical values of the criteria are known. In obedience to these values, a decision about the final of the printing run is made.

Accepted schemes and methods provide the proper quality of products. However, the complexity of the procedures which accompanying the control process and providing the quality of the edition, necessity of expenses of additional materials, printing equipment and staff time is quite significant. The retrenchment of these and other factors determine the relevance of the researches aimed at the development of the methodology of initial data anticipation for the quality of printing.

Research questions

A set of requirements and rules that concern to the indicators of the quality finishing of procedures related to the various phases of

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