

MATHEMATICAL MODEL OF THE DELIVERING A JUDGEMENT USING RESULTS OF DNA ANALYSIS (ON THE BASIS OF THE DECISION THEORY)

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Due to the probabilistic character of the values used in DNA identification, the problem of the choice of the criterion of the identity arises. The problem in question consists of both the assessment of the objective statistical indices of the reliability of the identification and the subjective factor of the acceptance of the decision concerning the choice of the criterion. Here the latter aspect will be discussed. On the basis of the decision theory the mathematical model of the delivering a judgement using the DNA information is developed. Certainly, a judgement depends on a variety of evidence but for the aim of the investigation of the problem it is assumed that the judgement depends directly on the result of the DNA analysis. In the model the mechanism of the acceptance of the decision is not determinant: whether the probabilistic values are analyzed directly by the court or a judgement is produced on the basis the issue which is formulated using the criterion. Using the hypothesis of the rational behavior the model of the functioning of the system is mathematically described, and the model factors influencing the acceptance of the decision are revealed. On the basis of the different conceptions of the decision theory ("averaging" and 'maximum guaranteed result") the border (critical) values of the match probability (Pcr) assessed as sufficient for the judgement. In the case of the averaging the border value of P is: $P_{cr} = \ln(1 + 1/n) / (1/V_{max} - 1)$, where V_{max} – the upper value of the number of the potential suspects, n – the value produced from the results of the public opinion poll used for the revealing of the preferences of the society. The detailed method of the questioning will be considered elsewhere. In this work the idea and the main approaches to the formulation of the questions are described. The result of the questioning significantly depends on the structure of the respondents. Possible questioned groups may be: (a) chance extract (reflecting "average" preferences of the society), (b) specialists of the legal system, (c) jury. The probabilistic parameter calculated concerning public opinion should be taken into consideration additionally to evaluate the objective statistical values. The preliminary assessment of the method (for the reliable conclusion it is necessary to perform full sociological investigations) shows that the range of the variation of the border values of Pcr. ordered by the considered quantitative parameters are expected to be acceptable and is in accordance with the high values of the reliability of the identity.