Approximations of Believeability Functions under Incomplete Identification of Sets of Compatible States

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Abstract: The believeability function has been introduced and investigated in the Dempster-Shafer theory as a numerical characteristic of uncertainty ascribing to each set of possible answers to a question, or set of possible states of an investigated system, under another interpretation, the probability with which the obtained random empirical data (observations) are such that the true answer, or the actual state of the system, can be proved to belong to the set in question. In other words, this value is defined by the probability that the set of all answers or states compatible with the at random obtained data is a subset of the set the believeability of which is to be defined. In this paper we shall investigate the case when the set of compatible states cannot be completely defined so that we have at hand just a class of sets of answers or states containing the set of compatible states. Using this class of sets, we shall define and compute an approximation of the desired value of the believeability function, which can be useful in some decision-making problems when not the value of this function itself, but rather the fact whether this value exceeds some threshold value or not is important.