PROBABILITY MEASUREMENTS CHARACTERIZING THE CLASSICALITY OF A PHYSICAL SYSTEM

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Abstract

Let S be a set of states of a physical system. The probabilities $p(s)$ of the occurrence of an event when the system is in different states $s \in S$ define a function from S to $[0,1]$ called a multidimensional probability. When appropriately structured in respect to the order, complements and sums of functions, sets P of multidimensional probabilities give rise to so called algebras of S-probabilities which, in the case of classical physical systems, are Boolean algebras. Knowing only a (small) subset X of P, and not the whole of P, the question arises whether the functions of X indicate that one deals with a classical physical system, or not. We will show that this question can be settled by (experimentically) finding further multidimensional probabilities which are terms of the given ones and can be precalculated by a recursive procedure depending on the number of elements of X. Our main tool for this procedure is a characterization of commuting pairs of multidimensional probabilities.