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**Optimal comparison strategies in Ulam's searching game with two errors.** (English)

Zbl 0902.90191

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Summary: Suppose  $x$  is an  $n$ -bit integer. By a comparison question we mean a question of the form “does  $x$  satisfy either condition  $a < x < b$  or  $c < x < d$ ?”. We describe strategies to find  $x$  using the smallest possible number  $q(n)$  of comparison questions, and allowing up to two of the answers to be erroneous. As proved in this self-contained paper, with the exception of  $n = 2$ ,  $q(n)$  is the smallest number  $q$  satisfying Berlekamp's inequality  $2^q \geq 2^n \binom{q}{2} + q + 1$ . This result would disappear if we only allowed questions of the form “does  $x$  satisfy the condition  $a < x < b$ ?”. Since no strategy can find the unknown  $x \in \{0, 1, \dots, 2^n - 1\}$  with less than  $q(n)$  questions, our result provides extremely simple optimal searching strategies for Ulam's game with two lies – the game of Twenty Questions where up to two of the answers may be erroneous.

**MSC:**

91A46 Combinatorial games

Cited in **1** Review  
Cited in **12** Documents

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**References:**

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