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VARIANCE-COVARIANCE SIGNIFICANT FIGURE REDUCTION AND ITS EFFECT ON COLLISION PROBABILITY CALCULATION

Abstract

A covariance matrix must be positive definite to be proper and useful. Essentially, one desires a sufficient number of digits to avoid unintended loss of information while also using few enough digits to be reasonably convenient. Certain data transmission formats require an elemental reduction in the number of significant figures. Sometimes this reduction can cause an otherwise positive definite covariance matrix to appear semi-definite or indefinite. A multitude of high fidelity, self- and other-generated, positive definite, covariance matrices are examined by reducing the number of significant digits while retesting for positive definiteness. Four individual reduction techniques are studied: rounding all elements, rounding up all elements, truncating all elements, and rounding up all diagonal elements while truncating all off-diagonal elements. Additionally, the number of significant digits required to perform collision probability suitably is investigated. Results indicate that, for most cases, at least six significant figures are required.