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2.6 Monte Carlo techniques

Sometimes the functional relationships are so complex or non-linear that the preceding analytical formulas are unwieldy. In such cases, an alternative is to employ what is conventionally called a *Monte Carlo* technique. In this approach, the measured quantities are varied randomly in ways that represent the experimental uncertainties, and the calculations leading to the final answer are repeated with these artificial quantities. This is done repeatedly, and the variances and covariances in the resulting final answers are calculated. Random number generators are available on computer systems that generate variables having zero mean, unity variance, and a Gaussian probability distribution. Correlated fluctuations can be represented by defining linear combinations of such independent variables. In cases where the error propagation is especially complex (e.g, where the final answer might depend on non-linear fits to the input data), Monte Carlo techniques may be the only feasible way of determining the uncertainty in the final result.

SOURCES AND FURTHER READING:

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