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EXTENSION OF STANDARDIZED TIME SERIES FOR CONTINUOUS-TIME STATISTICS

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In steady-state computer simulation experiments continuous-time statistics play an important role. They are used to estimate a variety of different system's parameters. For example, in queueing simulations continuous-time statistics are used to estimate expected number of customers in the system, expected utilization of the server, and the expected departure rate of customers, among others.

In steady-state simulation experiments we typically observe two types of continuous-time statistics:

1) A stationary stochastic process $y(t)$, $0 \le t \le T$, such that $E[y(t)] = \mu$, $0 \le t \le T$.

2) A stationary increment jump process $y(t)$, $0 < t \le T$ such that $E[y(t)/t] = \mu$, $0 < t \le T$, and $y(0) = 0$.

The objective of the experiment is typically to estimate an interval, I, which with a prespecified probability η contains μ, i.e., $\Pr\{\mu \in I\} = \eta$. The interval I is referred to as a confidence interval and is denoted by $\hat{\mu} \pm H$, where $\hat{\mu}$ is the center and H is the half-width of the interval. For the above cases, $\hat{\mu}$ is respectively computed by:

1) $\hat{\mu} = T^{-1} \int_0^T y(t)dt.$

2) $\hat{\mu} = T^{-1} y(T).$

In this talk we present formulas for estimating H for each of the above cases. These formulas are developed and evaluated in Nozari [1]. The formulas are extensions of the method of "Standardized Time Series" developed by Schruben [2] for discrete-time observations.

We give formulas for two different estimators: Area, which is the continuous-time version of the Sum estimator of Schruben, and Maximum. Also, we give formulas for combining these estimators with the classical estimator. To examine the behavior of the estimators, we present results of a Monte Carlo study. Our estimators work quite well and our results are consistent with those of Schruben for discrete-time observations.

References

[1] Nozari, A., "Confidence Intervals Based on Steady-State Continuous-Time Statistics," to be submitted for publication, 1985.

[2] Schruben, L., Confidence Interval Estimation Using Standardized Time Series, Operations Research, Vol. 31, 1983, 1090-1108.

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