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6. AUTHOR(S)
Drs. Nader Ebrahimi & T. Ramalingam

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
Northern Illinois University
Statistics & Statistical Consulting Laboratory
DeKalb IL 60115-2854

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13. ABSTRACT *(Maximum 200 words)*
Syngergism or the so-called dependence among the components of multivariate process induces a host of probabilistic structures among the hitting times of the processes. Conventionally, hitting times have been studied for isolated processes or for families of processes exhibiting specific dependence structures. Whereas this approach has been very useful, stochastic modeling of hitting times per se is equally fruitful. For example, it is possible to derive useful bounds for the reliability of a complex system like the wing of an aircraft if the joint dependence structure of the hitting times to failure of the components of the system is known adequately. The joint behavior of two or more hitting times, one each from the components of multivariate process is, therefore, of paramount importance in a plethora of disciplines. Research has continued on the development of positive (negative) dependence ideas and applied them to a number of areas.

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P.I. Nader Ebrahimi
Co-P.I. T. Ramalingam

I have continued my research development of assessing system reliability using sample paths. The results obtained in this manner are discussed in the following papers:

(i) On the dependence structure of multivariate processes and corresponding hitting times;

(ii) Information theory and the failure time of a system (to appear in **Ann. Inst. Stat. and Math.**);

(iii) On stopping a damage process to non-parametrically estimate system reliability and ruin probability;

(iv) Modeling of repairable systems.

We now provide a summary of our results.

Syngergism or the so-called dependence among the components of multivariate process induces a host of probabilistic structures among the hitting times of the processes. Conventionally, hitting times have been studied for isolated processes or for families of processes exhibiting specific dependence structures. Whereas this approach has been very useful, stochastic modeling of hitting times per se is equally fruitful. For example, it is possible to derive useful bounds for the reliability of a complex system like the wing of an aircraft if the joint dependence structure of the hitting times to failure of the components of the system is known adequately. The joint behavior of two or more hitting times, one each from the components of multivariate process is, therefore, of paramount importance in a plethora of disciplines. In paper one, I have continued my research development of positive (negative) dependence ideas and applied them to a number of areas.

In the second paper, I have come up with a measure of generation of information about the failure time of a system.

In paper 3, denoting the failure time as the instant at which the damage to the system first crosses a given threshold, I obtain a non-parametric estimate of system reliability.

In paper 4, given the fact most real world systems are intended to be repaired, I use hitting times to model a repairable system.

In addition to this work just described, the P.I. and Co-P.I. separately have completed the following work:
In the paper entitled, "How to compare two systems" (appeared in **JAP**), I have developed a method for comparison of two systems when the marginal behaviors of components are specified but complete joint behavior of components is unspecified. In the paper entitled, "Improvement and deterioration of a repairable system," due to appear in **Sankhya Series A**, we have developed a method for the comparison of two repairable systems.

In the following three papers, I have estimated the mean residual life function:

(i) On estimating change point in a mean residual life function (Sankhya, A, 206-219, 1991)

(ii) Estimation of two ordered mean residual lifetime functions.

(iii) A non-parametric estimator of the mean residual life function when new is better than used in expectation.

In the paper entitled, "More predictable, less predictable and stable counting process" (to appear in **JAP**), I have proposed a way to quantify information about the future of a counting process given in the past.

In the following papers, I have developed a goodness of fit test to a specified survival distribution. One of the test statistic is based on Kullback-Leibler information.

(i) Testing exponentiality based on Kullback-Leibler information (to appear in JRSS-B).

(ii) Testing to determine the underlying distribution using incomplete observations when the life-time distribution is proportionally related to the censoring time distribution, to appear in **Simulation and Computation**.

In practice we may want to estimate joint survival distribution, assuming that some information about the dependent structure is available. In the paper entitled, "Estimating Bivariate survival function and its marginals under positive quadrant dependence," we have provided useful estimates of joint survival function and its marginals.

In the following papers, I have proposed several repairment policies:

(i) "An optimal stopping time for a power law process," to appear in Journal **of Sequential Analysis;**

(ii) "Two new replacement policies," to appear in IEEE-Trans.

My co-principle has completed the following papers:

(i) "On Guffey's Estimator of the star-shaped mean function of a Poisson process;'

(ii) "An optimization problem in order restricted inference revisited."