shown that, in an important sense, the only admissible measure of fluctuation, except for a constant factor, is the variance $f(a_1, \cdots, a_n)=\sum_{i=1}^{n}(a_i-n^{-1}\sum_{j=1}^{n}a_j)^2$. The method of maximum likelihood is applied to special functions to obtain tests for significant differences. These tests have applications to industrial problems. (Received March 22, 1946.)

198. Isaac Opatowski: *Average duration of transition in Markoff chains.*

Consider a chain of transitions $(i\rightarrow i+1)$, $(i+1\rightarrow i)$, where $i=0, 1, \cdots, n-1$. Let the usual conditional probabilities of these transitions within any time Δt be respectively $k_{i+1}\Delta t+o(\Delta t)$ and $g_i\Delta t+o(\Delta t)$, where the k_i's and g_i's are constant. Let the probability of any other transition during Δt be $o(\Delta t)$. The probability $P(t)$ of a transition $(0\rightarrow n)$ within a time t is an increasing function of t and $P(\infty)=\prod_{i=1}^{i=n}k_i/K_i$, where $s=-K_i$ are the n roots of the secular equation $\|a_{r,c}\|/s=0$ defined by $a_{r,r}=s+k_{r+1}+g_{r-1}$, $a_{r,r-1}=k_r$, $a_{r,r+1}=g_r$, $a_{r,c}=0$ for $|r-c|>1$; $r, c=0, 1, \cdots, n$; $g_{-1}=0$ (Bulletin of Mathematical Biophysics vol. 7 (1945) pp. 170–177). If $g_{n-1}=0$ then $P(\infty)=1$, if $g_{n-1}\neq 0$ then $P(\infty)<1$. Consequently, the average duration of the transition $(0\rightarrow n)$ is $E=\int_0^{P(\infty)}tdP/P(\infty)$. Its explicit expression is a simple symmetric function of the k_i's and K_i's. If all the g_i's are zero, $E=\sum_{i=1}^{i=n}k_i^{-1}$. By using the results of a previous paper (Proc. Nat. Acad. Sci. U.S.A. vol. 31 (1945) pp. 411–414) simple expressions of E are obtained also in the cases in which the k_i's and g_i's are independent of i. The paper is a part of an article to appear in the Bulletin of Mathematical Biophysics vol. 8 (1946). (Received March 19, 1946.)

199. Isaac Opatowski: *Markoff chains with variable intensities: average duration of transition.*

Consider a simple Markoff chain. Let $k_{i+1}\Delta t+o(\Delta t)$ be the conditional probability of a transition $(i\rightarrow i+1)$ within any time Δt, where $i=0, 1, \cdots, n-1$ and $k_i=F(i)f(t)$. It is known that by changing t into a new time variable $T=\int_0^t f(t)dt$, the present chain may be treated as if its intensities k_i were constant and equal to $F(i)$. Let $t=\sum_m c_m T^m$ be a polynomial in T. Let $P(t)$ be the probability of a transition $(0\rightarrow n)$ within t. It is shown that $\int_0^1 tdP$, the average duration of a transition $(0\rightarrow n)$, equals $\sum_m m!c_m h_m$, where h_m is the complete homogeneous symmetric function of degree m of $1/F(1)$, $1/F(2), \cdots, 1/F(n)$. This formula is obtained by using a previous result on the moments of Markoff chains (Proc. Nat. Acad. Sci. U.S.A. vol. 28 (1942) pp. 83–88). The paper is a part of an article to appear in the Bulletin of Mathematical Biophysics vol. 8 (1946). (Received March 20, 1946.)

TOPOLOGY

200. E. E. Floyd: *On the extensions of homeomorphisms on the interior of a two cell.*

Let $f(I)=R$ be a homeomorphism of the interior I of a two cell with boundary C onto a bounded plane region R. It is shown that if f is extensible to $\bar{I}$, then the extension is non-alternating on the boundary C. A condition is also derived which is equivalent to the existence of an extension g of f, where $g(\bar{I})=\bar{R}$, $g=f$ on I, and g is light and non-alternating on C. This is applied to conformal maps, yielding the following theorem: let $f(I)=R$ be a 1-1, conformal map of the interior I of the unit circle onto a