MARK RESOURCES INC MARINA DEL REY CA
GENERATING REAL-TIME CLUTTER SEQUENCES - PRELIMINARY FORTRAN VE-ETC(U)
JUN 76 R L MITCHELL
DAAK40-76-C-0031
M6

UNCLASSIFIED MRI-149-23
Attached is a Fortran subroutine (TIMESQ) and a companion subroutine (GAUSSPN) to generate essentially a continuous clutter signal sequence where the parameters are set in real-time. The method is based on that in Reference 1. For this preliminary version, three arrays specifying the amplitude spectral functions on the $A$, $AA$, and $AE$ channels are the inputs to TIMESQ.

The subroutine to generate the amplitude spectral functions from the engagement geometry is under development. Basically a table of parameter values will be stored; then given the engagement geometry the desired values will be retrieved from the table, possibly with interpolation; finally, the amplitude spectral functions will be generated from the parameters. Current design is based on 14 parameters for the three channels. The most time consuming computation predicted is an exponential (4 $\mu$sec on the AP120B) for each spectral sample. The portion of the FFT computation for each sample is 6.3 $\mu$sec, and the total time allowed for all operations is 27 $\mu$sec per sample. Therefore, there appears to be sufficient time available to implement this approach on the AP120B.

---

SUBROUTINE TIMESQ(SA)

C IN THIS SUBROUTINE WE GENERATE A CORRELATED TIME SEQUENCE THAT HAS AN
C AMPLITUDE SPECTRAL FUNCTION DESCRIBED BY ARRAY SA OF LENGTH NFFT. THE
C METHOD USED IS THE ON-LINE FFT APPROACH DESCRIBED IN SECTION 6 OF MRI
C REPORT 132-44, WHERE SUCCESSIVE CALLS TO TIMESQ WILL CREATE CONTIGUOUS
C TIME SEQUENCES BASED ON OVERLAPPING FFTS IN THE FREQUENCY DOMAIN.
C
C ON INPUT........
C
NFFT = SIZE OF FFT (=2**INTEGER)
NOVLP = NUMBER OF SAMPLES THAT THE FFTS OVERLAP (NFFT/8 IS OK)
SA(K) = SPECTRAL AMPLITUDE OF KTH SAMPLE, K=1,...,NFFT
C
C ON OUTPUT........
C
XR(K) = KTH SAMPLE OF IN-PHASE SIGNAL, K=1,...,NF
XI(K) = KTH SAMPLE OF QUADRATURE SIGNAL, K=1,...,NF
C
C WHERE NF=NFFT-NOVLP.
C
C THE ARRAYS MUST BE DIMENSIONED AS LARGE AS.....
C
SA NFFT
XR NFFT+NOVLP-1
XI NFFT+NOVLP-1
A NOVLP-1
C
C THIS SUBROUTINE HAS NOT BEEN TESTED
C
DIMENSION SA(1),A(64)
COMMON /C2/ NFFT,NOVLP
COMMON /C4/ XR(320),XI(320)
DATA NO/0/
IF(NO.GT.0) GO TO 15
NO=1
NFFT-NOVLP
N1=NOVLP-1
DO 10 K=1,N1
A(K)=K/FLOAT(NOVLP)
XR(K+NFFT)=0.
XI(K+NFFT)=0.
10 CONTINUE
15 CALL QAUSHPN(SA,XR,XI,NFFT)
CALL FFT2(XR,XI,NFFT,1)
DO 20 K=1,N1
XR(K)=A(K)*XR(K)XR(K+NFFT)+XR(K+NFFT)
XI(K)=A(K)*XI(K)XI(K+NFFT)+XI(K+NFFT)
XR(K+NFFT)=XR(K+NFFT-NOVLP)
XI(K+NFFT)=XI(K+NFFT-NOVLP)
20 CONTINUE
RETURN
END
SUBROUTINE GAUSSPN(A, XR, XI, N)

C GENERATES RANDOM PHASOR COMPONENTS (XR(K), XI(K)) OF ZERO MEAN WITH THE
C AVERAGE POWER OF XR(K)**2+XI(K)**2 GIVEN BY A(K)**2 FOR K=1, ..., N.
C
C THE RANDOM NUMBERS ARE ACCESSED FROM RECIRCULATING TABLES. NTR AND
C NTI ARE THE CIRCULATION PARAMETERS AND NMAX=MAX(N). WE SHOULD CHOOSE
C NTR AND NTI RELATIVELY PRIME.
C
C ARRAYS TR AND TI MUST BE DIMENSIONED AS LARGE AS NTR+NMAX AND NTI+NMAX
C RESPECTIVELY.
C
C GAUSS IS A FUNCTION SUBROUTINE THAT GENERATES A GAUSSIAN R.V. OF ZERO
C MEAN AND UNIT VARIANCE.

C IF IRSET=1 IN COMMON /GS/, THE POINTERS WILL BE RESTORED TO THEIR
C ORIGINAL VALUES WHEN GAUSSPN WAS ENTERED. THIS MEANS THAT THE SAME
C GAUSSIAN SEQUENCE (EXCEPT FOR THE WEIGHTS A) WILL BE GENERATED ON THE
C NEXT CALL.
C
C THIS SUBROUTINE HAS NOT BEEN TESTED
C
DIMENSION A(1), XR(1), XI(1)
DIMENSION TR(1253), TI(1353)
COMMON /GS/ IRSET
DATA NTR, NTI/997, 1097/, NMAX/256/, KR, KI/0, 1/
    IF(KR.GT.0) GO TO 30
    IF(N. GT. NMAX) STOP
    N1=NTR+NMAX
    DO 20 K=1, N1
       TR(K)=.707107*GAUSS(DUMMY)
       20 CONTINUE
    N2=NTI+NMAX
    DO 25 K=1, N2
       TI(K)=.707107*GAUSS(DUMMY)
       25 CONTINUE
    KR=1
    DO 35 I=1, N
       XR(I)=A(I)*TR(KR)
       XI(I)=A(I)*TI(KI)
       KR=KR+1
       KI=KI+1
       35 CONTINUE
    IF(IRSET.NE.1) GO TO 40
    KR=KR-N
    KI=KI-N
    40 IF(KR. GT. NTR) KR=KR-NTR
    IF(KI. GT. NTI) KI=KI-NTI
    RETURN
END