AD-A089 578 MARK RESOURCES INC MARINA DEL REY CA F/G 9/4
GENERATING REAL-TIME CLUTTER SEQUENCES - PRELIMINARY FORTRAN VE--ETC(U)
JUN 78 R L MITCHELL DAAK40-78-C-0031
UNCLASSIFIED MRI-149-23 NL

END
DATE FILMED
10-80
DTIC

LEVEL II

RFSS

GENERATING REAL-TIME CLUTTER SEQUENCES -
PRELIMINARY FORTRAN VERSION

TECH NOTE 105-045

13 JUN 78

PREPARED FOR: RF SYSTEMS BRANCH (DRDMI-TDR)
SYSTEMS SIMULATION DIRECTORATE
TECHNOLOGY LABORATORY
US ARMY MIRADCOM
REDSTONE ARSENAL, AL 35809

DAAK40-78-C-0031

PREPARED BY: DR. R. L. MITCHELL
MARK RESOURCES, INC.
4676 ADMIRALTY WAY
SUITE 303
MARINA DEL REY, CA 90291

MARK RESOURCES INCORPORATED

GENERATING REAL-TIME CLUTTER SEQUENCES - PRELIMINARY FORTRAN VERSION

R. L. Mitchell

13 Jun[redacted]978

MRI [redacted] 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 Σ, ΔA, and ΔE 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 parameteters for the three channels. The most time consuming computation predicted is an exponential (4 μsec on the AP120B) for each spectral sample. The portion of the FFT computation for each sample is 6.3 μsec, and the total time allowed for all operations is 27 μsec per sample. Therefore, there appears to be sufficient time available to implement this approach on the AP120B.

---

[1] Mitchell, R. L., and I. P. Bottlik, "Design Requirements for Simulating Realistic RF Environment Signals on the RFSS," MRI Report 132-44, Section 6, 23 September 1977.

4676 ADMIRALTY WAY / SUITE 303 / MARINA DEL REY, CALIFORNIA 90291 / (213) 822-4955

```
      SUBROUTINE TIMESQ(SA)
C
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
C      NFFT = SIZE OF FFT (=2**INTEGER)
C     NOVLP = NUMBER OF SAMPLES THAT THE FFTS OVERLAP (NFFT/8 IS OK)
C     SA(K) = SPECTRAL AMPLITUDE OF KTH SAMPLE, K=1,...,NFFT
C
C ON OUTPUT.....
C
C     XR(K) = KTH SAMPLE OF IN-PHASE SIGNAL, K=1,...,NF
C     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
C                         SA         NFFT
C                         XR         NFFT+NOVLP-1
C                         XI         NFFT+NOVLP-1
C                         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
      NF=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 GAUSSPN(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
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
C IF IRSET=1 IN COMMON /GS/, THE POINTERS WILL BE RESTORED ON EXIT 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
   30 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
```

BOLIC REFERENCE MAP (R=1)