Biofeedback and Self-Regulation, Vol. 11, No. 2, 1986

Notes and Observations

Fast Sample Collection for the Autogen 1700 (EMG) and Apple II

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ENVELOPE TIME CONSTANT CHANGE

Autogenic systems Inc. (ASI) sells an EMG unit that filters the EMG signal through a band-pass filter, full-wave rectifies it, then processes that signal with an envelope circuit. The time constant of this envelope circuit can be varied from 10, 20, 50, 100, 200, 500 to 1,000 seconds. These long time constants may be desirable for obtaining baseline values during biofeedback therapy, but they will filter out the majority of any transient phenomena in the signal that may be meaningful. This is particularly true for work with mental rehearsal.

Permission was obtained from ASI to reduce the time constant of the envelope circuit by changing the capacitor (C79) from 1.0 MFD to .05 MFD. This produced time constants of 1, 2, 5, 10, 20, 50, and 100 seconds, respectively. The front panel was also altered to reflect these changes. One should contact ASI for permission to alter the equipment and for the capacitor location.

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0363-3586/86/0600-0163$05.00/0

TIMER INTERFACE

A timer board was built for an Apple II microcomputer to allow it to collect data via an analogue to digital (A/D) converter (Mountain Hardware A/D + D/A) at a 10-Hz rate using "peeks" within BASIC. The timing circuit, shown in Figure 1, uses a timer chip (National Semiconductor LM555) as an astable multivibrator that produces a pulse approximately 2 ms in duration, repeating at the desired sample rate. The variable resistor (R_a) is used to adjust the time between the pulses from 50 ms (200-Hz sample rate) to 500 ms (2-Hz sample rate). The board plugs into the game I/O socket inside the Apple II and controls the "PB#0" signal that can be monitored by a WAIT instruction in BASIC.

TIMER DEMO PROGRAM

Table I is a program listing that illustrates how two A/D channels are sampled using the clock board. After storing each pair of readings, the keyboard is checked for any activity that would indicate the user wishes to terminate the sampling loop. The clock pulse, which controls the PB#0 input, is checked via the WAIT instruction, thus controlling the speed of the collection loop. The two variables used to store the A/D readings have been dimensioned for 2,000 samples and as integers to conserve memory (DIM A%(2,000), B%(2,000)). When reading the A/D channels, a dummy reading

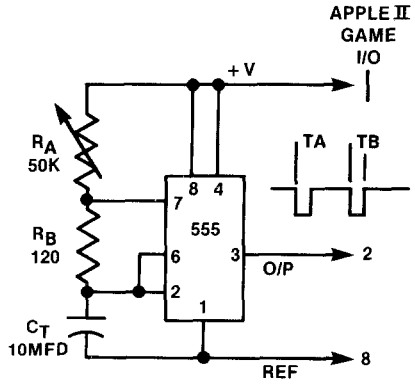

Fig. 1. Circuit diagram of the 10-Hz clock.

Table I. Listing of Fast Sample Program

```
10 REM A/D TEST
20 REM
30 DIM A%(2000),B%(2000)
30 C1=49344:C2=C1+1:REM A/D ADDR OF 2 CHANNELS
40 T=-16287:REM ADDR OF PB#0 USED FOR 100MS PULSES
50 T1=128:REM MASK FOR PB#0 BIT
60 K=-16384:REM ADDR of KYBRD FLAG
70 HOME:PRINT "A/D TEST PROGRAM":PRINT
80 PRINT "READING 2 CHANNELS OF A/D"
90 PRINT "AT 10 SAMPLES/SECOND."
100 PRINT:INPUT "HOW MANY SAMPLES (2000 MAX)?";N
110 PRINT:PRINT "I WILL BE MONITORING KEYBOARD,"
120 PRINT "ANY KEY WILL STOP COLLECTION."
130 PRINT:INPUT "HIT RETURN KEY WHEN READY...";A$
140 REM TAKE DUMMY READING BEFORE STORING A/D VALUE
150 FOR I=1 TO N
160 A=PEEK(C1):A%(I)=PEEK(C1)
170 A=PEEK(C2):B%(I)=PEEK(C2)
180 A=PEEK(K):IF A>127 THEN 200
190 WAIT T,T1,T1
200 NEXT I
210 PRINT CHR$(7);"DONE"
220 END
```

is done first to select the A/D channel and allow the A/D to settle before the second reading is taken and used as the actual value.

(Revision received July 29, 1986)