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INTERACTIVE COMPUTERS

AS SIMPLE LEARNING MACHINES

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Introduction

Although learning by rote, as an immediate response to a presented symbol or word, is somewhat discouraged by current theories of education, there remain a number of situations where such learning can be of considerable benefit. The widespread use of abbreviations, symbols, and logograms requires the recognition and learning of the symbols and their translation - the chemist who does not quickly learn the symbols used for chemical elements, for example, remains at a disadvantage until he has learnt them, and there are many parallel examples. Perhaps the most important use of rote learning, however, is in quickly acquiring an extensive vocabulary of the most frequently used words in a foreign language. While an understanding of the essential structure of the language is necessary before a vocabulary can be used, even the simple everyday transactions require a remarkably wide vocabulary, and the student needs an efficient means of obtaining a basic vocabulary quickly. A similar need is found in the learning of the correct scientific names of organisms, and in the recognition of the correct spelling of difficult words. All of these situations require an instant recall of the correct response to the presented symbol or word.

There is, of course, nothing new in the suggestion of using an interactive computer as a simple learning machine. Kemeny and Kurtz (1971) in their introduction to the BASIC language give a simple example of a suitable program for comparing a typed response to a presented symbol or word with the correct answer. The programs of tables 1 and 2 are essentially modifications of this original program. Table 1 gives a BASIC program for building up a list of words or symbols and their expected response on a disk file. Table 2 gives a program which uses this disk file to present the user with a series of questions to which a response is invited. If the correct response is typed, the program presents the next question. If an incorrect response is typed, the user is invited to "Try again", a correct response to this invitation resulting in the presentation of the next question. If, however, the second response is also incorrect, the program types the correct answer and then asks the user to copy this answer, thus providing an immediate reinforcement of the correct response.

Two modes of the program are provided. "Straight" merely lists the questions in the order in which they are stored on the disk, giving as many questions as the user wants , selected from a named part of the list. "Random" presents the questions in a random order, including repetitions, again from a defined part of the entire list. The strategy for using such a program for practical learning is to gradually extend the range of questions answered by working through a section of questions systematically and then to test the knowledge gained on a random set of questions over the full range already covered. The program of table 2 contains a simple percentage assessment of the ability of the respondent to make the correct response and either the "straight" or "random" modes can be used until a satisfactorily high percentage of recall has been achieved.

For example, assume that the respondent has already worked through the first 100 words of a French vocabulary. At his next session on the computer, he may make a "straight" run through words 101-120. His percentage of recall may be low if many of the words in this list are new to him, but he will have learnt most of them by the end of the run. By then making a "random" run of a further 20 words from the words 1-120, he can then check on his retention of the past material as well as a proportion of the new words. If his percentage of correct recall is low, he may attempt a further set of 20 random words, and continue in this way until he reaches a satisfactory level. In this way, with regular practice, an extended vocabulary is built up within a relatively short period of time. Table 3 gives an example of part of a "straight" run on the NATO codewords for the letters of the alphabet. Table 4 gives an example of a "random" run on French nouns which are similar in both French and English.

Alternative forms of the programs can easily be envisaged. For example, a special list of words with which the student has had difficulties could be built up with a simple modification of the program in table 2. In this way, practice could be concentrated on those words or symbols which the student does not know, and this list gradually reduced until he knows them all. However, the speed of learning with the program of table 2 is so rapid that this alternative form is probably unnecessary.

Applications on which these programs have been tested so far include the following:-

1. NATO codewords for the letters of the alphabet
2. International car symbols
3. French vocabulary: nouns alike in French and English
4. " " nouns unlike in French and English
5. " " verbs
6. " " adverbs
7. " " adjectives
8. " " invariable words and miscellaneous phrases
9. Scientific names for common species of trees

Further applications will be developed as required.

Table 1

```
LIST
   10 RECORD Q$(7),A$(7)
   15 OPEN 8,"QUEST"
   20 PRINT "HOW MANY ITEMS";
   25 INPUT N
   30 FOR I=1 TO N
   35 LINPUT Q$(0),Q$(1),Q$(2),Q$(3),Q$(4),Q$(5),Q$(6),Q$(7)
   40 LINPUT A$(0),A$(1),A$(2),A$(3),A$(4),A$(5),A$(6),A$(7)
   45 PUT 8,10,I
   50 LET I=I-1
   55 NEXT I
   60 PRINT "GENERAL INSTRUCTION"
   65 LINPUT Q$(0),Q$(1),Q$(2),Q$(3),Q$(4),Q$(5),Q$(6),Q$(7)
   70 LINPUT A$(0),A$(1),A$(2),A$(3),A$(4),A$(5),A$(6),A$(7)
   75 LET I=0
   80 PUT 8,10,I
   85 STOP
   90 END

READY
```

Table 2

```
LIST
    5 RECORD Q$(7),A$(7)
   10 OPEN 8,"QUEST"
   15 DIM L$(3),C$(3),T$(7)
   20 READ L$(0),L$(1),L$(2),L$(3)
   25 READ C$(0),C$(1),C$(2),C$(3)
   30 LET I=0
   35 GET 8,5,I
   40 FOR J=0 TO 7
   41 PRINT Q$(J);
   42 NEXT J
   43 PRINT
   45 FOR J=0 TO 7
   46 PRINT A$(J);
   47 NEXT J
   48 PRINT
   50 PRINT "FROM N TO M";
   55 INPUT N,M
   60 PRINT "STRAIGHT (0) OR RANDOM (1)";
   65 INPUT Z
   75 LET S=0
   80 IF Z=1 THEN 220
   82 LET P=M-N+1
   85 FOR I=N TO M
   90 GET 8,5,I
   95 LET I=I-1
  100 LET T=0
  105 FOR J=0 TO 7
  106 PRINT Q$(J);
  107 NEXT J
  110 LINPUT T$(0),T$(1),T$(2),T$(3),T$(4),T$(5),T$(6),T$(7)
  115 IF T$(0)=A$(0) THEN 140
  120 IF T>0 THEN 180
  125 PRINT L$(0);L$(1);L$(2);L$(3);
  130 LET T=T+1
  135 GO TO 110
  140 IF T$(1)<>A$(1) THEN 120
  145 IF T$(2)<>A$(2) THEN 120
  150 IF T$(3)<>A$(3) THEN 120
  155 IF T$(4)<>A$(4) THEN 120
  160 IF T$(5)<>A$(5) THEN 120
  165 IF T$(6)<>A$(6) THEN 120
  170 IF T$(7)<>A$(7) THEN 120
  175 GO TO 200
  180 PRINT C$(0);C$(1);C$(2);C$(3);
  185 FOR J=0 TO 7
  186 PRINT A$(J);
  187 NEXT J
  188 PRINT
  190 LET T=T+1
  195 GO TO 105
  200 LET S=S+2-T
  205 PRINT\PRINT
  210 NEXT I
  215 GO TO 355
  220 RANDOMIZE
  222 PRINT "HOW MANY";
  223 INPUT P
  225 FOR I=1 TO P
  230 LET K=INT(M*RND(X)+N)
  235 GET 8,5,K
  240 LET T=0
  245 FOR J=0 TO 7
```

```
246 PRINT Q$(J);
247 NEXT J
250 LINPUT T$(0),T$(1),T$(2),T$(3),T$(4),T$(5),T$(6),T$(7)
255 IF T$(0)=A$(0) THEN 285
260 IF T>0 THEN 325
265 PRINT L$(0);L$(1);L$(2);L$(3);
270 LET I=I+1
280 GO TO 245
285 IF T$(1)<>A$(1) THEN 260
290 IF T$(2)<>A$(2) THEN 260
295 IF T$(3)<>A$(3) THEN 260
300 IF T$(4)<>A$(4) THEN 260
305 IF T$(5)<>A$(5) THEN 260
310 IF T$(6)<>A$(6) THEN 260
315 IF T$(7)<>A$(7) THEN 260
320 GO TO 340
325 PRINT C$(0);C$(1);C$(2);C$(3);
331 FOR J=0 TO 7
332 PRINT A$(J);
333 NEXT J
334 PRINT
335 LET I=T+1
338 GO TO 245
340 LET S=S+2-T
345 PRINT\PRINT
350 NEXT I
355 LET S1=S/(2*P)
360 PRINT "YOUR SCORE IS";INT(S1*100+0.5);"%"
365 STOP
366 DATA "TRY AG","AIN   ","  ","  "
367 DATA "CORREC","T ANSW","ER IS:","  "
370 END

READY
```

WHAT IS THE NATO CODEWORD FOR THE LETTER:

FROM N TO M? 1,26
STRAIGHT (0) OR RANDOM (1)? 0

Table 3

A? ALPHA

B? BETA

C? CHARLIE

D? DELTA

E? EUROPE
TRY AGAIN ? EASY
CORRECT ANSWER IS: ECHO
E? ECHO

F? FOXTROT

G? GOLF

H? HOTEL

I? INDIA

J? JULIET

K? KILO

L? LIMA

M? MICK
TRY AGAIN ? MIKE

N? NOVEMBER

O? OSCAR

P? PAPA

Q? QUEBEC

R? ROMEO

SIS? ERRA

T? TANGO

```
U? UMBRELLA
TRY AGAIN      ? UNIVERSE

V? VICTOR

W? WHISKY

X? XRAY

Y? YANKEE

Z? ZULU

YOUR SCORE IS 92 %

READY
RUN
```

Table 4

```
RUN

THERE ARE 346 FRENCH NOUNS IN THIS FILE
WHAT IS THE FRENCH FOR THE FOLLOWING:
FROM N TO M? 1,80
STRAIGHT (0) OR RANDOM (1)? 1
HOW MANY? 10
AN ARREST, STOPPING PLACE? UN ARRET


CREDIT? LE CREDIT


ARRIVAL? L'ARRIVEE


A HELPER? UN AIDE


CASE? LE CAS


AN ADDRESS? UNE ADDRESS
TRY AGAIN      AN ADDRESS? UNE ADRESS
CORRECT ANSWER IS: UNE ADRESSE
AN ADDRESS? UNE ADE-RESSE


CRIME? LE CRIME


CRIME? LE CRIME


AN AERODROME? UNE AERODROME
TRY AGAIN      AN AERODROME? UN AERODROME


CHEQUE? LA CHEQUE
TRY AGAIN      CHEQUE? LE CHEQUE


YOUR SCORE IS 80 %


READY
```

Selection instructions.