

# A simple program for use in the “conversational mode”

By A. J. T. Colin\*

This paper describes a simple “conversational mode” program and some of the experience gained in using it. Originally, the program was written to afford some direct experience in man-machine communication. The results confirm widely held opinions about the usefulness of this facility.

## 1. Introduction

Direct on-line communication with computers is a widely discussed subject, but in this country actual experience of the facility is still extremely hard to obtain. Most of the discussion about the topic is centred on the mechanisms and software needed to allow a large computer to service several user consoles simultaneously, and little is being said about the uses of on-line communication, except in the most general terms.

Applications of man-machine communication, and the languages in which the dialogues are to take place, can be considered quite independently of the time-sharing aspect of the problem. All that is necessary for practical experiments is a small and not too heavily loaded computer with a console typewriter and a random access backing store of reasonable size.

The “conversational mode” program described below was written for the IBM 1620 with disk file, a computer which satisfies these conditions. The program was intended as a pilot project to discover some of the difficulties involved. The topic of elementary statistics was chosen as the subject-matter of the program, because many people are familiar with this topic and are willing to act as experimental subjects. The program is intended to be self-teaching, in the sense that it can be used without prior instruction by a person who is familiar with elementary statistical concepts, but ignorant of conventional computer techniques.

Communication takes place on the simplest level. Information is supplied by the user in units of one word or number at a time, in response to specific questions put by the computer. As well as being easy to implement, this system is perhaps the most suitable one for the occasional, non-sophisticated user. Its drawback is that the flow of information is much slower than would be the case if a compact symbolic language were used.

The system allows several users to maintain data and other information in the backing store simultaneously. Each user may “call up” his data at any time by giving his name.

A transcript of a typical man-machine dialogue is given below. The text of the dialogue has been set up in print directly from several pages of material typed by both user and computer. Unfortunately, technical causes connected with the printing and production of this journal have made it impracticable to reproduce the text photographically. Only the scatter diagram at the end is an actual reproduction.

In the transcript, the user's replies are printed in heavy type so as to make them distinct. The data consists of meteorological observations.

## 2. A sample dialogue

HELLO. WHENEVER YOU TYPE A MESSAGE ON THIS TYPEWRITER, PLEASE TERMINATE IT WITH THE R-S KEY TO BE FOUND AT THE TOP LEFT-HAND CORNER OF THE KEYBOARD. IF YOU MAKE A MISTAKE, THEN TYPE @ JUST BEFORE R-S AND WHAT YOU HAVE JUST TYPED WILL BE IGNORED. HAVE YOU EVER USED THIS PROGRAM BEFORE. (PLEASE TYPE YES OR NO.)

**NOR**S

PLEASE GIVE YOUR NAME.

**A. J. T. COLIN**R·S

A FILE HAS BEEN OPENED UNDER YOUR NAME.

THIS IS A STATISTICAL PROGRAM, AND YOUR FIRST STEP MUST BE TO SUPPLY THE MACHINE WITH DATA TO BE ANALYSED. YOUR DATA PRESUMABLY CONSISTS OF A SET OF RECORDS, EACH OF WHICH CONTAINS NUMERICAL VALUES FOR ONE OR MORE VARIABLES. WOULD YOU LIKE AN EXAMPLE (TYPE YES OR NO)

**NO THANKS**R·SNO. YOUR CHOICE IS LIMITED TO THE FOLLOWING

YES

NO

NOW TRY AGAIN **NOR**·S

YOUR DATA MUST BE PUNCHED ON TO CARDS, ONE CARD TO EACH RECORD. THE VALUES OF THE OBSERVATIONS MAY BE ARRANGED IN ANY WAY YOU LIKE, PROVIDED THAT FRACTIONAL VALUES ALWAYS HAVE A DECIMAL POINT IN THE RIGHT PLACE, AND THAT THE ARRANGEMENT IS THE SAME FOR ALL YOUR CARDS. YOU MUST DECIDE ON NAMES (SUCH AS \*AGE\* OR \*IQ\*) FOR ALL YOUR VARIABLES.

HOW MANY VARIABLES ARE THERE IN EACH RECORD

**4**R·S

GOOD. YOU MUST NOW DESCRIBE THE WAY YOUR VARIABLES ARE ARRANGED, AND GIVE THEM NAMES. WE SHALL DEAL WITH THE VARIABLES ONE AT A TIME.

VARIABLE 1

WHAT NAME DO YOU GIVE TO THIS VARIABLE

**CLOUD COVER**R·S

\* *Mathematics Dept., University of Lancaster, St. Leonard's House, Lancaster.*

# Conversational mode

WHAT IS THE FIRST CARD COLUMN WHERE VALUES OF THIS VARIABLE ARE PUNCHED

SEVEN R-S THIS IS NOT A VALID NUMBER

NOW TRY AGAIN 7R-S

WHAT IS THE LAST COLUMN

7R-S

CLOUD COVER IS PUNCHED IN 1 COLUMNS STARTING AT COLUMN 7

IS THIS RIGHT

YESR-S

VARIABLE 2

WHAT NAME DO YOU GIVE TO THIS VARIABLE

TEMPERATURER-S

WHAT IS THE FIRST CARD COLUMN WHERE VALUES OF THIS VARIABLE ARE PUNCHED

13R-S

WHAT IS THE LAST COLUMN

16R-S

TEMPERATURE IS PUNCHED IN 4 COLUMNS STARTING AT COLUMN 13

IS THIS RIGHT

YESR-S

VARIABLE 3

WHAT NAME DO YOU GIVE TO THIS VARIABLE

TEMPERATURER-S

YOU HAVE ALREADY USED THIS NAME. CHOOSE ANOTHER

HUMIDITYR-S

WHAT IS THE FIRST CARD COLUMN WHERE VALUES OF THIS VARIABLE ARE PUNCHED

18R-S

WHAT IS THE LAST COLUMN

21R-S

HUMIDITY IS PUNCHED IN 4 COLUMNS STARTING AT COLUMN 18

IS THIS RIGHT

YESR-S

VARIABLE 4

WHAT NAME DO YOU GIVE TO THIS VARIABLE

PRESSURER-S

WHAT IS THE FIRST CARD COLUMN WHERE VALUES OF THIS VARIABLE ARE PUNCHED

23R-S

WHAT IS THE LAST COLUMN

26R-S

PRESSURE IS PUNCHED IN 4 COLUMNS STARTING AT COLUMN 23

IS THIS RIGHT

YESR-S

THE VARIABLES YOU HAVE DEFINED ARE AS FOLLOWS

FIRST COL LAST COL

7 7

13 16

18 21

23 26

NAME

CLOUD COVER

TEMPERATURE

HUMIDITY

PRESSURE

ARE YOU SATISFIED THAT YOUR DEFINITIONS ARE CORRECT  
YESR-S

LOAD YOUR CASE CARDS INTO THE 1622 READER, FACE DOWN, WITH THE \*NINES\* EDGE TOWARDS THE MACHINE. PUT THREE BLANK CARDS ON TOP AND START THE READER (GREEN BUTTON)

VARIABLE VALUES ON THE FIRST CARD ARE

CLOUD COVER = +2.000000

TEMPERATURE = +47.800000

HUMIDITY = +65.000000

PRESSURE = +1006.0000

IS THIS RIGHT

YESR-S

NUMBER OF CASES READ = 109

THE HIGHEST AND LOWEST VALUES OF YOUR VARIABLES ARE

CLOUD COVER 0.000000 , +8.000000

TEMPERATURE +47.100000 , +68.100000

HUMIDITY +45.000000 , +99.000000

PRESSURE +991.00000 , +1029.0000

THE COMPUTER IS NOW READY TO COMPUTE STATISTICS. WOULD YOU LIKE TO SEE A LIST OF THOSE IT CAN WORK OUT  
YESR-S

THE FOLLOWING OPTIONS ARE AVAILABLE.

(A) FUNCTIONS OF ONE VARIABLE

AVERAGE

STANDARD DEVIATION

HISTOGRAM

FREQUENCY TABLE

(B) FUNCTIONS OF ANY TWO VARIABLES

CORRELATION

REGRESSION EQUATION (LINEAR)

SCATTER DIAGRAM

TWO-WAY FREQUENCY TABLE

WHICH STATISTIC DO YOU WANT

AVERAGER-S

FOR WHICH VARIABLE

TEMPERATURER-S

AVERAGE VALUE OF TEMPERATURE = +56.729357

WHAT FURTHER STATISTIC WOULD YOU LIKE

FREQUENCY TABLER-S

FOR WHICH VARIABLE

COULD COVER-S

YOU HAVE NO VARIABLE OF THIS NAME. YOUR VARIABLES

ARE  
CLOUD COVER  
TEMPERATURE  
HUMIDITY  
PRESSURE

NOW TRY AGAIN **CLOUD COVER**<sub>R-S</sub>

FREQUENCIES OF DIFFERENT VALUES OF CLOUD COVER

VALUE	NO. OF RECORDS HAVING THIS VALUE	PERCENTAGE OF TOTAL	CUMULATE PERCENTAGE
0	1	+0.91743119	+0.91743119
1	8	+7.3394495	+8.2568806
2	9	+8.2568807	+16.513761
3	6	+5.5045871	+22.018348
4	9	+8.2568807	+30.275228
5	13	+11.926605	+42.201833
6	10	+9.1743119	+51.376144
7	25	+22.935779	+74.311923
8	28	+25.688073	+99.999996

WHAT FURTHER STATISTIC WOULD YOU LIKE

**HISTOGRAM**<sub>R-S</sub>

FOR WHICH VARIABLE

**TEMPERATURE**<sub>R-S</sub>

INTO HOW MANY GROUPS ARE THE VALUES TO BE SORTED

**10**<sub>R-S</sub>

```

+46.050000      ***
+48.150000      *****
+50.250000      ***
+52.350000
+54.450000      *****
+56.550000      *****
+58.650000      *****
+60.750000      *****
+62.850000      ***
+64.950000      ***
+67.050000      *
+69.150000
    
```

WHEN A VARIABLE HAS EXACTLY THE VALUE OF A BOUND  
IT IS INCLUDED IN THE HIGHER CATEGORY.

WHAT FURTHER STATISTIC WOULD YOU LIKE

**CORRELATION**<sub>R-S</sub>

BETWEEN (FIRST VARIABLE)

**TEMPERATURE**<sub>R-S</sub>

AND (SECOND VARIABLE)

**PRESSURE**<sub>R-S</sub>

CORRELATION BETWEEN TEMPERATURE AND PRESSURE

= +0.13852716

WHAT FURTHER STATISTIC WOULD YOU LIKE

**CORRELATION**<sub>R-S</sub>

BETWEEN (FIRST VARIABLE)

**HUMIDITY**<sub>R-S</sub>

AND (SECOND VARIABLE)

**PRESSURE**<sub>R-S</sub>

CORRELATION BETWEEN HUMIDITY AND PRESSURE

= -0.27588907

WHAT FURTHER STATISTIC WOULD YOU LIKE

SCATTER DIAGRAMS

BETWEEN (FIRST VARIABLE)

**HUMIDITY**<sub>R-S</sub>

AND (SECOND VARIABLE)

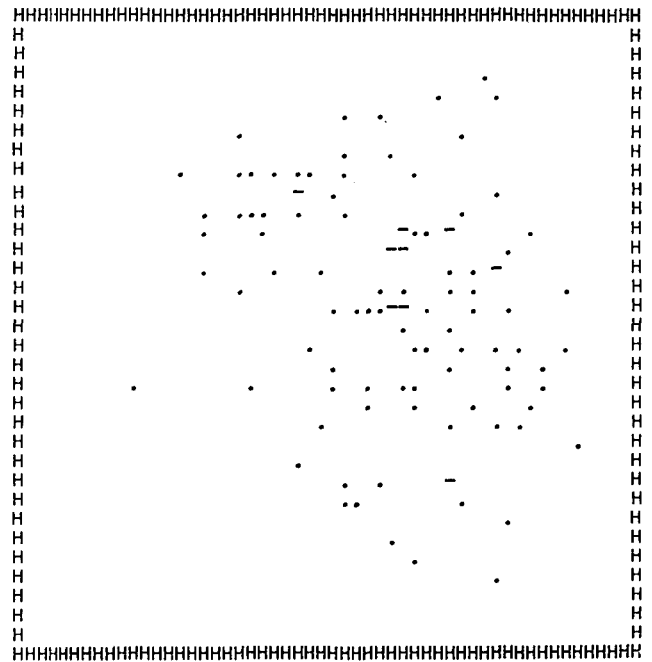
**PRESSURE**<sub>R-S</sub>

HORIZONTAL AXIS - HUMIDITY

SCALE FROM +42.300000 TO +101.70000

VERTICAL AXIS - PRESSURE

SCALE FROM +989.10000 TO +1030.9000



KEY - . =1 POINT, - =2/3 POINTS, = =4/7 POINTS,  
+ =8/15 POINTS, \* =16+ POINTS

### 3. Conclusions

One conclusion to be drawn from this project is that on-line communication systems of this type are indeed simple and fast to implement. The planning, programming and debugging of the program took three weeks. This time would have been reduced somewhat if a suitable programming system more sophisticated than assembly language had been available.

In the present system, all the conversational input-output is handled by a hierarchy of subroutines. Messages to be printed by the computer are supplied in a standard form together with a symbolic name; thereafter they are referred to by this name in the program.

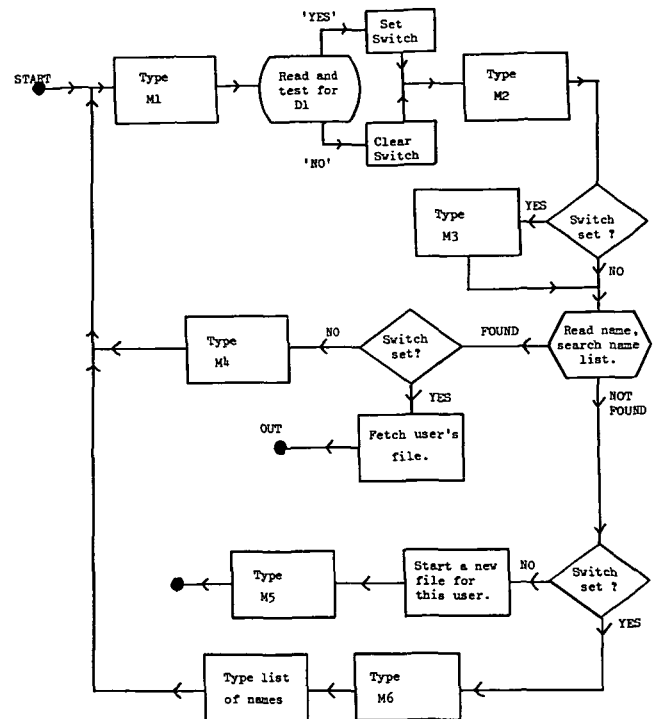
The user's replies are read by one of three different routines, depending upon whether the program expects a number, an arbitrary word (such as a name of a user or one of his variables) or one of a small number of permitted responses (such as YES / NO). Where appropriate, the routine checks that the message is a permitted one; if it finds that it is not, it prints a warning and allows the user to retype the message. A count of the number of successive illegal messages is used to select one of several different warnings, of increasing sternness.

The structure of name dictionaries and stored data is organized round a system of "pointers" and links, thus allowing all stored items to be of arbitrary length. The routines involved are all very simple. In writing them, no attention was paid to the question of speed, since any delay they may introduce is heavily outweighed by human response time.

Once these routines had been defined, the flow-charting of the conversational part of the program was almost trivial. The flow chart which deals with the initial segment of the program is shown in Fig. 1.

Another conclusion is that systems of this type are easily understood and used by most people who try them, including all those who have any practical interest in the results. In an experiment, a number of people, all of whom knew something about statistics but nothing about computers, were given a pack of data cards, together with an explanation of the way in which the cards were punched, and were assigned a loosely defined "task", such as investigating the distribution of certain variables and the relationship (if any) between them. All these subjects were successful in defining their data to the program and in producing the required statistics. The majority did this without apparent difficulty, but some (about 30%) seemed to be suffering from "computer fright", and were unable to read or understand the first message printed by the computer. This group gained confidence when they discovered that mistakes were not disastrous, and that anything they did would always elicit an understandable reply from the machine.

A further group consisted of subjects who were, in varying degrees, familiar with programming. Some of this group had more difficulty in using the program



M1 : HELLO, WHENEVER YOU TYPE A MESSAGE ON THIS TYPEWRITER, PLEASE TERMINATE IT WITH THE R-S KEY TO BE FOUND AT THE TOP LEFT-HAND CORNER OF THE KEYBOARD. IF YOU MAKE A MISTAKE, THEN TYPE @ JUST BEFORE R-S AND WHAT YOU HAVE JUST TYPED WILL BE IGNORED. HAVE YOU EVER USED THIS PROGRAM BEFORE. (PLEASE TYPE YES OR NO.)

M2 : PLEASE GIVE YOUR NAME.

M3 : PLEASE USE EXACTLY THE SAME FORM AS YOU DID PREVIOUSLY.

M4 : SOMEONE ELSE WITH YOUR NAME HAS ALREADY USED THE PROGRAM. ALTER YOUR NAME AND START AGAIN.

M5 : A FILE HAS BEEN OPENED UNDER YOUR NAME.

M6 : I HAVE NO RECORD OF YOUR NAME. THE PROGRAM MUST BE RESTARTED. NAMES IN THE LIST ARE -

D1 : YES  
NO

Fig. 1

because of imaginary problems such as the "permitted format of identifiers".

Finally, the practical use the program has received since it was completed seems to show that this type of system is of considerable value in universities and other environments where there are occasional users. Such programs can also be used to introduce computers to students, and to increase their motivation in learning more conventional techniques.

## References

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