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MICROBOL — A MAGNETIC TAPE EDITING SYSTEM FOR THE IBM 1620 COMPUTER

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Issued Sydney, September 1963

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ABSTRACT

A language structure has been devised for the preparation and editing of card image information on magnetic tapes.

A computer programme has been written for the IBM 1620 computer to use this language.

CONTENTS

1. INTRODUCTION

Card image information occurs frequently in card oriented computer systems, and it is desirable to have some simple means of selectively transferring such information between the various peripheral devices available such as magnetic tape units, card reader, card punch, and printer or typewriter.

A language called Microbol has been devised to enable such transfer requirements to be written in English.

2. USES OF MICROBOL

Microbol may be used to copy any tape written by the IBM 1620, where the information on the tape consists solely of card images and end of file marks. Source information may be present on more than one tape, and may be directed to more than one tape. Any desired changes may be made during the copying process, and new information may be brought in from the card reader.

Information may be punched on cards, or both punched and typed, as desired, in part or in whole.

3. CARD IMAGE IDENTIFICATION

Card images are identified either directly, by specifying some combination of up to 5 numerical digits to be present in some selected part of the card image, or indirectly, by means of a relative count beyond the next or some other specified card image.

For example, 123 + 5 would refer to the 5th card image past the first card image encountered containing the appropriately positioned identification 123. The identification + 11, without any specified digit combination, would refer to the 11th card image past the next encountered card image. The identification +0 refers to the next card image.

4. MICROBOL PROGRAMMES

Microbol programmes consist of an intermixture of control statement cards and new information cards. Control cards are distinguished by some special character in the first column of the card. The choice of this special heading character is arbitrary, and heading characters may be changed during the course of a programme.

A sample Microbol programme is given in Appendix A.

5. THE MICROBOL LANGUAGE

The Microbol language has been designed to ensure that a Microbol programme listing gives a reasonable readable statement of the action being taken by that programme.

The control statements available for use are illustrated by the examples given below. A precise statement of each control card requirement is given in Appendix B.

* TAPE 2 INPUT

Subsequent source information from tape to be taken from tape unit 2.

* TAPE 3 OUTPUT

Subsequent output on tape to be written on tape unit 3.

* NUMBERING IN COLUMNS 1 TO 5

Subsequent reference numbers to be sought, when required, between card image columns 1 to 5 inclusive.

* NUMERIC MODE

Subsequent card image transfers to be in numeric mode.

* ALPHAMERIC MODE

Subsequent card image transfers to be in alphameric mode.

* DELETE FROM 123 + 5 to 762 + 4

Copy card images from the input to the output tape up to, but not including, that card image containing the identification 123.

Copy 5 more card images.

Skip over input tape card images to just past card image 762.

Skip over 4 more card images.

* DELETE 123 + 5

Copy up to but not including card image 123.

Copy 5 more card images.

Skip over one card image.

* DELETE FROM 123 + 5 ON

Copy up to but not including 123.

Copy 5 more card images.

Skip to just past first encountered end of file mark.

* DELETE TO 762 + 4

Skip to just past 762.

Skip 4 more card images.

* OUTPUT FROM 967 + 9 TO 127 + 11

Output on cards, when encountered.

* TYPE

* OUTPUT FROM 967 + 9 TO 127 + 11

Output on both cards and typewriter.

Output statements do not in themselves cause any tape motion; but the output requirements are stored, and acted upon during subsequent tape transfers or skips.

* INSERT

This control card must precede new information being read at the card reader.

* AFTER 123 + 6

Copy up to and including 123.

Copy 6 more card images.

* COPY

Copy up to but not including the first encountered end of file mark, with the input tape stopping just past this end of file mark.

* COPY 4 FILES

Copy card images and file marks, up to but not including the fourth encountered file mark, with the input tape stopping just past this fourth end of file mark.

* SKIP

Skip to just past the first end of file mark.

* SKIP 4 FILES

Skip to just past the fourth end of file mark.

* END FILE 2

Write an end of file mark on tape 2.

* REWIND 2

Rewind tape 2 to the load point on the tape.

* BACKSPACE 3, 11 RECORDS

Backspace tape 3 eleven records. Both card images and file marks count as records.

* CHANGE HEADING CHARACTER

No operation, but the next card read must be a control card, and the character in column one of this next card will be taken as the subsequent control card identification character.

* NEW PATTERN CARD

The next card read must be a pattern card, giving the desired correspondence between characters read alphamerically at the card reader and written numerically onto magnetic tape in numeric mode operations. Card column N of the pattern card contains the numeric mode digit whose two digit alphameric representation is N - 1.

The card immediately following the new pattern card must be a control card, and this card will determine a new control card heading character.

All waiting output requests will be lost after a new pattern card is read, and subsequent card image transfers will be in alphameric mode until reset.

* PAUSE

A halt occurs. Push start to continue.

* END

A load card sequence is executed.

**

If the character in column 2 of a control card is an asterisk, the contents of this card will be typed, but otherwise ignored.

6. CONCLUSIONS

The Microbol language should prove useful for handling card image information on magnetic tapes.

Cross section data libraries and information retrieval systems are two particular fields of application for Microbol.

APPENDIX A

A SAMPLE MICROBOL PROGRAMME

Suppose that the following portion of an SPS programme occurred as card images within the first file on a tape.

```
123 START RCTY
          WATY STIM
          H
          B    START
124 STIM  DAC 16,END OF PROGRAMME@
```

Mounting this tape as tape 2, and a scratch tape 3, the Microbol programme:

```
* REWIND 2
* REWIND 3
* TAPE 2 INPUT
* TAPE 3 OUTPUT
* NUMBERING IN CARD COLUMNS 1 TO 4
* TYPE
* OUTPUT 124
* AFTER 123 + 1
* INSERT
          RCTY
* DELETE 124
* INSERT
 124 STIM  DAC 17,END OF PROGRAMME@
* COPY 1 FILE
* END FILE 3
* REWIND 2
* REWIND 3
* END
```

would result in

```
123 START RCTY
          WATY STIM
          RCTY
          H
          B    START
124 STIM  DAC 17,END OF PROGRAMME@
```

appearing on tape 3, the remainder of the original file being copied intact.

```
124 STIM  DAC 16,END OF PROGRAMME@
```

would also be both typed, and punched on a card.

APPENDIX B

CONTROL CARD REQUIREMENTS

Control card heading characters must appear in column 1, and may be any chosen character except a record mark. Control information may occur anywhere between columns 2 and 80.

Particular control card requirements are:

* TAPE 2 INPUT

The tape number may be any single digit from 0 to 5 inclusive. Information may follow the word INPUT, provided that the information does not begin with a letter.

* TAPE 2 OUTPUT

The tape number may be any single digit from 0 to 5 inclusive. Any desired information may follow the word OUTPUT.

* NUMBERING IN COLUMNS 1 TO 5

The combination NUMBER is significant. At least one letter must follow this combination, and only letters may precede the first number. This first number must not exceed the value 80. The word TO must follow. The second number likewise must not exceed 80, and may not be less than the first number. Any desired information not beginning with a number may follow this second number.

* NUMERIC MODE

The combination NUMERI is significant. The remainder of the card is irrelevant.

* ALPHAMERIC MODE

The combination ALPHAM is significant. The remainder of the card is irrelevant.

* DELETE

The remainder of a DELETE control card must be in one of the following forms, all limits being inclusive.

(a) 123 + 5 TO 762 + 4

(b) FROM 123 + 5 TO 762 + 4

(c) 123 + 5

(d) FROM 123 + 5

(e) 123 + 5 ON

(f) FROM 123 + 5 ON

(g) TO 762 + 4

No other information may appear, unless preceded by a record mark.

* OUTPUT

As for DELETE

* TYPE

Nothing else may appear on this card, unless preceded by a record mark.

* INSERT

Any information may appear on an INSERT card after the word INSERT.

* AFTER

A card image identification must follow. Nothing else may appear on this card, unless preceded by a record mark.

* COPY

A number not exceeding five significant digits may follow. The letter F must then follow this number. COPY by itself implies COPY 1 FILE. In the case of COPY by itself, a record mark must precede any further information.

* SKIP

As for COPY, SKIP replacing COPY.

* END FILE 2

The combination ENDFIL is significant. At least one letter must follow, but then as many letters as desired may precede the tape number. The tape number may have leading zero digits, but must not exceed 5 in value. Subsequent information on the card must not begin with a number.

* REWIND 2

The combination REWIND is significant. No other character, other than zero, may precede the tape number which must not exceed 5 in value. Subsequent information on the card must not begin with a number.

* BACKSPACE 3, 11 RECORDS

The combination BACKSP is significant. One or more letters must follow before the tape number specification, which may have leading zeros but must not exceed 5 in value. A comma must follow. The record count must not contain more than five significant digits, and must be followed by the letter R. The rest of the card is irrelevant.

* CHANGE HEADING CHARACTER

Only the combination CHANGE is significant.

* NEW PATTERN CARD

Only the combination NEWPAT is significant.

* PAUSE

Nothing else may appear on this card, unless preceded by a record mark.

* END

Provided that subsequent information does not begin with a letter, the rest of this card is ignored.

**

When an asterisk occurs in column 2 of a control card, the whole card is typed but otherwise ignored.

APPENDIX C

ERROR CONDITIONS AND MESSAGES

Each card image reference specified must be found subsequently within the file in which that reference request was made, otherwise the request will be lost, and one of the following error messages will be typed:

INCOMPLETE DELETE

INCOMPLETE OUTPUT

INCOMPLETE AFTER SEARCH

Other messages and their meanings are:

TOO MANY OUTPUT REQUESTS

More than twenty different output requests current at any one time.

INPUT TAPE

The input tape was not stated. Type in a single digit tape number. If a typing error is made, press RESET and START, otherwise press RELEASE and START.

OUTPUT TAPE

The output tape was not stated. Type in a single digit tape number. If a typing error is made, press RESET and START, otherwise press RELEASE and START.

NUMBERING IN COLUMNS 77 to 80

If no selected part of the card image is specified for referencing, columns 77 to 80 will be chosen automatically.

ILLEGAL CONTROL CARD

Correct, and replace the control card in error. It may be necessary to use a CHANGE card to reset the desired heading character.

NO INSERT CARD

New information not preceded by an INSERT card. Correct, and press START.

RECORD MARK ON CARD

This usually arises if a NUMERIC card has been omitted. Record marks are not permitted in ALPHAMODE.

INVALID RECORD LENGTH

This occurs when other than 80 character records are read from tape.

ILLEGAL RECORD LENGTH

This occurs when other than 80 character records are written onto tape.

INPUT TAPE CHECKS

This occurs after nine unsuccessful attempts have been made to read a record. Press START to try another nine times.

OUTPUT TAPE CHECKS

This occurs after three unsuccessful attempts have been made to write a record. Press START to erase tape forward and try another three times.

READER CHECK

Unusual. Run out cards, replace these and also the last card apparently read, in the read hopper, and try again.

PUNCH CHECK

Press punch RESET key, and try again.