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COLLEGE ON MEDICAL PHYSICS

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CMPM
(Computer Management of Preventive Maintenance)

Laboratory Notes

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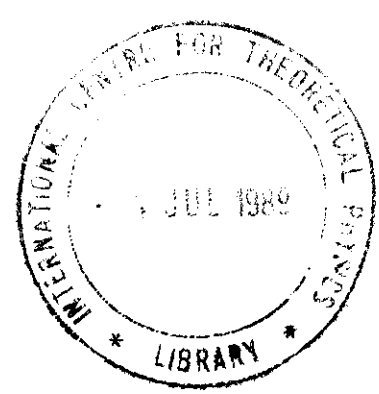

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by

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Exercise 15

Computerised Management of Preventive Maintenance (CMPM)

A. Starting CMPM

1. Make yourself familiar with the PC. Configure the system: FILES = 20, BUFFERS = 15. Set Caps Lock to ON.

2. dBase is already on the hard disk. Copy all files on the CMPM diskette into the same directory as dBase.

3. Get into this directory and start dBase by entering:

   DBASE

4. Stay in the same directory and start CMPM by entering:

   DO CMPM

5. CMPM's title screen now appears. It asks for a password. Enter:

   CMPM

6. CMPM gives three loud beeps and moves on to its Main Menu. Refer to the separate note "CMPM Display Screens" for examples of what will happen when you make various menu choices.

B. Making a menu choice

7. The CMPM diskette already has data for a few instruments in its data files. Start by working with this. Do not at this stage try to enter more data. You can do that later when you are more familiar with the program.

8. Choose Main Menu Option 2 ("LOOK AT OR EDIT INSTRUMENT INFORMATION"). A new menu appears. Choose option L ("LOOK FOR INSTRUMENT INFORMATION").

9. CMPM asks if you know the "Tag Number" of the instrument about which you want information. Every instrument in CMPM is identified by a Tag Number allocated to it by CMPM. CMPM allocates a new Tag Number whenever it accepts a new instrument into its inventory.

10. Answer NO (enter: N) as you do not yet know any Tag Numbers. CMPM responds by displaying the Tag Numbers of all the instruments for which it holds data. Make a written note of these now so you can refer to them later without having to go back to look them up.

11. Choose Tag No. 3501, which corresponds to a multichannel analyser. CMPM's inventory record for this appears on the screen. Read the entries. Consider the significance of each line. There is rather a lot of data in these records - consider whether is it all worth recording.

12. Look at the inventory records for some of the other instruments. Do this by following instructions on the screen. Then return to the Main Menu.

C. Exploring the program

13. Explore CMPM by trying some of the other Main Menu options. Start with Option 8, "INFORMATION SEARCH". You can use this to find the Tag Number of an instrument even if you have very little detailed information about it.

14. Suppose you are interested in an oscilloscope but do not remember the make or model number. Choose Option A, "INSTRUMENT NAME". The display asks you to name the instrument. There is no need to enter the full name. Just enter a few characteristic letters, in this case OSC will be enough. CMPM searches for names containing this sequence of letters (which may come anywhere in the name) and in this case finds a storage oscilloscope, Tag No. 6301. If you had entered just an "O" it would have brought up a gas chromatograph and a computer as well.

If you choose Option D, "INSTRUMENT MANUFACTURER", and then enter PHIL, CMPM finds the oscilloscope again, as it was manufactured by Philips. But entering PHILLIPS (i.e. making a spelling mistake) would bring nothing, as this long and incorrect sequence is not part of any manufacturer's name. Better enter too little than too much.

The same applies for all the other options. For example, with Option G, "ARRIVAL DATE", it is sufficient to enter "8" to get all instruments which arrived in the 1980s (and in 1978 as well).

D. Scheduling parameters

15. CMPM contains programs which can work out schedules (time-tables) for doing regular preventive maintenance work on the instruments in its records. It gets most of the information it needs for this from the inventory records, of which you saw an example when you chose Main Menu Option 2 (paragraph 11 above).

This time choose Main Menu Option 3. CMPM will show you all the data it needs for sheduling one particular instrument, which you must select. Enter a Tag Number, for example 3501. You could edit (change) the data which is displayed, but do not do so now.

E. Printed or graphic reports

16. A good way to learn what CMPM can do is to look at its written and graphic reports. Most of these summarise the work schedules CMPM computes for routine maintenance work by the technicians of the maintenance service.

17. Written reports can be generated by choosing Main Menu Option 9. Try this. When the report menu appears begin by choosing Report Option 0, which shows the work load, throughout the year, for all technicians doing PM (preventive maintenance) at Level 2. Enter "D" to display this report.

18. If you call for written report 6 the program will write a row of headings but then cannot find information it needs to complete the report. An error message appears and you must enter "C" to cancel the run. The program will then jump back to dBase and must be restarted by entering "DO CMPM" and the password.

    There is evidently a fault in this part of the program. Help to fix it would be welcome !

19. Graphic reports are generated via main menu Option G. When the graphics menu appears try its Option 1. Then try Option 6. In each case send the report to the display by entering "D".

F. Question form for results of preventive maintenence

20. When a preventive maintenance service has been completed the technician can record the results in CMPM. To see how this is done choose Main Menu Option 5 (ENTER FINDINGS OF PREVENTIVE MAINTENANCE). Enter a Tag Number, for example 3501. A questionnaire appears on the screen. Answers are to be entered into it from the keyboard (but don't do this now).

21. The questions apply only to a specfic instrument, in this case 3501. They were previously set up in CMPM by choosing Main Menu Option 4 (ENTER/EDIT QUESTION FORM).

    When Option 4 is chosen, and a Tag Number is entered for which no question form has been defined, a blank form appears on the screen. Text in the display indicates the kinds of question needed. Appropriate questions are then entered from the keyboard.

    If the Tag Number refers to an instrument for which questions have already been defined, the form will appear complete with questions. They can be edited (changed) from the keyboard. If you do this, please change them back afterwards.

G. Enter details of repair

22. Main Menu Option 6 brings up a form on which the history of a repair job can be entered. Have a look at this. When the information has been entered CMPM will calculate the cost of the repair. But this part of the program needs further checking - tests show it can give incorrect answers. Maybe this is related to the error referred to above in paragraph 18, which is also about work history.

    To see a completed repair history choose Main Menu Option 9 and call for Report 7.

H. Spare parts

23. CMPM has a rather elementary system for keeping an inventory of spare parts (Main Menu Option 7). It will report the spares held for any particular instrument (Main Menu Option 9, Report 8). But for this to be effective a general policy for coding and stocking spare parts would have to be worked out first.

I. Scheduling

24. A sophisticated feature of CMPM is its ability to work out servicing schedules for the instruments in its records, or for a selected set of these instruments. By calling for various written reports (Main Menu Option 9) the Maintenance Manager can see these schedules. He may not always follow them exactly, but they serve as reliable reminders and help him to share work evenly among the servicing staff.

25. Main Menu Option 1 allows the user to choose a set of instruments to be scheduled or rescheduled. Fully scheduled maintenance is not really necessary for every item in the inventory. Xray sets certainly need careful scheduled checking, but hotplates probably do not (maybe they do - someone should check for frayed power leads).

26. CMPM's scheduling programs are rather smart. They take account of the locations of instruments, timing the work so that jobs in the same location are done together. They know, and allow for, the number of preventive maintenance jobs each technician is expected to do per week (between 1 and 9), how much time is needed for each job, the expertise of each technician with respect to each instrument, and the condition of the instrument. A choice of types of maintenance schedule is available, with different intervals between servicings (how to change these schedules is not described here. It is not difficult). If any relevant factor is changed, for example if another technician is recruited, the program calculates new schedules.

    It is however not certain that CMPM can deal properly with all the combinations of parameters and circumstances which may be presented to it. More study of this part of its operation is needed.

J. Entering data

27. Main Menu Option 0 is used to enter new instruments into inventory. A blank inventory record appears and this is to be filled in from the keyboard. This part of the program is treated here, after other parts have been studied, because there is no way to work through it without entering some data into CMPM. If this is done wrongly it may damage other data.

28. Before it accepts a new instrument into its inventory CMPM requires that the instrument be categorised, i.e. allocated to one of 90 categories (classes) of instrument defined internally in CMPM. Subsidiary menus called up in Option 0 ask for this to be done, and show the categories available.

    CMPM needs this categorisation because it applies different PM programmes to different types of instrument (see above, paragraph 26). It cannot do this unless the user tells it the proper category for each instrument.

29. CMPM also requires (and demands) certain other information, to avoid subsequent hang-ups when it is scheduling, etc. The program will not move on until this is provided. Maybe the hang-up referred to in paragraph 18 above is due to some lack of input data.

30. Main Menu Option 0, which has a rather confusing presentation, begins by offering the choice of instrument category in two stages, first a choice of "group type" (analytical, nuclear detector, etc) and then of "instrument name" (chromatograph, spectrometer, etc). Select any group and instrument. An inventory record form then appears, empty except for the Tag Number which CMPM has allocated to the new instrument.

    Move quickly through the record by tapping the ENTER key (in effect, make null entries) and answer "Y" when asked if the information entered is correct ("N" would take the cursor back to the first line to allow editing).

    The program next demands some essential data. You must enter at least some arbitrary values, otherwise you are stuck. CMPM asks for the location of the instrument (enter AAA), its price (enter 999) and its date of arrival (enter 01/01/88). It demands the names of two technicians (enter XXX and YYY), two quality factors (enter 2 and 2) and the week in which person XXX will start work, i.e. become available for inclusion in scheduling (enter 25). This completes this dummy inventory record, which is stored along with the real ones in CMPM's database.

31. You may want to test the program by entering some more realistic data for an extended set of imaginary instruments. You will need to define three or four locations (CHEM LAB, XRAY, etc), three or four technicians (ALI, BILL, CARLOS, etc), and decide on a reasonable purchase price for each instrument. Enter "year of arrival" at random in the 70s and 80s, and set the quality factors between 1 and 3. Other data may be entered or not, as you please. To test the scheduling function thoroughly you should enter 30 to 40 instruments.

The question about the technician's starting week appears only if it has not already been answered, for the same technician, in another record.

32. It is possible to delete instruments from CMPM (Main Menu Option 2) and to change information about technicians, so in principle you should be able to remove your dummy data and leave CMPM as you found it. Your experimental additions may nevertheless have damaged data already in the system. You may for example have chosen a technician's name which had already been used for scheduling other instruments.

    Don't worry about this. When you have finished your work session all data files in the program with which you are working will be deleted and replaced by a set from the original CMPM diskette.

K. Protecting and saving data

33. If you want to save data you have entered, to work on again later, return to DOS and copy all the DBF and NDX files in your CMPM into another directory. Returning again to CMPM, you, or someone else, can then go on experimenting without risk to the saved data.

    To work again with the saved data go back to DOS, delete all DBF and NDX files from CMPM, and then copy back into its directory all the saved DBF and NDX files.

L. Modification of CMPM for use with hospital equipment

34. During the College some students may like to create a version of CMPM optimised for use with hospital equipment. To do this, new categories of equipment, and new servicing programmes, must be agreed and defined. To test the revised program a set of artificial data should be created and entered. It will not be necessary to invent something for every line of the lengthy inventory record, only items used internally by CMPM are needed.

M. Concluding comment

34. Some students may feel that CMPM is unnecessarily complicated for managing the few items which need scheduled maintenance in a small hospital. This may well be true, although the inventory aspect of the program will always be worth while. Studying the program can bring other benefits, however. Thinking in detail about how a computer would deal with scheduling can help a maintenance manager to do a better job with pencil and paper. Getting all aspects of the problem clear in ones own mind is what matters most.

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