Can / Am EMTP News

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Salford EMTP for 80386 Given Scrollable SPY & LUNIT6 Windows

Windows have been added to the Salford EMTP, as explained on pages 17-23 of the June issue of EMTP News. The remainder of this summary has been extracted from Section I (the first half) of Dr. Meyer's paper:

The Salford EMTP for Intel 80386-based computers now offers scrollable windows to SPY users at no extra charge. Details are provided in the first of two chapters of this paper. Three months ago (see pages 26-30 of the March, 1990, issue), SPY dialogue was interleaved with LUNIT6 output. Today, the Salford EMTP responds to the opening command "SPY" by the creation of two scrollable windows that separate the two different classes of program I/O. Whereas each window displays only 80 columns at any one time, the content being viewed by the LUNIT6 window is assumed to be 132 columns in width. Hence there is no need (or even desirability) to reduce the output width to 79 columns in order to view the LUNIT6 output intelligently (without wraparound) using common, inexpensive, 80-column monitors. Unlike the design for Apollo workstations (see Chapter XVI of the ATP Rule Book), the Salford EMTP only displays one window at a time. This is believed to be best for the smaller, more-inexpensive monitors that commonly are used with personal computers. Graphics provide a third possible display for the entire screen, and this can be paged using the horizontal arrow keys. The ROLL-ing SPY "PLOT" works well, of course. Unlike before, text no longer is lost when graphic mode is entered; the window that was visible when graphics began will reappear when graphics end. Finally, as a record of the simulation, the contents of Salford EMTP windows can be preserved on disk as conventional, editable disk files after the windows are closed.

Scrolling or popping (switching between) the Salford EMTP windows is responsive (i.e., nearly instantaneous) during data input, the time-step loop, or any of the several other program activities that provide frequent SPY opportunities. This is because SPY input is required to modify the view provided by Salford EMTP windows or graphics.

The contents of Salford EMTP windows can be preserved as conventional, editable disk files after program execution has ended. Otherwise-unused variables of STARTUP determine whether this option is to be used, and if so, whether the backup is to be created continuously or rather only upon window closure or the need to overwrite (in case window RAM has filled).

Positioning of Salford EMTP windows is controlled by familiar computer keys in intuitive fashion. The up and down arrows provide continuous scrolling whereas the Page Up and Page Down keys move the display half a page at a time (modeled after Apollo). The Home key will transfer to the top (start) of the window whereas the End key will transfer to the bottom. Function keys allow the user to switch between the two windows: F1 will display the SPY window whereas F2 will switch to the LUNIT6 window. The left arrow key will display the left-most 80 columns of the LUNIT6 window whereas the right arrow will switch to the right-most 80 columns. The Esc key will abort graphic mode to return to the SPY windows. Or, if touched while in text mode, it will close the SPY and LUNIT6 windows, flushing the contents to disk in the process. If a plot is on the screen, the left and right arrow keys will shift the window left or right along the time axis while preserving the previously-requested time span. Etc. (look for a more complete definition of such controls in the READ_ME.DOC file that accompanies Salford EMTP distribution).

"SPY @4" is all the user need key at the start of

Salford EMTP execution in order to initiate a demonstration of the features discussed in this paper. Disk file INCLSPY4.DAT, which will be driving SPY, has been heavily commented for those who are interested in understanding the different SPY commands.

Unrelated Miscellaneous News about the Salford EMTP

33-Mhz 80386 motherboards are extremely attractive for those who want substantially more power while still keeping the price low. The experimentation was done in Portland about 5 months ago by Brian Furumasu, who moved his original 386-SX motherboard to Dr. Liu's home computer (originally a genuine IBM PC AT). Surprisingly, the 33-MHz replacement motherboard seems to triple rather than double the rate of EMTP simulation, on average. Computer expert David Szymanski had predicted speed better than would be suggested by the clock frequency, and he was right (as usual). The 33-MHz coprocessor deserves the credit, it would seem. RAM caching also is important (performance degraded badly when this was disabled). While waiting for the 80486, power-hungry EMTP users are strongly advised to take a close look at a 33-MHz 80386 for support of the Salford EMTP.

If Salford EMTP execution dies in "MULT" after the phasor solution, readers should be aware that this bug was corrected several months ago. Only for certain modeling, an uninitialized variable was manipulated (used), causing the trouble. The problem was recognized independently, using different data cases, by Mustafa Kizilcay in Hannover and Dr. Gary Thomann of PTI in Schenectady, New York.

The Salford EMTP might not hang when it tries to page to a nonexistent swap file. Of course, DBOS/386 should be protected, and experiments using a 25-MHz COMPAQ with 1 Mbyte of RAM confirm this for both DC-1 and DC-6. Execution ends gracefully, as it should, with the message "page memory exhausted." Why this was not the case using the 16-MHz 386-SX motherboard earlier this year (see the next to the last paragraph on page 18 of the March issue) remains a mystery. David Vallance was skeptical of this reported trouble, which we have been unable to confirm using the 25-MHz COMPAQ. Maybe the phenomenon is not a problem for the average computer, and hence need not be a concern of the average user.

TPPLOT has been converted to run under Salford's DOS extender (DBOS/386). Whereas the MS-DOS version of TPPLOT required GEOGRAF for screen graphics, the Salford version of TPPLOT offers free screen graphics for either EGA, VGA, or Super VGA (Paradise 600 by 800). Because of the use of extended (even virtual) memory, there no longer is any practical limit on the number of time steps in the ".PL4" file. Hard copy can be obtained using either PostScript or HP-GL (see pages 33-36 of the March issue of EMTP News). Direct hard copy might be possible with the new compiler (Rev. 2.40), which was received from OTG Systems on July 27-th. No doubt substantial new work on graphics of the Salford EMTP and TPPLOT will result. Already, specialized windows (e.g., for TIMESPAN or the new TYPE command) have been added. Look for a report in the September issue of EMTP News.

A new "DIR" command at the start of Salford EMTP execution connects the user to Salford's interactive selection of an EMTP data file. The EMTP will respond to "DIR" with a prompt for a file name, which usually will involve a wild card (e.g., "DC3*.DAT"). All files satisfying the user's name then will be displayed in a vertical list that will appear in a window that will open on the right. The up and down arrow keys will move the highlighted entry, which the user selects with a <CR>. The FILE command of TPPLOT also has this feature in response to a name involving a star (wild card "*").

Prof. Dennis Carroll has taken delivery of more 80386-based computers during the last 3 months. Next year (March of 1991), each student at the EMTP short course of the University of Florida in Gainesville should be able to run the Salford EMTP on his own 80386-based computer. For EMTP education, the University of Florida is more attractive than ever before.

Drs. Tsu-huei Liu and Kai-hwa Ger have succeeded in producing CGA and Hercules graphics (not supported by Salford itself) while running under Salford DBOS/386. For most, the support of such older graphical standards no longer is of interest. But some overhead projectors (e.g., those in Gainesville and Leuven) require CGA graphics.

Stuart McKay of Toronto, Ontario, uses Mustafa Kizilcay's interactive plotting program PCPLOT on Salford ".PL4" files. But he quickly exceeded a limit (in PCPLOT) of 200 names that he did not understand. While the limit of PCPLOT is fixed, one can decrease the burden of names by disabling automatic branch and switch naming by setting STARTUP variable NMAUTO ("name automatic") to zero. As presently distributed, the Salford EMTP has NMAUTO = 1.

The Salford symbolic debugger works on EMTP FORTRAN using the Rev. 2.40 compiler. Mustafa Kizilcay of the University of Hannover (West Germany) was the first to verify this critical detail for program developers. ATP developers in Portland first learned of this important news by FAX from Hannover dated July 26-th.

The new Salford FORTRAN compiler, Rev. 2.40, offers such important extensions as rotatable and scalable fonts, and the ability to transfer graphics between the screen and either RAM (virtual memory) or disk (a user-specified permanent file). This would be great, were it not for incompatibility. Should the owner of an old DOS extender (DBOS/386 Rev. 2.20) try to use new features of a new program, the operating system will terminate execution. Considering the large number of older Salford DOS extenders already in use to support EMTP, developers do not want to modify EMTP so that it would become incompatible. This difficulty is being pondered. Another change also might be mentioned: Like MS-DOS programs, it seems that Rev. 2.40 Salford programs no longer require RUN77 for execution. In fact, a new program has been found to hang if RUN77 is used with an old DOS extender. Well, this is good news: the DOS extender is becoming more transparent.

Salford EMTP Under DESQview

Stuart McKay of Toronto, Ontario (Canada), is the author of a 5-page paper in the June issue of EMTP News. Pages 24-28 summarize Mr. McKay's important experience with multitasking by running the Salford EMTP within a window of Quarterdeck's DESQview.

More than just multitasking was involved in Mr. McKay's use of Quarterdeck software. DESQView was required in order to install the Salford DOS extender (DBOS/386) because of a conflict with shadow RAM. Mr. McKay's computer is unusual. Purchased in 1987 from Greff Computers of Brampton, Ontario, this system has 2 Mbyes of RAM with shadowing and operates at 22 MHz with zero wait states. The system is managed by Phoenix BIOS version 1.10 00 which will suppress the shadowing as required by DBOS, but will not reallocate the associated RAM for program use. An expensive hardware upgrade to a current BIOS (one alternative) was avoided by the software of DESQview, which includes QEMM (Quarterdeck's Extended Memory Manager, popular by itself). But QEMM by itself would not solve the problem with the shadow RAM.

With DESQview, programs can run in viewing areas, or windows, which can be placed in the background with various priorities while the current window is active. The program windows can be resized and moved as desired, and the user can switch among these windows easily. DESQview supports both text and graphics and can run most DOS applications. Context switching is the process of allocating time slices to each of the active windows.

Additional PCPLOT Improvements

Mustafa Kizilcay of the University of Hannover in West Germany once again has improved his popular interactive plotting program PCPLOT, which runs under MS-DOS on Intel-based microcomputers. The following has been extracted from his 2-page report in the June issue of EMTP News (see pages 12-13).

The initialization file PCPLOT.INI has grown in size during recent months. Since each parameter line is preceded by a comment line, the contents are largely self-explanatory. Users are advised to review the 26 entries (52 lines) of a new program version in order to understand better the variations that now are possible.

Hard copy is handled differently, resulting in support for HP Laserjet printers (or Deskjet Plus, as verified by Prof. Ned Mohan in Minneapolis). Also, VGA graphics are supported, the maximum number of curves per graph has been increased from 3 to 4, and tic marks of axes now are under user control (an explicit declaration was required for WordPerfect Version 5.1). The manual selection of the graphical standard has been corrected (required by Dr. Liu's 1987 "EGA Wonder" by ATI Technologies, Inc.). Scaling and offsetting of individual curves now is possible. For HP-GL output, the size of numbers and labels now is under user control. Finally, a ".PL4" plot file can be specified along with the command to execute the plotting program (e.g., "PCPLOT HHMMSS.PL4").

Enhanced ATP Software for Unix

Computer expert David Szymanski of Wattsburg, Pennsylvania, reports progress in the June issue of EMTP News. The following summary has been extracted from pages 14-16, which describe his ATP enhancements that run under standard Unix (AT&T's System V, Release 3).

Dynamic dimensioning of EMTP tables means that the user is able to select his own program limits at the start of EMTP execution. Some steps resemble what was done in the past, but in fact operate completely different, so it is worth summarizing the procedure. First, the user maintains his dimensioning information in disk file **listsizes.dat** that will be attached automatically by **vardim** when this variable-dimensioning program is executed. The explanation of which data fields control which EMTP tables remains as explained in Section I-E of the ATP Rule Book. The dimensions assigned to EMTP tables as EMTP execution begins correspond to the information that was in **listsizes.dat** when **vardim** last was executed. Note that the user need not have EMTP object files, or a FORTRAN compiler to compile the output of **vardim**. Nor does the user need a linker to create a new executable EMTP version from object files.

The Motorola 88000 microprocessor is used to power high-speed RISC workstations from several manufacturers. Included is the Data General Aviion, with which Mr. Szymanski has done considerable experimentation in recent months. Recall that basic batch-mode compatibility

of ATP to the Data General Aviion was reported on pages 70 and 71 of the December, 1989, issue of EMTP News. But the initial EMTP experimentation in Portland ignored bit-mapped graphics, SPY, and windows --- which now are being considered by Szymanski. Movement of Szymanski's software from AT&T's 80386-based computer to DG Aviion was easy because of compatibility in most important things. The same standard Unix is being used, and the same FORTRAN compiler (from Green Hills) was available, so is being used. Even though the hardware is completely different (the CISC Intel 80386 vs. the RISC Motorola 88000), identically the same EMTP FORTRAN and C-language code is used on both computers.

The Pittsburgh office of Data General has loaned Szymanski one of its Aviion workstations since April 12th in order to assist movement of the author's ATP software to this high-speed workstation. About DG Aviion EMTP simulation speed, using compilation with minimal optimization, the time-step loop of DC-1 requires 112 seconds of CPU time if output goes to the screen (a graphical window of OSF's Motif, which sits between the user and MIT's X Window System). If output goes instead to disk, the time drops to 99.04 seconds. Compare this with 721 seconds for a 16-MHz 80386-SX (see page 15 of the March, 1990, issue of EMTP News). Szymanski is pleased with both the DG hardware and software, which seem well-suited for high-speed support of EMTP.

Szymanski has been working to make life easier for the EMTP user who does not have all of his EMTP disk files in the same directory. New EMTP structure now accommodates a routine that will locate a disk file just using its name. Szymanski uses C-language to access Unix environment variables that will locate a file much the way the PATH command of more-familiar MS-DOS operates.

Additional utilities are being written in order better to support compressed table dumping of the EMTP. Recall that Szymanski's software does not dump unused portions of EMTP tables, thereby greatly speeding the table transfer and also minimizing the resultant storage on disk. Extra tools are desirable because of the tricky nature of the compressed data file. If one were to inventory such a compressed disk file using the Unix "ls" command, the full (i.e., uncompressed) size would be seen. If a copy were to be made, the original might be compressed but the copy would not be. The same goes for a copy to magnetic tape. Of course, the user wants to preserve the compression for copies of such disk files that are produced by the EMTP. With enormous dimensions, the difference could be staggering.

63 Attend Minnesota EMTP Short Course

A total of 63 paying students were exposed to MS-DOS and Salford versions of ATP during the 2-day EMTP short course that both preceded (July 12-14) and followed (July 19-21) the IEEE PES Summer Meeting. This is a reference to Prof. Ned Mohan's EMTP short course at the University of Minnesota in Minneapolis, about which several observations will be made (the remainder of this article).

The amphitheater in which the course was held in the new, underground Civil and Mineral Engineering building provided ideal physical accommodations. With controlled lighting like a theater, and 3 screens behind the speaker to serve 2 conventional overhead projectors and 2 ceiling-mounted computer projectors, the visual environment was exceptional. No loud speaker was used or required, surprisingly. The amphitheater had good acoustics, and background noise did not seem to pose the challenge that it did in Florida. For one thing, no printers were used in Minnesota, and computers were either a quiet, new model (IBM PS/2 Model 50) or were an older model (IBM PC AT) that was enclosed and somewhat muffled below the desks.

Two students shared a computer in most cases, rather than each student having his own computer as at previous short courses in Florida and California. This was the key to the large attendance. Each of 4 concentric arcs of stationary counters supported 5 computers and a maximum of 10 students. In fact, paid attendance was only 25 for the first offering, but it was 38 for the second. There seemed to be a clear preference for EMTP education after the IEEE meeting, thereby avoiding a Sunday layover.

Power electronics and rotating machinery were covered more effectively than at other ATP short courses. Of course, it helps to have resident faculty who specialize in these subjects (Prof. Riaz in machinery and Prof. Mohan in power electronics). The course ended on power electronics, with Prof. Mohan referring persons having further interest to his John Wiley textbook ("Power Electronics: Converters, Applications, and Design") and his 63 illustrative EMTP data cases ("Computer Exercises for Power Electronics Education"). This was the high point, a natural climax to a successful, new format (2 days) for EMTP education. Could the course be repeated next year in San Diego, following the 1991 Summer Meeting?

Graphical Assembly of EMTP Data

N. D. Hatziargyriou of the Electrical Energy Systems Laboratory of National Technical University of Athens, Greece, seems to be working creatively on EMTP data assembly. On pages 42-50 of the June issue of EMTP News will be found a paper by this gentleman entitled "An

interactive graphical preprocessor for preparation of data files in the PC environment." The following paragraph is all text of the CONCLUSIONS section of this interesting paper.

An interactive graphical preprocessor is presented which can be used to set up study ATP data files for the IBM Personal Computer and Compatibles environment. The basic routines written in C utilize the hardware capabilities offered by these machines and can be interfaced to any FORTRAN based routine. Thus, it should be possible to integrate these routines in the basic ATP package at a little memory expense. The preprocessor is applied to switching studies in mutually coupled reactors. Although the simple case used can only serve to indicate the basic organization of the ATP Preprocessor, the proposed approach shows distinct advantages of a very convenient and fast data entry. This is attributed not only to the diagrammatic frame for data specification, but also to the help instructions provided at key points of the entry procedure. Drastic reduction in syntax errors has also been noted. With inexperienced ATP users the results are expected (to be) even more spectacular. Clearly, a considerable amount of work is still required in order to include all the models and facilities offered by EMTP. This will also inevitably complicate the drawing procedure. It is believed however that, if carefully designed, the Preprocessor can tremendously facilitate ATP studies and encourage new users.

Alternate Transformer Modeling

"Interface program for the transformer model" is the title of a carefully-prepared paper that appears on pages 51-65 of the June issue of EMTP News. The authors are Messrs. L. Bompa and P. Bertrand of Merlin Gerin in Grenoble, France. Once again, Merlin Gerin has demonstrated the seriousness of its EMTP use, this time by a call for the reformation of transformer data input. The following paragraph is copied from the introduction (Section 1).

The EMTP code provides several possibilities for simulating the main characteristics of a power transformer. This involves several subprograms such as XFORMER, TRANSFORMER, BCTRAN, TRELEG, based upon data from resistances, inductances and the winding ratio for the simplest transformers, or on data produced by standard off-load or short circuit tests for the most complex, such as the BCTRAN program. All of these programs do not provide modelling that responds to all the technical characteristics of the transformer and they require complex interventions so as to complete the basic model. These interventions are very long and are marred by errors, resulting in incomplete models. The elements of the model requiring external completion are the following: *) magnetic saturation; *) iron losses; *) additional losses shown by short circuit testing; *) magnetic asymmetry; *) winding capacity of the transformer; *) and, in particular, the model for internal fault simulation. As a result, so as to automatically constitute a transformer model to meet certain previously defined requirements, we propose the development of an interface program named TRAF, which is the topic of this study.

Classroom Instruction Using EMTP

Juan A. Martinez of the Polytechnic University of Catalunya is the author of a 13-page paper entitled "Adapting the EMTP for classroom instruction." Refer to pages 29-41 of the June issue of EMTP News, from which the following ABSTRACT has been copied. Those who believe that EMTP data input is excessively complicated, and that schematic diagrams offer the best hope for relief, are advised to contemplate this carefully written article. Martinez, one of the deeper thinkers in Europe, shows what can be done without any changes to the program or the hardware that supports it.

This paper shows how to adapt the EMTP for classroom instruction. A module package to simulate transient phenomena in power systems has been developed by using the supporting program DATA BASE MODULE. Any general configuration of single-phase system can be studied. Since a fixed and very simple structure is used for each data file, only a few rules about data module formats and the use of the plotting program PCPLOT are to be learnt. Three examples are included to illustrate the scope of the package.

OS / 2 Benchmark of DCG / EPRI ?

ATP researchers in Portland still are looking for someone who could, and would, benchmark the OS/2 version of DCG / EPRI's EMTP. This is a continuation of the paragraph in the middle of page 6 of the January issue. BPA received advertizing from EPRI (a "ready now" page) by mail early in August --- apparently indicating availability of the DCG/EPRI EMTP Version 2.0 to the general public. Dated "July 1990," this single sheet of slick color advertizing confirms the need for much more RAM (at least 4 Mbytes). But how about execution speed for BENCHMARK DC-1? Those who work with the Salford EMTP have become increasingly curious about this question, to which no one has yet responded. Skepticism about the efficiency of OS/2 for 80386-based computers remains. Can any reader provide the hard numbers for the usual ATP test cases (BENCHMARK DC-1, 3, 26A, 35, 38C, and 41)?

Usage of DCG / EPRI's EMTP is not very widespread when one remembers that EPRI began investing money in its commercial EMTP development way back in 1981 or 1982. The new EPRI advertizing states: "EMTP Version 2.0 is used world-wide by over 170 utilities, manufacturers, universities, and laboratories ..." Consider what this EPRI statement must really mean. First, there is no way of knowing how many sites actually use EMTP. Nothing like the Nielson ratings of commercial television exists for EMTP, to determine how many sites or persons used EMTP during any given week. EPRI, like any other software distributor, only has an accurate count of its licenses. Now, if one can believe that the count of its EMTP licenses recently has surpassed 170, EPRI has not been very successful in handing out free copies to its members (which number some 600). Not only is distribution of DCG/EPRI's EMTP far behind that of ATP on a world-wide basis, it even trails within the USA and Canada. As reported on page 9 of the June issue of EMTP News, Can/Am ATP "site licenses exceeded 230 in number" at last count.

ATP Benchmarking of new IBM RS/6000 RISC Workstation

Richard Niska and Thomas Kiriakedis of Pacific Power and Light Company cooperated with Dr. Meyer of BPA and the user group to evaluate the EMTP capabilities of IBM's new Unix workstation, which is named RS/6000. This began in the downtown Portland offices of IBM at 13:00 on June 20th, 1990. Three hours later when the initial session ended, correct simulations of several simple test cases already had been confirmed. It is difficult to remember an easier, faster, or more successful start using a compiler, operating system, and hardware that never before had been exposed to EMTP.

Simulation speed of the IBM RS/6000 is most easily summarized by adding an IBM row to Prof. James Smith's tabulation on page 31 of the March issue of EMTP News. See below. Unoptimized compilation and standard BENCHMARK DC-XX test cases were used for all timings of each computer. Comparing IBM's speed with the faster of Sun and DEC leads to the bottom row. It is seen that IBM has a speed advantage for EMTP simulation that varies from a minimum of 40% to a maximum of 76%.

Szymanski's enhanced EMTP software might run on IBM's RS/6000, but no one yet knows. Once batch-mode testing is completed successfully, this detail should be considered. IBM's Unix (AIX) is derived from AT&T's System V, Release 2 rather than from System V, Release 3, so compatibility is not guaranteed. But there is hope.

Standard test case name	DC - 3	DC - 26A	DC - 35	DC - 41	DCNEW - 4
Sun SPARCStation 330	1.81	9.04	6.99	2.47	1.37
DEC DECStation	1.82	7.02	5.78	2.05	1.11
IBM RS/6000 workstation	1.03	4.99	3.80	1.46	0.76
IBM's speed advantage	76%	41%	52%	40%	46%