Technical Forum

TI Has Faster Solutions

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Before reading Mr Arp's article, "The Power of the HP-67 Programmable Calculator, Part 2" (April 1979 BYTE, page 176), I was under the impression that the Hewlett-Packard HP-67 and the Texas Instruments TI59 programmable calculators were about equal in function, utility, and calculating power. Both are "top of the line" although the HP-67 costs about 70% more than the TI59.

The procedures used by Mr Arp in writing his simultaneous equations program can be applied, with minor reprogramming, to the TI59. The resulting program would then be capable of solving 29 simultaneous equations in 29 unknowns, as opposed to 9 equations in 9 unknowns with the HP-67.

The TI59 can use up to 100 data storage registers, compared to 26 registers for the HP-67. It can read/write data from/to magnetic cards in banks of 30 values. Each card can thus contain the 29 coefficients and one constant term for one complete row of the solution array.

The Library Module supplied with the TI59 contains a program for solving simultaneous equations which will solve up to 8 equations with 8 unknowns, as compared to 4 equations with 4 unknowns for the HP-67.

Mr Arp did not tell us how much time is required to solve the set of 9 equations given in his listing 4 (page 186), or the resultant accuracy of the solution. It appears to involve one hundred or more read/write operations from/to magnetic cards, a considerable amount of external manual bookkeeping to keep track of the cards, hand copying of coefficients, and the like. My guess is that solution time is about 90 minutes, provided the wrong card does not slip in. With regards to accuracy, Mr Arp gives his solution results with 6 digit values, but does not state the closure error on back substitution in the original equations.

For comparison, I tried the library program in the TI59. To reduce the problem to eight equations instead of nine, I deleted cell 9 in figure 1 (page 180). This has the effect of deleting the ninth coefficient of the first eight equations and the entire ninth equation of table 1 (page 180).

This was my first experience with using the TI59 to solve simultaneous equations, so I read the instructions carefully. Then I timed the operation. From the beginning at the start of data entry, to the end after all eight unknowns had been copied down, the procedure took just 13 minutes.

All answers came out as 10 digit numbers. On back substitution all equations closed out with a maximum error of 4.6E−9 and a mean absolute error of 2.2E−9. Most of the functions and operations on Mr Arp's "wish list" are already available on the TI59. He would be well advised to check out the TI59.

Incidentally, Texas Instruments software isn't always quite as good as its hardware. The TI59 has sufficient computing capacity to solve 10 simultaneous equations in 10 unknowns with the program entered from magnetic cards, and 11 equations in 11 unknowns with the program resident in a library module. This is with a full set of equations with non-zero values for all coefficients.