```
        converge := converge + 1;
        if converge ≧ 3 then go to TERMINATE else go to D;
C:      converge := 1;
D:      for i := 1 step 1 until n do temp[i] := x[i]
    end m;
    go to THROUGH;
TERMINATE:
    maxit := m;  go to THROUGH;
SING:
    singular := 0;
THROUGH:
    end nonlinearsystem
```

APPENDIX

We include a sample procedure *evaluatekthfunction* for the 2×2 system:

$$\left(1 - \frac{1}{4\pi}\right)(e^{2x_1} - e) + \frac{e}{\pi}x_2 - 2ex_1 = 0$$

$$\frac{1}{2}\sin(x_1x_2) - \frac{x_2}{4\pi} - \frac{x_1}{2} = 0,$$

one solution of which is $(.5, \pi)$ see [2]

```
procedure evaluatekthfunction (x, y, k);
    integer k;  real y;  array x;
begin switch functionnumber := F1, F2;
    go to functionnumber [k];
F1:  y := 2.71828183 × (.920422528 × (exp(2×x[1]−1)−1)+
        x[2]/3.14159265−2×x[1]);
    go to RETURN;
F2:  y := .5 × sin(x[1]×x[2]) − x[2]/12.5663706 − x[1]/2;
RETURN:
end evaluatekthfunction;
```


REFERENCES:

1. BROWN, K. M. A quadratically convergent method for solving simultaneous non-linear equations. Doctoral Thesis, Dept. Computer Sciences, Purdue U., Lafayette, Ind., Aug., 1966.
2. BROWN, K. M., AND CONTE, S. D. The solution of simultaneous nonlinear equations. Proc. ACM 22nd Nat. Conf., pp 111–114.

ALGORITHM 317*
PERMUTATION [G6]

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```
procedure permute(n, k, v);  value n, k;  integer array v;
    integer n, k;
comment This procedure produces in the vector v the kth
    permutation on n variables. When k = 0, v takes on the value
    1, 2, 3, 4, ··· , n. This algorithm is not as efficient as pre-
    viously published algorithms [1], [2], [3] for generating a
    complete set of permutations but it is significantly better
    for generating a random permutation, a property useful in
    certain simulation applications. Any non-negative value of
    k will produce a valid permutation. To generate a random
    permutation, k should be chosen from the uniform distribu-
    tion over the integers from 0 to n! − 1 inclusive;
begin integer i, q, r, x, j;
    for i := 1 step 1 until n do v[i] := 0;
    for i := n step −1 until 1 do
    begin
q := k ÷ i;  r := k − q × i;  x := 0;  j := n;
no: if v[j] = 0 then
        begin
            if x = r then go to it else x := x + 1
        end;
        j := j − 1;  go to no;
it:  v[j] := i;  k := q;
    end
end
```


REFERENCES:

1. COVEYOU, R. R., AND SULLIVAN, J. G. Algorithm 71, Permutation. *Comm. ACM 4* (Nov. 1961), 497.
2. PECK, J. E. L., AND SCHRACK, G. F. Algorithm 86, Permute. *Comm. ACM 5* (Apr. 1962), 208.
3. TROTTER, H. F. Algorithm 115, Perm. *Comm. ACM 5* (Aug. 1962), 434.

Algorithms Policy • Revised August, 1966

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An algorithm must normally be written in the ALGOL 60 Reference Language [*Comm. ACM 6* (Jan. 1963), 1-17] or in ASA Standard FORTRAN or Basic FORTRAN [*Comm.* ACM 7 (Oct. 1964), 590–625]. Consideration will be given to algorithms written in other languages provided the language has been fully documented in the open literature and provided the author presents convincing arguments that his algorithm is best described in the chosen language and cannot be adequately described in either ALGOL 60 or FORTRAN.

An algorithm written in ALGOL 60 normally consists of a commented procedure declaration. It should be typewritten double spaced in capital and lower-case letters. Material to appear in **boldface** type should be underlined in black. Blue underlining may be used to indicate italic type, but this is usually best left to the Editor. An algorithm written in FORTRAN normally consists of a commented subprogram. It should be typewritten double spaced in the form normally used for FORTRAN or it should be in the form of a listing of a FORTRAN card deck together with a copy of the card deck. Each algorithm must be accompanied by a complete driver program in its language which generates test data, calls the procedure, and produces test answers. Moreover, selected previously obtained test answers should be given in comments in either the driver program or the algorithm. The driver program may be published with the algorithm if it would be of major assistance to a user.

For ALGOL 60 programs, input and output should be achieved by procedure statements, using any of the following eleven procedures (whose body is not specified in ALGOL) [See "Report on Input-Output Procedures for ALGOL 60," *Comm. ACM 7* (Oct. 1964), 628–629]:

insymbol	*inreal*	*outarray*	*ininteger*
outsymbol	*outreal*	*outboolean*	*outinteger*
length	*inarray*	*outstring*	

If only one channel is used by the program for output, it should be designated by 1 and similarly a single input channel should be designated by 2. Examples:

```
outstring (1, 'x=');  outreal (1,x);
for i := 1 step 1 until n do outreal (1,A[i]);
ininteger (2, digit [17]):
```

For FORTRAN programs, input and output should be achieved as described in the ASA preliminary report on FORTRAN and Basic FORTRAN.

It is intended that each published algorithm be well organized, clearly commented, syntactically correct, and a substantial contribution to the literature of Algorithms. It is necessary but not sufficient that a published algorithm operate on some machine and give correct answers. It must also communicate a method to the reader in a clear and unambiguous manner. All contributions will be refereed both by human beings and by an appropriate compiler. Authors should pay considerable attention to the correctness of their programs, since referees cannot be expected to debug them.

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