i.e. constraint 1 is underactive and constraint 3 is violated.

The method of solution of nonconvex polynomial programmes by direct application of the Kuhn-Tucker necessary conditions is known to be computationally unreliable (Templeman, 1971) and the methods of conservatively approximating the negative term constraints (Avriel, 1970) are generally more satisfactory. Results from an algorithm using such a method on problem four yield the results below:

$$\text{Primal minimum} = -2420{\cdot}07$$
$$X_1 = 1000{\cdot}00 \quad X_2 = 98{\cdot}5413 \quad X_3 = 272{\cdot}919 \quad X_4 = 5{\cdot}0572$$
$$X = 23.5997 \quad X_6 = 52{\cdot}5416 \quad X_7 = 203{\cdot}474$$

constraint 1	constraint 2	constraint 3
0·99995	0·99999	1·00000

$$\text{Primal initial starting point } X_i = 10{\cdot}0,\ i = 1, 7\ .$$

A systematic comparison of the various methods would be interesting.

The authors mention that higher order methods help accelerate convergence. However, their solution procedure, which involves the sequential solution of decomposed systems of linear equations, will become less suitable if, say, a quadratic approximation is used in equation (24). Certainly, the attractive linear decomposition will no longer be possible.

As a comparison with their first-order algorithm, a summary is given below of the results of solving sample problem (3) using a Newton-Raphson based second-order method applied to the dual programme, to a high accuracy (Bradley, 1973).

$$\text{Primal minimum} = 135{\cdot}0734; \text{ Dual maximum} = 135{\cdot}0736$$
$$X_1 = 5{\cdot}33259 \quad X_2 = 4{\cdot}65674 \quad X_3 = 10{\cdot}43297$$
$$X_4 = 12{\cdot}08211 \quad X_5 = 0{\cdot}75262 \quad X_6 = 0{\cdot}87865$$
$$\text{Constraint 1} = 1{\cdot}00001$$
$$\text{Constraint 2} = 0{\cdot}99999$$
$$\text{Number of Newton-Raphson iterations} = 6$$
$$\text{CPU time (IBM System 360/65)} = 1{\cdot}56 \text{ seconds.}$$

Here, the CPU time includes that taken to load the program from the core-image library and to produce a fairly comprehensive report and sensitivity analysis.

Of course comparison of CPU times for such small problems is not very meaningful. Nevertheless, since the only motivation for the separate development of GP algorithms for polynomial problems is the edge they have over methods of more general application, it would seem wise to make full use of at least second order information, particularly since this is available in analytic form.

Yours faithfully,

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31 November 1974

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To the Editor
The Computer Journal

Sir

Your correspondent J. Leech (Vol. 17, No. 4, p. 383) is quite right in thinking that uses of the word 'algorithm' may well go back before 1923. In an Appendix to Dr. Mansfield Merriman's book entitled *Elements of the Method of Least Squares*, published in London by Macmillan in 1877 is given a history of the well known Method of Least Squares for the adjustment of measurement errors. On page 195 appear the words 'To GAUSS is also due the development of the algorithm of the method'.

Incidentally, the word 'computer' is used several times in the book, referring, of course, to a person.

Yours faithfully,

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To the Editor
The Computer Journal

Sir

Some time ago in a review of *Understanding Natural Language*, there was a slight discussion of ETAOIN SHRDLU, which you said was the top of a linotype keyboard like qwertyuiop on a typewriter. It is of little import, but some of your readers might like to know that these letters are actually the first two vertical columns of the keyboard, reading down from the left. The reason these letters were chosen is the fact that they are the most frequently used letters of the alphabet. The linotype machine can only hold a finite number of matrices for each letter, and after they are used to cast the hot lead type-slug, they are recycled along a slow moving track. The type-matrix elements are coded in a notch which fits on the track, and drop into the correct channel. The fact that E is the first letter to drop means that the great frequency of E will not overload the machine, since it returns promptly. I enclose a Xerox copy of an official publication showing the entire keyboard.

Yours truly

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7 January 1975

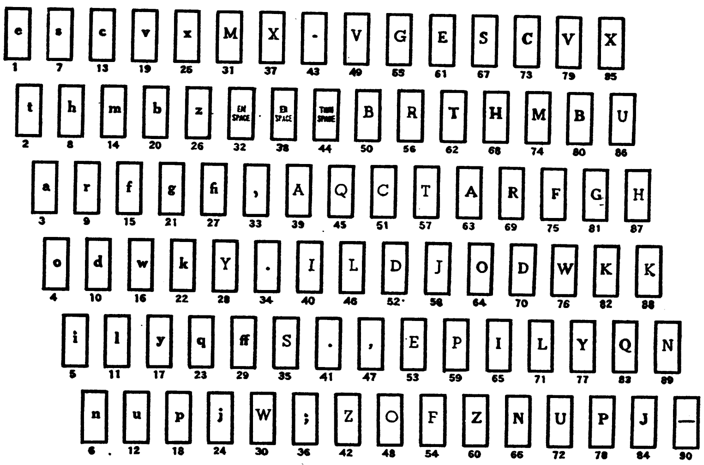

Diagram 22-B. Lower case and caps of same face in lower case and cap channels—caps of another face in centre channels

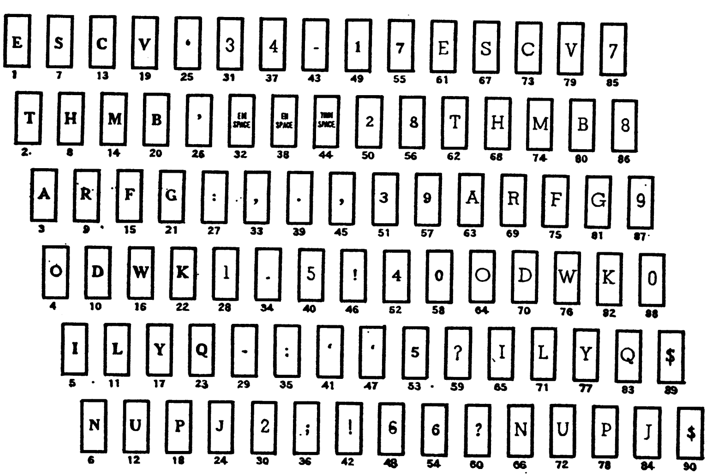

Diagram 87. Two cap founts in 90-channel magazine.