

Homework 13- Truncated Newton Methods

Use the Truncated Newton (Inexact Newton) code supplied (tnfull.f) to find the minimum of:

1. Woods problem (provided in the code in subroutine SFUN)
2. Minimize the function :

$$f(x) = \frac{1}{10}(x-e)^T D(x-e) + (x^T x - \frac{1}{4})^2$$

$$e = (1, 1, \dots, 1)^T$$

$$D = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 2 & 0 & 0 \\ 0 & 0 & 3 & 0 \\ 0 & 0 & 0 & 4 \end{bmatrix}$$

With initial guess: $x_0 = (1, -1, 1, -1)^T$

Please derive explicitly and enter function and gradient of f for n=4 in subroutine SFUN

Please flowchart and explain how truncated Newton method works i.e. where in the code is

$$\nabla^2 f(x_k)v \approx \frac{\nabla f(x_k + hv) - \nabla f(x_k)}{h}$$

implemented.

Explain where in the code is the preconditioned conjugate gradient method used and how is preconditioning used.

Explore accuracy of the stopping criterion as well as that of the line search.

Plot on semi log the function and gradient norm vs. number of iterations.