

1 Problem

$$\begin{aligned} \min_x & f(x) \\ & g(x) \leq 0 \\ & h(x) = 0 \end{aligned}$$

2 Algorithm

Algorithm 1 Filter Line Search

```

1: procedure TRUST REGION FILTER
2:   initialize
3:    $\kappa_\Delta \in (0, 1]$ 
4:    $\kappa_\mu > 0$ 
5:    $\mu \in (0, 1)$ 
6:   while True do
7:      $n \leftarrow -A_{\mathcal{A}}^T[A_{\mathcal{A}}A_{\mathcal{A}}^T]^{-1}c_{\mathcal{A}}$ 
8:     Solve:
9:      $\min_s m(x + s) = f_x + g_x^T s + \frac{1}{2}s^T H_x s$ 
10:     $c_{eq} + A_{eq}s = 0$ 
11:     $c_{ineq} + A_{ineq}s \geq 0$ 
12:     $\|s\| \leq \Delta$ 
13:    Compatible  $\leftarrow$  Feasible region  $\neq \emptyset \wedge \|n\| \leq \kappa_\Delta \Delta \min\{1, \kappa_\mu \Delta^\mu\}$ 
14:    if Compatible then
15:      compute  $t$ 
16:      if  $x + s$  is acceptable then
17:        if  $m(x) - m(x + s) \geq \kappa\theta$  then
18:          if  $\rho < \eta$  then
19:            leave  $x$  alone
20:            reduce  $\Delta$ 
21:            update  $H$ 
22:            continue
23:          else
24:            add  $x$  to filter
25:             $x \leftarrow x + s$ 
26:            increase  $\Delta$ 
27:          else
28:            leave  $x$  alone
29:            reduce  $\Delta$ 
30:        else
31:          add  $x$  to filter
32:          compute new  $r$  and  $\Delta$ 
33:           $x \leftarrow x + r$ 
34:          update  $H$ 

```
