function [inform,x] = DoglegTR(fun, x, trparams)

global numf numg numH;

numf=0; numg=0; numH=0;

status=0;

iter=0;

x.f = feval(fun,x.p,1);

% Algorithm 4.1 parameters

dhat =trparams.hatDelta; % must be greater than 0

dk = trparams.delta; % initial delta, between 0 and dhat

eta = trparams.eta; % [0,0.25)

syms xs;

% Perform interation

for k=1:trparams.maxit

g = feval(fun,x.p,2);

B = feval(fun,x.p,4);

if g'\*B\*g <= 0

[Evec, EV\_matrix]=eig(B);

EV=diag(EV\_matrix);

lambda\_i\_new=max(trparams.delta\*ones(length(x.p),1),EV);

B=Evec\*(EV\_matrix+diag(lambda\_i\_new))\*Evec';

eig(B);

taw=1;

else

g\_norm=norm(g,2);

taw=min(g\_norm^3/(dk\*g'\*B\*g),1);

end

pu\_taw=taw\*-g/g\_norm\*dk;

pu = -g'\*g/(g'\*B\*g)\*g;

pb=-inv(B)\*g;

if (norm(pb,2)<dk)

p=pb;

else

%have to solve for taw=x+1

% ||pu+x\*(pb-pu)||=dk

pu=pu\_taw;

a=(pb-pu)'\*(pb-pu);

b=2\*pu'\*(pb-pu);

c=pu'\*pu-dk^2;

xsol=(-b+sqrt(b^2-4\*a\*c))/2/a;

taw=xsol+1;

p=pu+(taw-1)\*(pb-pu);

end

% Form rhok

fk = feval(fun,x.p,1); fkpk =feval(fun,x.p+p,1);

mk0 = fk; mkp = fk + g'\*p + 0.5\*p'\*B\*p;

rhok = (fk - fkpk)/(mk0 - mkp);

if rhok < 0.25

dk = 0.25\*dk;

else

if rhok > 0.75 && abs(norm(p)-dk) < eps

dk = min(2\*dk,dhat);

end

end

if rhok > eta

x.p = x.p + p;

iter=iter+1;

res=norm(feval(fun,x.p,2));

end

if res < trparams.toler

status=1;

break

end

end

x.f = feval(fun,x.p,1);

x.g = feval(fun,x.p,2);

x.h = feval(fun,x.p,4);

x = struct('p',x.p,'f',x.f,'g',x.g,'h',x.h);

inform = struct('status',status,'iter',iter);

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Success: 7 steps taken

Ending point: -0.5 0.5

Ending function value: -1.5

No. function evaluations: 16, No. gradient evaluations 15

Norm of ending gradient: 0

Success: 9 steps taken

Ending point: 0.586667 -0.0346667

Ending function value: -0.362667

No. function evaluations: 20, No. gradient evaluations 19

Norm of ending gradient: 8.88178e-16

Success: 25 steps taken

Ending point: 1 1

Ending function value: 3.99101e-26

No. function evaluations: 56, No. gradient evaluations 53

Norm of ending gradient: 3.9085e-12