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% <----->
% function num_Jacobian.m
% This function computes numerical Jacobian matrix for any function vector
% Input arguments to the function are
% fun_name : String containing name of the MATLAB function,
%           which returns function vector F(x) given x
% x0       : vector at which gradient should be computed
% Output arguments of the function are
% gradF    : (n x n) Jacobian matrix
% -----
function JackF = num_Jacobian( fun_name, x0 )

nx0 = length( x0 );
factor = 10000 ;    % A large number used to create
                   % perturbation in i'th variable

for i = 1 : nx0

    eps = x0(i) / factor ; % Perturbation in i'th variable
    if ( eps == 0 )
        eps = 1 / factor ;
    end

    xp = x0 ;
    xp(i) = xp(i) + eps ; % Positive perturbation xp(i)
    fp = feval( fun_name, xp ) ;
    xn = x0 ;
    xn(i) = xn(i) - eps ; % Negative perturbation xp(i)
    fn = feval( fun_name, xn ) ;
    JackF (:,i) = (fp - fn) / (2 * eps) ; % Generate i'th column of Jacobian matrix

end
```