HouseHolder QR decomposition

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A = [1 1 1 1 1;-1 -0.5 0 0.5 1;1 0.25 0 0.25 1]';
b = [1 0.5 0 0.5 2]';
b_o = b;
R = A;
[n,m] = size(A);
Q = eye(n);
for i = 1:m
    %finding v
    v = R(i:n,i) + eye(n-i+1,1).*(norm(R(i:n,i))*R(i,i)/abs(R(i,i)));
    H = eye(n);
    %finding the H
    H(i:n,i:n) = eye(n-i+1) - (2/(v'*v)).*(v*v');
    H;
    R = H*R;
    b = H*b;
    Q = H*Q;
end
R;
Q;
%back substitution
A1 = R(1:m,1:m);
x = zeros(m,1);
for i = m:-1:1
    a = 0;
    for j = m:-1:i+1
        a = a + A1(i,j)*x(j);
    end
    x(i) = (b(i)-a)/A1(i,i);
end
x;
%finding least square error
least_square_error = sqrt(sum((A*x-b_o).^2));
```

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