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```
function [xHat, P] = kalmanFilter(Y, x_0, P_0, A, Q, H, R)

%KALMANFILTER Filters measurements sequence Y using a Kalman filter.
%
%Input:
% Y [m x N] Measurement sequence
% x_0 [n x 1] Prior mean
% P_0 [n x n] Prior covariance
% A [n x n] State transition matrix
% Q [n x n] Process noise covariance
% H [m x n] Measurement model matrix
% R [m x m] Measurement noise covariance
%
%Output:
% x [n x N] Estimated state vector sequence
% P [n x n x N] Filter error covariance
%
```

## Parameters

```
N = size(Y,2);
n = length(x_0);
m = size(Y,1);
```

## Data allocation

```
xHat = zeros(n,N);
P = zeros(n,n,N);
for k=1:N
    if(k==1)
        [xHat(:,k),P(:, :,k)] = linearPrediction(x_0, P_0, A, Q);
        [xHat(:,k),P(:, :,k)] = linearUpdate(xHat(:,k), P(:, :,k), Y(:,k), H,
        R);
    else
        [xHat(:,k),P(:, :,k)] = linearPrediction(xHat(:,k-1), P(:, :,k-1), A,
        Q);
        [xHat(:,k),P(:, :,k)] = linearUpdate(xHat(:,k), P(:, :,k), Y(:,k), H,
        R);
    end
end

end
```

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