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function X = genNonLinearStateSequence(x_0, P_0, f, Q, N)
%GENNONLINEARSTATESEQUENCE generates an N+1-long sequence of states
 using a
%    Gaussian prior and a nonlinear Gaussian process model
%
%Input:
%   x_0         [n x 1] Prior mean
%   P_0         [n x n] Prior covariance
%   f           Motion model function handle
%               [fx,Fx]=f(x)
%               Takes as input x (state),
%               Returns fx and Fx, motion model and Jacobian evaluated
 at x
%               All other model parameters, such as sample time T,
%               must be included in the function
%   Q           [n x n] Process noise covariance
%   N           [1 x 1] Number of states to generate
%
%Output:
%   X           [n x N+1] State vector sequence
%

% Your code here
%determine the lentght of the state vector and allocate space for it
n=length(x_0);
X=zeros(n,N+1);

%then samples for the process noise are done and the initial state is
%determined using the gaussian inputs for the prior
q=mvnrnd(zeros(n,1),Q,N+1)';
X(:,1)=mvnrnd(x_0,P_0);

%using the linear gaussian process model the state sequence is
 generated
for i=2:N+1
    X(:,i)=f(X(:,i-1))+q(:,i-1);
end
end
```

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