```
function Htilde = MeasurementPartials_RngRngRate_sc(X,X_s)
% Function that outputs the measurement partials matrix for orbital
% measurements using range and range rate for spacecraft
%   Inputs:
%       - X: Spacecraft state arranged as follows:
%            [x; y; z; xDot; yDot; zDot; J2]
%       - X_s: Station state arranged as follows:
%            [x_s; y_s; z_s; xDot_s; yDot_s; zDot_s]
%
%   Outputs:
%       - Htilde: Measurement partials matrix
%
%   By: Ian Faber, 01/24/2025
%

x = X(1);
y = X(2);
z = X(3);
xDot = X(4);
yDot = X(5);
zDot = X(6);

x_s = X_s(1);
y_s = X_s(2);
z_s = X_s(3);
xDot_s = X_s(4);
yDot_s = X_s(5);
zDot_s = X_s(6);

rho = norm(X(1:3) - X_s(1:3));

delRhoDelX =  (x-x_s)/rho;
delRhoDelY =  (y-y_s)/rho;
delRhoDelZ =  (z-z_s)/rho;

delRhoDotDelX = (rho^2*(xDot - xDot_s) - (x-x_s)*((x-x_s)*(xDot-xDot_s) + (y-
y_s)*(yDot-yDot_s) + (z-z_s)*(zDot-zDot_s)))/(rho^3);
delRhoDotDelY = (rho^2*(yDot - yDot_s) - (y-y_s)*((x-x_s)*(xDot-xDot_s) + (y-
y_s)*(yDot-yDot_s) + (z-z_s)*(zDot-zDot_s)))/(rho^3);
delRhoDotDelZ = (rho^2*(zDot - zDot_s) - (z-z_s)*((x-x_s)*(xDot-xDot_s) + (y-
y_s)*(yDot-yDot_s) + (z-z_s)*(zDot-zDot_s)))/(rho^3);

delRhoDotDelXDot = delRhoDelX;
delRhoDotDelYDot = delRhoDelY;
delRhoDotDelZDot = delRhoDelZ;

Htilde = [
            delRhoDelX, delRhoDelY, delRhoDelZ, zeros(1,3);
            delRhoDotDelX, delRhoDotDelY, delRhoDotDelZ, delRhoDotDelXDot,
delRhoDotDelYDot, delRhoDotDelZDot
         ];
```

```
end
```

```
Htilde_xsc =

  Columns 1 through 3

   0.411675406210137  -0.728665623223756   0.454315409890463
   0.106678749088795  -0.089553413359551  -0.191228169768138

  Columns 4 through 6

                   0                   0                   0
   0.411675406210137  -0.728665623223756   0.454315409890463
```

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