Method to transform ENU to Sensor Coordinates: fcn\_Transform\_ENUToSensorCoord

STEP 1: Loading the parameters of the vehicle and sensor

(Updated\_VehicleParameters\_and\_SensorParameters.m).

STEP 2: Input “sensor\_or\_vehicle” - transform matrix of this "sensor\_or\_vehicle" is generated to transform the ENU coordinates to "sensor\_or\_vehicle" coordinates.

Ex: If sensor\_or\_vehicle = ‘Velodyne\_Lidar\_Rear’, the ENU coordinates are transformed to Rear Velodyne Lidar coordinates.

STEP 3: Perturbations are added to the sensor pose parameters before determining the transform matrix. fcn\_Transform\_setPerturbationToSensorPose is used to add the perturbations to the sensor pose parameters. If there are no perturbations, an empty array is given as the input.

STEP 4: Using fcn\_Transform\_determineTransformMatrix, the transform matrix/matrices are determined based on vehicle pose and sensor\_or\_vehicle string by multiplying the translation and rotation transform matrices of the sensor and vehicle.

Suppose vehiclePose\_ENU = 100x6 and sensor\_or\_vehicle = ‘Velodyne\_Lidar\_Rear’, 100x6 transform matrices are generated based on sensor\_or\_vehicle string.

fcn\_Transform\_determineTransformMatrix currently has 6 cases. Each case corresponds to a different sensor.

In each case, the translation operations are multiplied first, and then the rotation cases are multiplied.

Ex:

Case ‘velodynelidarrear’

1. transform matrix of the sensor platform is multiplied first. The sensor platform does not have any rotations, so the transform matrix of the sensor platform is multiplied first.
2. Second, the translation matrix of the velodyne\_lidar\_rear is multiplied.
3. Third, the transform matrix of the vehicle is multiplied.

The transform matrix of the vehicle is computed in this order.

* The translation matrix of the vehicle is multiplied.
* Then, the rotation matrix for the yaw of the vehicle is multiplied.
* Next, the rotation matrix for the pitch of the vehicle is multiplied.
* Finally, the rotation matrix for the roll of the vehicle is multiplied.

1. The rotation matrix of the yaw of the rear velodyne lidar is multiplied.
2. The rotation matrix of the pitch of the rear velodyne lidar is multiplied.
3. The rotation matrix of the roll of the rear velodyne lidar is multiplied.

STEP 5: The transform matrices are divided by homogenous ENU readings to obtain the transformed ENU readings in sensor coordinates.