

Navigation\_gnss .yaml file

Sensor timeout -> 0.2 representing 5 or 10 hz

IMU only taking vyaw values , maybe take yaw values to begin with

At the moment the IMU is not used as often,

The initial estimate is very confident, so it might break in the beginning

## 1. Relax sensor timeout (both EKF's)

**Change:**

```
ekf_filter_global:
  ros__parameters:
    frequency: 50.0
-   sensor_timeout: 0.05
+   sensor_timeout: 0.3

ekf_filter_local:
  ros__parameters:
    frequency: 50.0
-   sensor_timeout: 0.05
+   sensor_timeout: 0.3
```

**Why:**

0.05 s is too strict for slow/noisy sensors like GPS; 0.3 (or similar) prevents GPS and other updates from being treated as “stale” so often.

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## 2. Increase GPS queue size

**Change (global EKF):**

```
- odom1_queue_size: 2
+ odom1_queue_size: 5
```

**Why:**

Small queue + timing jitter can drop GPS messages. A bigger queue makes GPS fusion more robust.

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## 3. Use IMU yaw (orientation) + yaw rate

## Change (global EKF):

```
imu0: imu/data
-   imu0_config: [false, false, false,
-                 false, false, true,
-                 false, false, false,
-                 false, false, false,
-                 false, false, true,
-                 false, false, false]
+   imu0_config: [false, false, false,
+                 false, false, true,
+                 false, false, false,
+                 false, false, true,
+                 false, false, false]
+   ...
```

**\*\*Why:\*\***

Currently only yaw **\*\*rate\*\*** is fused. Enabling yaw **\*\*orientation\*\*** lets the filter use IMU heading directly, improving heading stability and GPS fusion.

\_(Assumes IMU orientation is reasonably calibrated and aligned.)

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### 4. Let navsat\_transform use IMU yaw & simplify TF

**\*\*Change:\*\***

```
```bash
navsat_transform:
  ros__parameters:
    frequency: 5.0
    delay: 3.0
    magnetic_declination_radians: 0.180641578
    yaw_offset: 0.000000000
    zero_altitude: true
-   broadcast_cartesian_transform: true
-   broadcast_utm_transform: true
+   broadcast_cartesian_transform: false
+   broadcast_utm_transform: false
    publish_filtered_gps: true
-   use_odometry_yaw: true
+   use_odometry_yaw: false
    wait_for_datum: false
```

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## 5. Make initial covariances less extreme

### What to actually change:

- Replace each diagonal `1e-9` (especially for x, y, yaw) with something like `1.0`.
- For yaw, use a higher value like `100.0` so the filter knows yaw is quite uncertain at startup.

**Why:**

The filter is currently *too* confident in its initial zero state ( $1e-9$ ). More reasonable covariances let it accept sensor corrections smoothly and avoid weird jumps.