Error Sources in Odometric Data

Even though odometry is simple and fast, it is **not perfectly accurate**. Various types of errors can accumulate over time:

1. **Wheel Slippage**
   - If a wheel slips (especially on smooth, wet, or uneven surfaces), the rotation does not correspond to actual movement.
   - Causes wrong estimation of distance or direction.
2. **Uneven Surface or Rough Terrain**
   - If the ground is not flat, wheels may bounce or tilt, leading to wrong measurements.
   - The robot might move in ways that are not detected properly by wheel sensors.
3. **Imperfect Wheel Calibration**
   - If the wheels are not exactly the same size or the encoders are slightly inaccurate, the robot's estimation of distance and rotation will be wrong.
   - Small calibration errors accumulate into large position errors over time.
4. **Mechanical Wear and Tear**
   - Over time, wheels, gears, and sensors can wear out or get loose.
   - This results in inaccurate readings of rotations and distances.