

- 关键部分代码展示:

```
private void estimatePositions() {
    final double horizontalEncoderReading = horizontalEncoder.getCurrentPosition() * horizontalEncoderFactor,
        verticalEncoder1Reading = verticalEncoder1.getCurrentPosition() * verticalEncoder1Factor,
        verticalEncoder2Reading = verticalEncoder2.getCurrentPosition() * verticalEncoder2Factor,
        verticalEncoder1Difference = verticalEncoder1Reading - verticalEncoder1PreviousReading,
        verticalEncoder2Difference = verticalEncoder2Reading - verticalEncoder2PreviousReading,
        verticalEncoderMovement = (verticalEncoder1Difference + verticalEncoder2Difference) / 2,
        verticalEncodersDifferentiated = (verticalEncoder1Difference - verticalEncoder2Difference);

    double horizontalEncoderDifference = horizontalEncoderReading - horizontalEncoderPreviousReading;

    debugMessages.put("horizontal enc val", horizontalEncoderDifference);
    debugMessages.put("vertical enc cor", verticalEncodersDifferentiated * verticalDifferenceToHorizontalBias);
    horizontalEncoderDifference -= verticalEncodersDifferentiated * verticalDifferenceToHorizontalBias;

    Vector2D translationalDifference = new Vector2D(new double[] {
        horizontalEncoderDifference,
        verticalEncoderMovement
    });

    this.currentPosition2D = currentPosition2D.addBy(translationalDifference.multiplyBy(
        new Rotation2D(getRotation())
    ));

    horizontalEncoderPreviousReading = horizontalEncoderReading;
    verticalEncoder1PreviousReading = verticalEncoder1Reading;
    verticalEncoder2PreviousReading = verticalEncoder2Reading;
}
```

## 2. PID动态轨迹修正系统

- 有了从动轮提供的导航信息，我们建立了一套兼顾灵活、精准、易用的控制系统。这套系统的核心是动态轨迹纠正系统
- 当驾驶员输入移动命令后，系统首先根据自身IMU获取的方向对驾驶员输入进行变换，使机器的移动方向永远和驾驶员参照系的方向一致，不论机器朝向。这个功能简称“无头模式”
- 而且，机器在运动途中，从动轮会实时监测机器的实际运动，如果与驾驶员的输入存在误差，会用PID算法进行校正，使机器走一条直线

