Self-Driving Cars
Midterm Presentation

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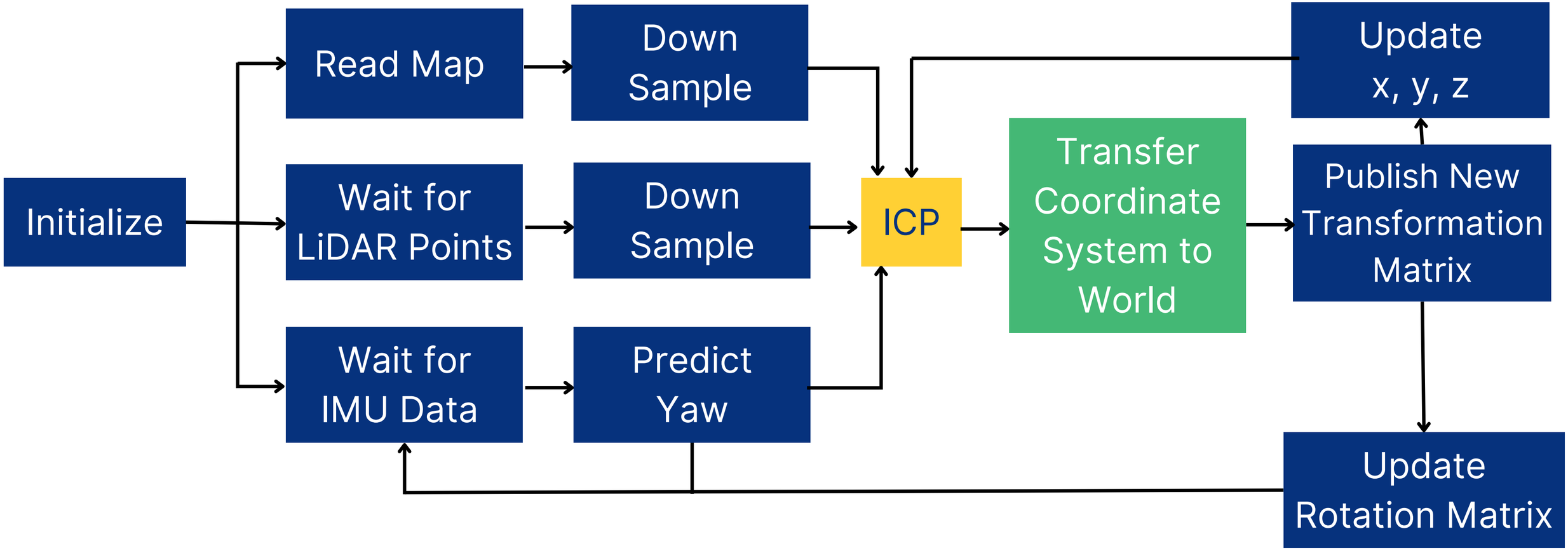
Outline

- Pipeline
- Contributions
- Room for Improvements

Pipeline


Initialize
Read Map
Down Sample
Wait for LiDAR Points
Down Sample
Wait for IMU Data
Predict Yaw
ICP
Transfer Coordinate System to World
Update x, y, z
Publish New Transformation Matrix
Update Rotation Matrix

Contributions - Application of IMU

$$\theta = |\omega \cdot dt| \qquad B = \begin{bmatrix} 0 & -w_z & w_y \\ w_z & 0 & -w_x \\ -w_y & w_x & 0 \end{bmatrix}$$

$$C(t+dt) = C(t) \cdot \left(I + \frac{\sin(\theta)}{\theta} \cdot B + \frac{1-\cos(\theta)}{\theta^2} \cdot B^2 \right)$$

Contributions - Data Preprocessing

- Filter out Useless Edge Points on the X-axis & Y-axis, not the Z-axis(ITRI)
- Remove Points Around the Car (nuScenes 1)
- Fairly Reduce Some Points (nuScenes 2)

Contributions - Other Findings

- Bigger Max Correspondence Distance

  Results Better (nuScenes 1)

- Better & More Accurate Initial Guess

Room for Improvements

- Accuracy Drops While Making Turns
- The Process of Iconic Static Objects
- The Invisible Map

Thank You

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