

## Reflection

The interplay of **/cmd\_vel**, **/odom**, and **/scan** constitutes the operational backbone of mobile robot navigation in ROS-based systems. The **/cmd\_vel** topic delivers commanded robot motion as geometry\_msgs/Twist, specifying linear and angular velocities issued by a teleoperation interface or a planner such as move\_base in the navigation stack. This serves as the **actuation command** that drives robot movement (Chikrutev 2020; Zhao, S., & Hwang, S. H. 2023)

Conversely, the **/odom** topic, publishing nav\_msgs/Odometry, provides **pose and velocity feedback** derived from wheel encoders or other motion sensors. This feedback enables closed-loop control and state monitoring essential for accurate path following (Chikrutev 2020; Zheng, K. 2021)

Complementing these, the **/scan** topic offers **real-time environmental perception** through LiDAR-based distance measurements. This sensory information is critical for obstacle detection, avoidance, and the construction of costmaps that planners use to compute safe paths (Ros.org; Quang et. Al 2020)

Together, these topics form a **closed-loop navigation framework**: /cmd\_vel initiates movement, /odom reflects the actual outcome of that movement, and /scan informs the environment-aware decision-making. This integration enables both reactive teleoperation and higher-level autonomous behaviors, ultimately supporting robust and safe robot navigation.

## References

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