Chapter 10 — TEB + SLAM

[DIAGRAM — TEB + SLAM WORKFLOW]

LiDAR → Cartographer SLAM → Real-Time Map
Real-Time Map → TEB Planner → Smooth Path → /cmd_vel → Robot Motion

1. Overview

TEB (Timed Elastic Band) is a local planner that creates a smooth, curved path. When combined with SLAM, the robot can navigate unknown environments in real time.

2. Start SLAM

Run:
roslaunch r2_slam cartographer.launch

This builds a live map using LiDAR.

3. Start TEB Local Planner

Run navigation using TEB:
roslaunch r2_navigation teb_navigation.launch

TEB uses the SLAM map directly as it updates.

4. How TEB Works (Simple)

• Predicts best path
• Smooths turns
• Avoids obstacles
• Plans based on robot's turning radius
• Adjusts motion every split second

5. Ackermann Steering Settings

Important for Rosmaster R2:
• **min_turning_radius**: 0.25–0.35 m
• **max_vel_x**: 0.15 m/s
• **acc_lim_x**: 0.5 m/s²
• **weight_obstacle**: medium
• **weight_kinematics_nh**: high

6. Sending a Goal During SLAM

Use RViz '2D Nav Goal'.
TEB will generate a smooth path over the live map while it is still growing.

7. Best Practices

• Move slow during SLAM.
• Ensure LiDAR sees the environment.
• Let SLAM build a stable local map before sending large goals.

8. Common Problems

• Sharp turns → reduce speed
• Oscillation → increase turning radius
• Stopping too often → reduce obstacle weight
• Bad paths → check LiDAR angles

9. Safety Notes

• Keep obstacles away from robot path.
• Stop robot if SLAM map collapses.
• Watch robot during early testing.