

Chapter 4 — Camera & Visual Processing (Rosmaster R2)

[DIAGRAM — VISUAL PROCESSING FLOW]

Camera → Xavier NX → ROS Image Topic → Processing Node → AI / Lane Detection / Navigation

1. Overview

The camera is how the robot sees the world. It sends live images to the Jetson Xavier NX, which processes them for navigation, mapping, and AI lane-following.

2. Camera Setup

- Connect the USB camera to the Jetson NX.
- Make sure it shows up with:

`ls /dev/video*`

- Recommended device: `/dev/video0` or `/dev/video1`.

3. Check Camera Feed

Verify the camera works using:

`rqt_image_view`

Select the image topic (usually `/camera/image_raw` or `/usb_cam/image_raw`).

4. ROS Image Topics

Cameras in ROS publish to topics such as:

- `/camera/image_raw`
- `/camera/info`
- `/usb_cam/image_raw`

These topics allow other nodes to process the image.

5. Visual Processing Pipeline

- Capture image
- Convert format (RGB/BGR)

- Resize or crop
- Apply filters (optional)
- Send to AI model or mapping system

6. Lighting Requirements

- Keep the area well-lit.
- Avoid shadows directly across the robot's path.
- Indoor fluorescent lighting is acceptable.
- Avoid direct sunlight on the camera.

7. FPS (Frames Per Second)

The camera should ideally run at:

- 20–30 FPS for AI tasks
- 15–20 FPS for mapping/navigation

Higher FPS = smoother lane following.

8. Xavier NX Performance Tips

- Close unused programs.
- Disable unused cameras.
- Use 640x480 resolution for fast processing.
- Avoid 1080p unless needed—it slows the AI.

9. Safety Notes

- Clean the camera lens regularly.
- Keep liquids away.
- Ensure the camera cable is secure and not pulling.
- Always check image before running AI.