CarBot Orin

Advanced Autonomous Navigation & AI Platform



Robox
Crafting powerful machines

Product Overview

CarBot is a premium educational robot kit engineered to bridge the gap between classroom theory and real-world autonomous systems. Designed for students and developers, it provides a rugged, high-performance platform for mastering the Robot Operating System (ROS 2). From basic kinematics to advanced AI-driven navigation and sensor fusion, CarBot offers a comprehensive hardware-software suite for developing next-generation robotics skills.



Technical Specifications

Mechanical & Performance

Dimensions
390 x 290 x 213.5 mm.

Wheel base
330 mm.

Speed & Mobility
Max speed of 1 m/s and climbing capacity of up to 10°.

Weight
6 kg (unladen) with a 5 kg Payload capacity.

Drive Modes
Supports both Four-wheel Differential and Mecanum (Omnidirectional) motion modes.

Environment
Operational range of -10°C to +40°C.

Technical Specifications

Computing & System

Onboard IPC: NVIDIA **Jetson Orin Nano Super.**

GPU:
1024-core
NVIDIA Ampere architecture with 32 Tensor cores.

CPU:
6-core Arm Cortex-A78AE.

OS:
JetPack + ROS 2 Jazzy

Memory:
8GB
LPDDR5.

Storage:
256GB
MicroSD Card.

Display:
Integrated **7-**inch IPS touch screen
1024x600 resolution for real-time interaction.

Technical Specifications

Advanced Sensor Suite



LiDAR:
Slamtec RPLIDAR A1 for 360-degree environment scanning up to 12 meters.



IMU:
Absolute Orientation Sensor for precise heading and motion tracking.



Depth Camera:
Orbbec Astra Pro (RGB-D) for 3D vision and structured light depth sensing.



Encoders:
High-precision Hall effect encoders built into BLDC motors for odometry.

Power System



Battery:
12V 12Ah high-capacity battery.



Endurance:
3 hours of continuous working time; 5 hours standby.



Charging:
Included 12.6V 2A charger with trickle-charge protection.

Software

CarBot Orin runs ROS 2 Jazzy natively on JetPack, providing a modular and extensible software framework.

Navigation Stack:

Utilizes Nav2 (Navigation2), featuring behavior trees for high-level decision making and recovery strategies.

Mapping & Localization:

Supports SLAM Toolbox for 2D mapping and AMCL (Adaptive Monte Carlo Localization) for precise positioning.

Advanced 3D SLAM:

Supports RTAB-Map for dense 3D point cloud and voxel map generation using fused LiDAR and depth camera data.

Remote Access:

Full support for SSH command-line control for remote graphical tools like RViz and rqt.

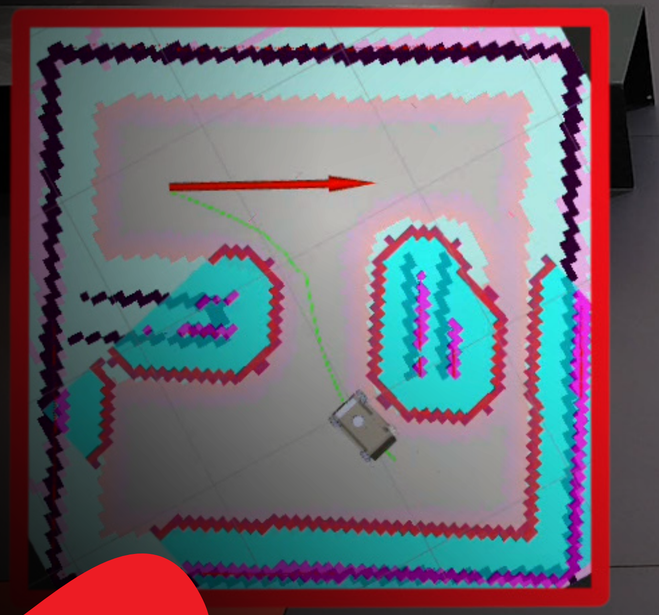
Development Tools:

Includes Python and C++ drivers, with pre-configured launch files for teleoperation (Keyboard/Joystick) and visualization.



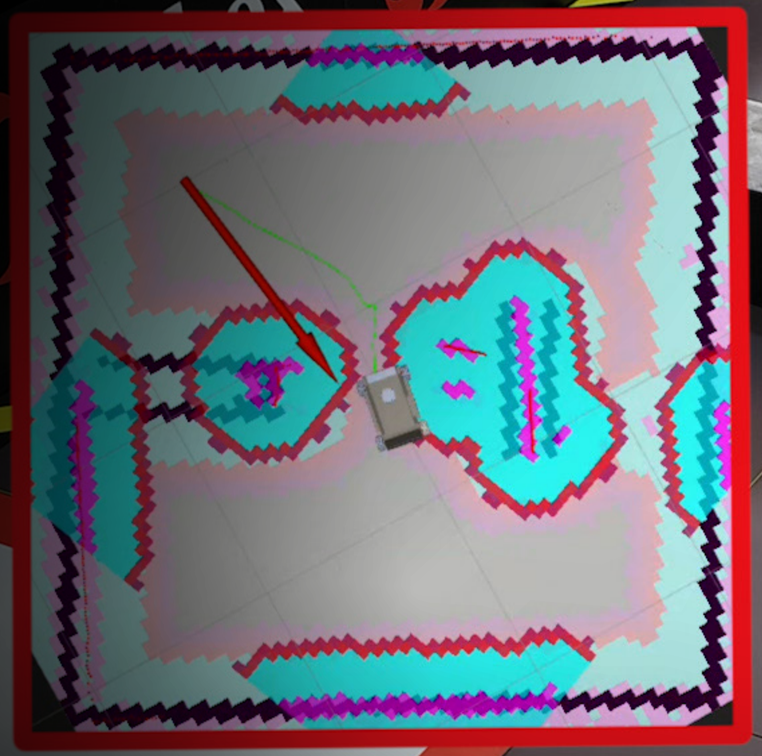
SLAM Mapping:

Real-time 2D occupancy grid creation.



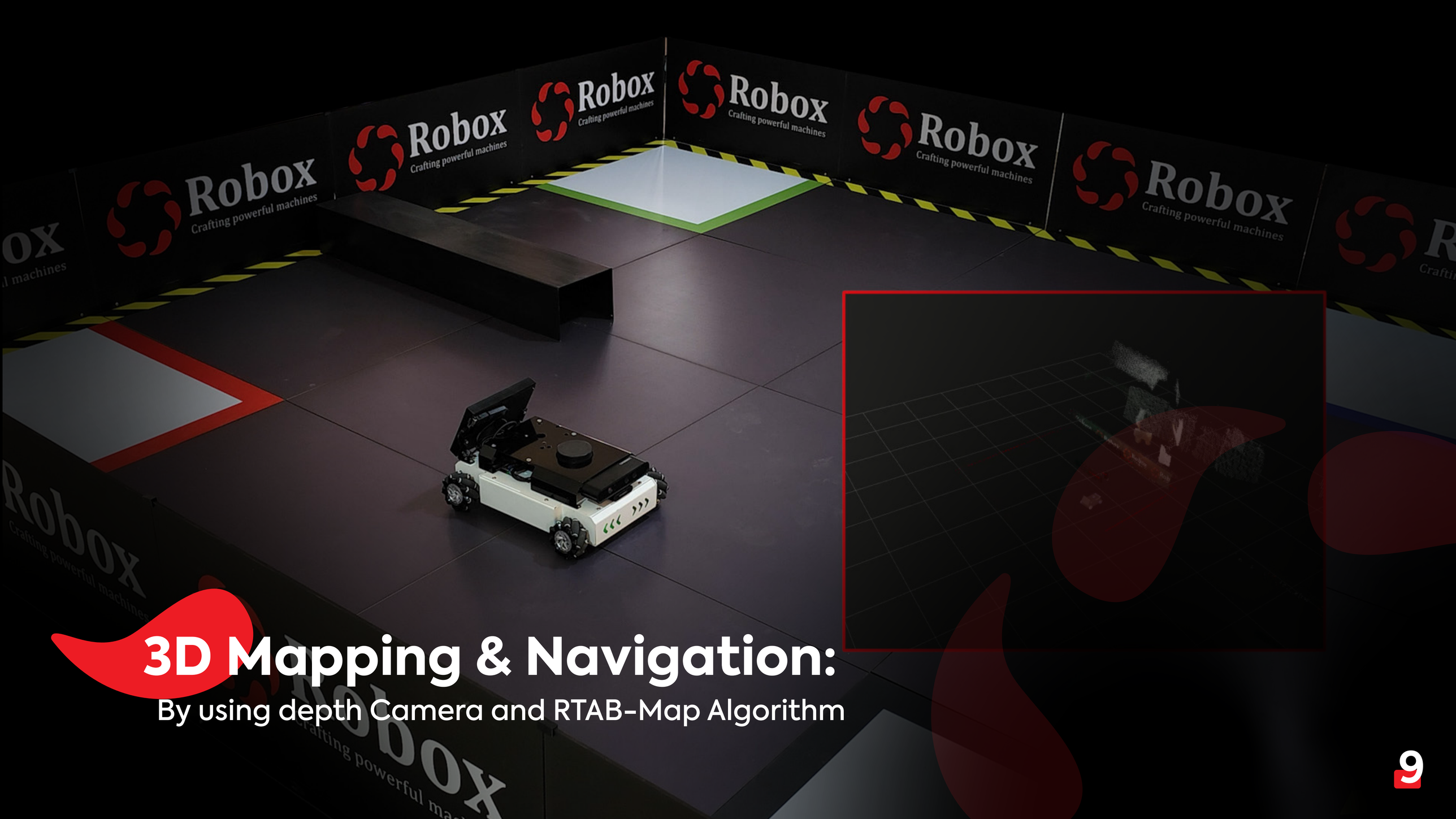
Autonomous Navigation:

Goal-based path planning using global and local costmaps.



3D/2D Obstacle Avoidance:

Moving through environments using 3D obstacle avoidance (LiDAR + Depth Camera) and global path planning.



3D Mapping & Navigation:

By using depth Camera and RTAB-Map Algorithm



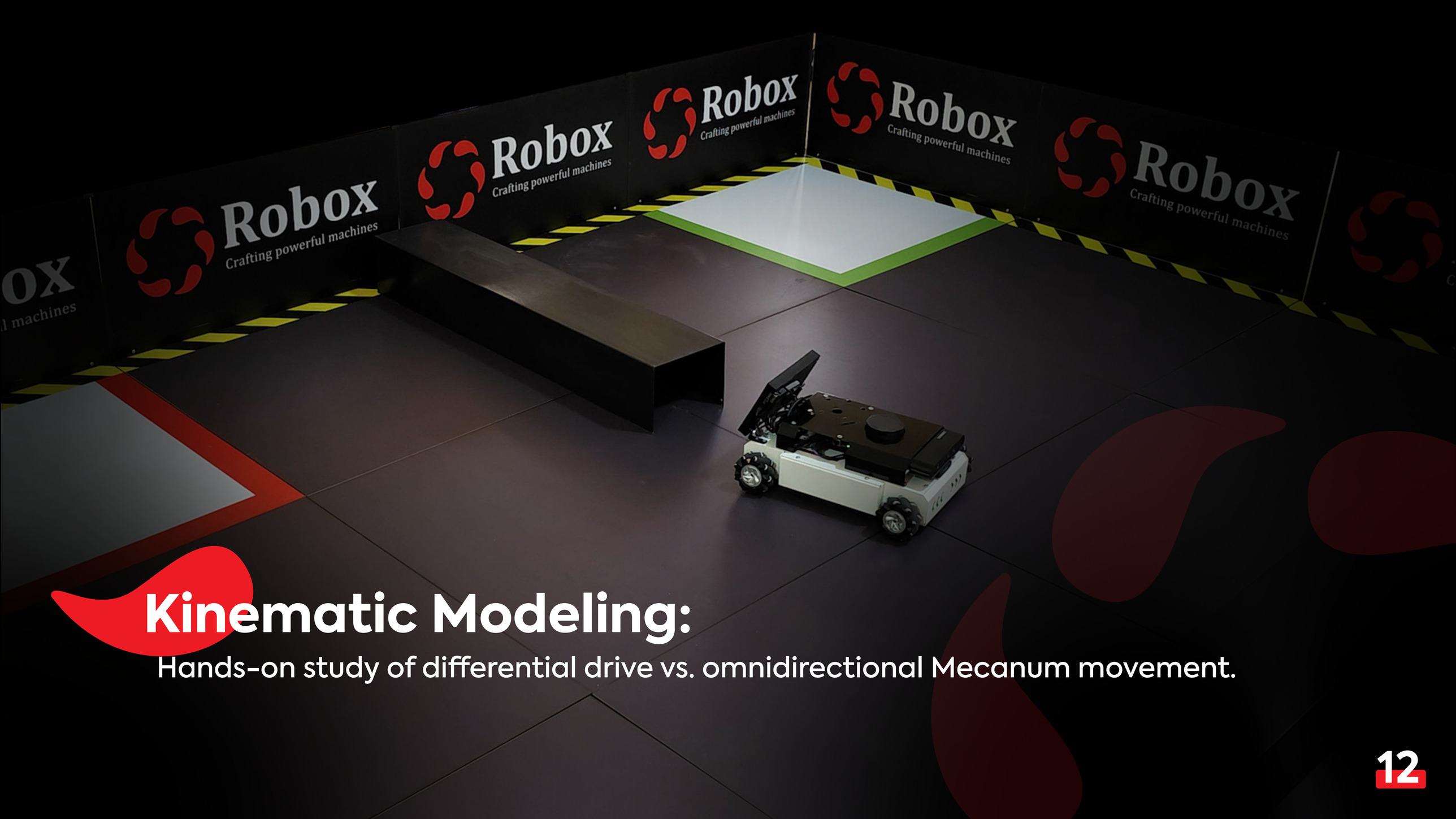
AI & Vision:

Color detection/tracking, QR code recognition, object detection/tracking,
scene recognition and semantic segmentation, and deep learning-based object following.



Human-Robot Interaction:

Voice command execution, gesture recognition, and human detection and following.



Kinematic Modeling:

Hands-on study of differential drive vs. omnidirectional Mecanum movement.

Scope of Delivery

The CarBot educational kit includes the following core components:

CarBot High-End Body

Fully assembled chassis with integrated NVIDIA Jetson Orin Nano Super and 7-inch touch screen.

Mecanum Wheels

Set of 4 mecanum (omnidirectional) wheels, interchangeable with the standard wheels.

Sensor Package

Pre-mounted RPLIDAR A1,
Orbbec Astra Pro depth camera.

Charging Kit

220V Battery Charger (GX connector).

Software & Manual

Pre-installed JetPack + ROS 2 Jazzy environment; integrated manual (lab manual, step-by-step experiments, operation manual) + URDF model



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