

The background image is a composite of several futuristic and industrial elements. In the foreground, the top of a dark-colored car is visible. Behind the car, there are two large, white robotic arms with multiple joints, positioned as if they are working on or inspecting the car. To the left, there are large, rectangular solar panels. In the background, there are several wind turbines and a tall, modern building. The entire scene is bathed in a warm, orange-brown light, giving it a high-tech, industrial feel.

Autonomous Mobile Robots Demo

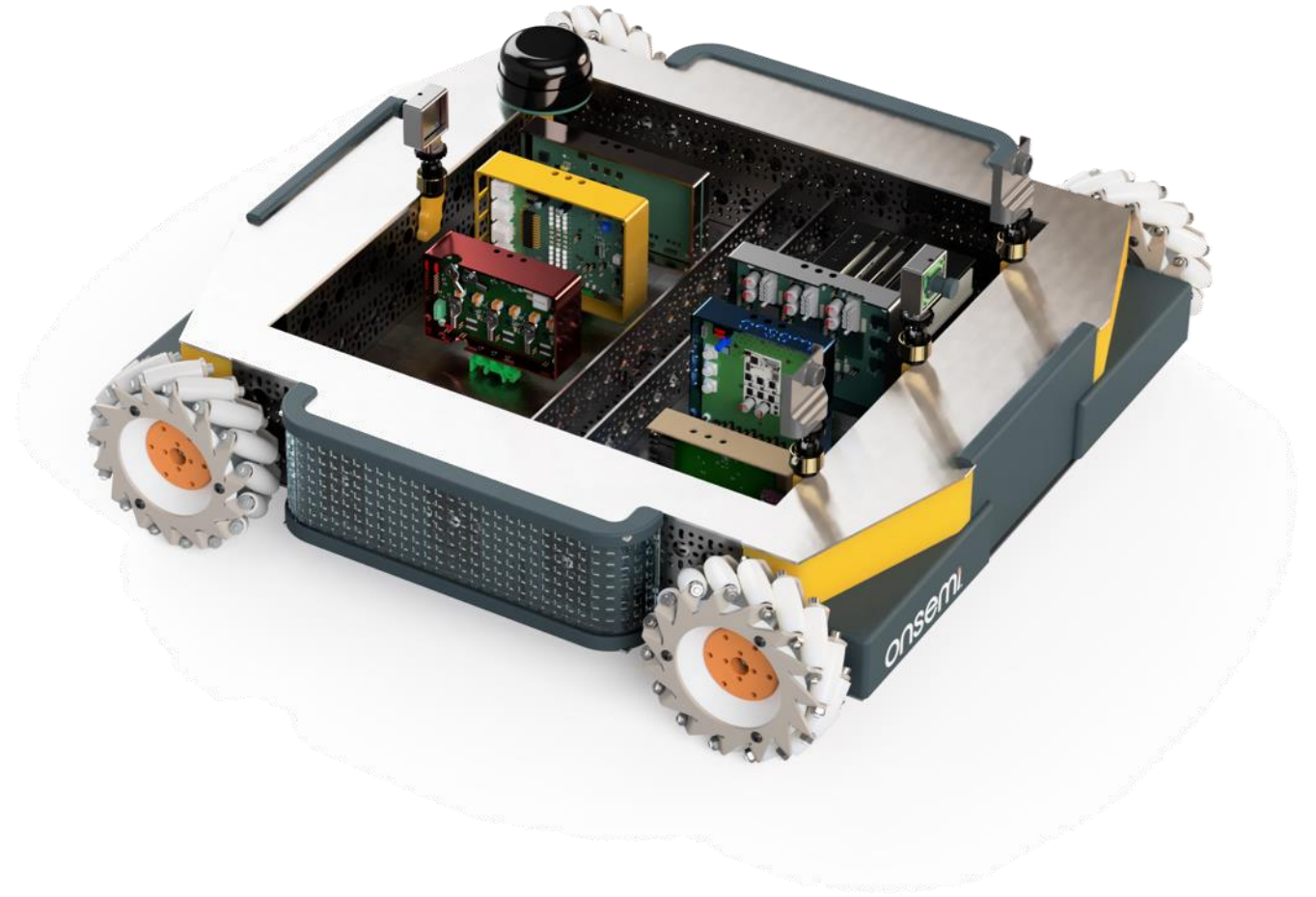
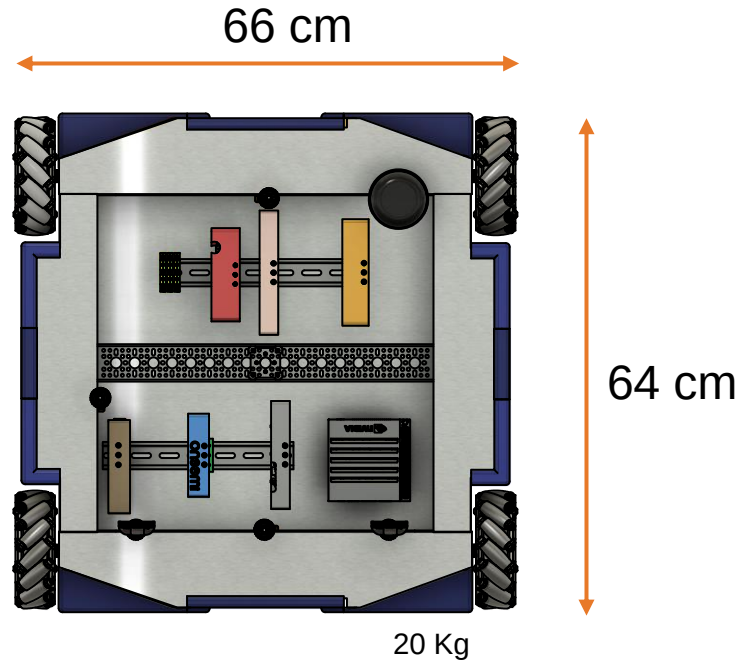
User Manual

Agenda

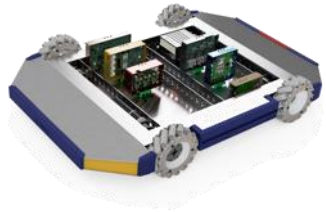
1. Demo Overview
2. Unpacking
3. Power-Up and Power-Down
4. Demo Control

Overview

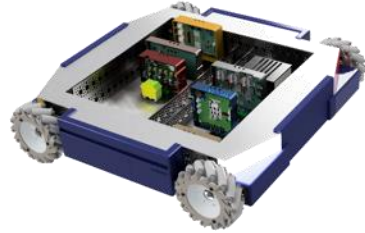
onsemi Autonomous Mobile Robot



onsemi Autonomous Mobile Robot system demo



AMR Version 1

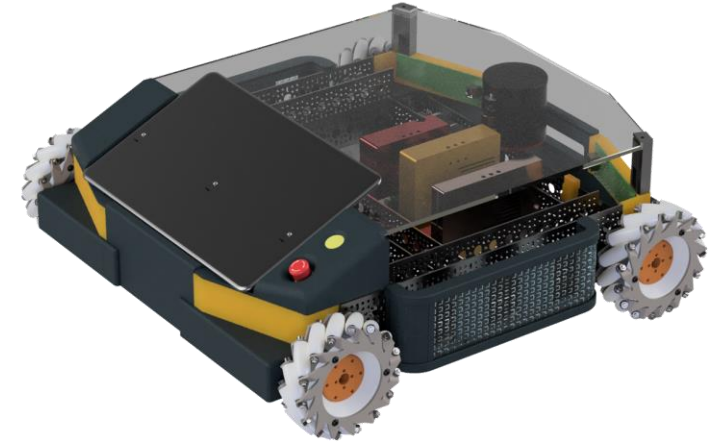


AMR Version 2



AMR Version 3

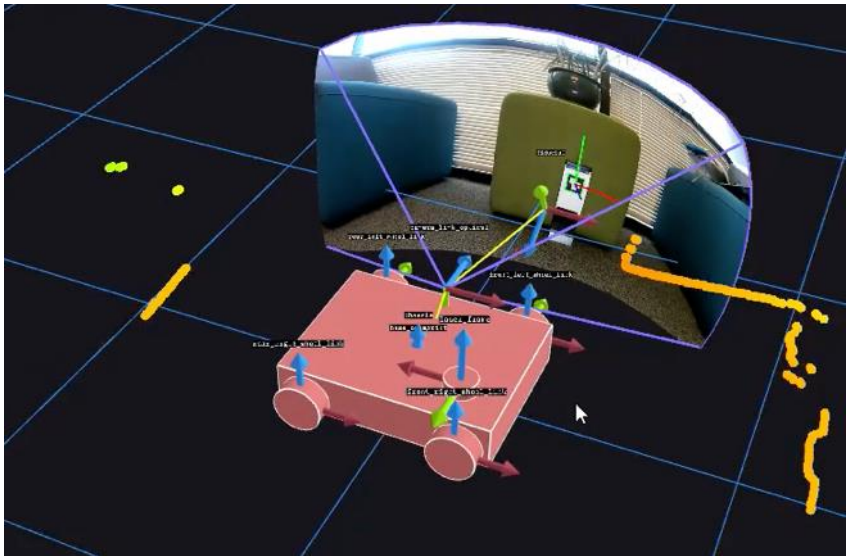
- D3 Engineering Jetson Orin
- 2D lidar
- AR0234



AMR Version 4

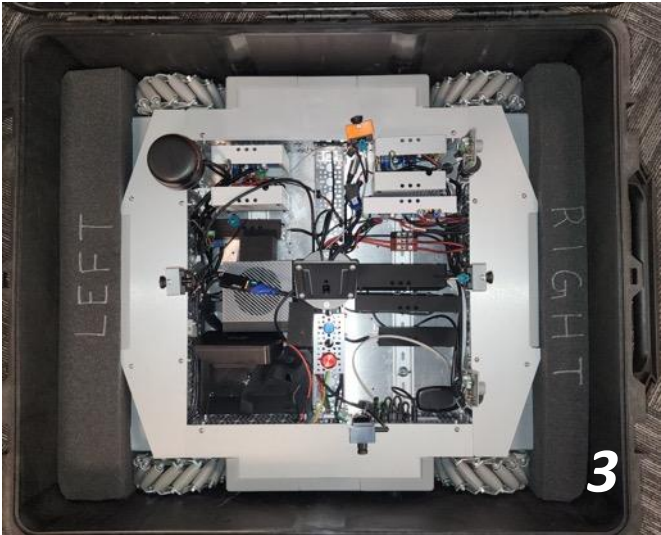
- NVIDIA Jetson
- iToF
- 3D lidar
- AR0234

Demo Overview



Unpacking

Mobile Robot Case



Mobile Robot setup

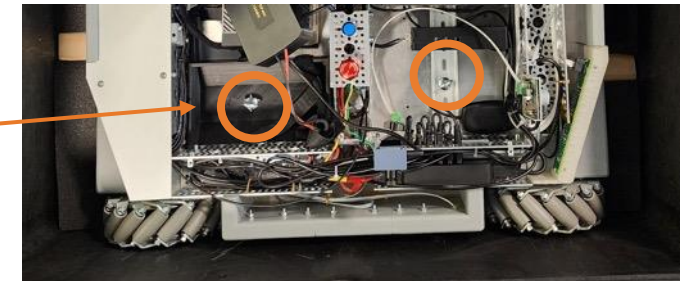
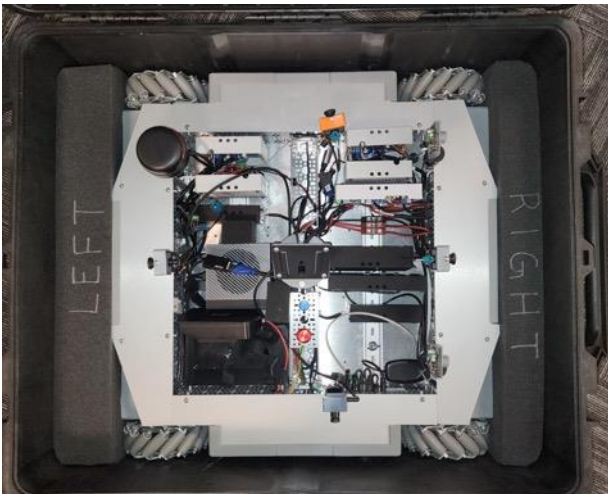
1

- Open Case
- Remove 3 items
 - *Blue Ethernet Cable*
 - *LCD touch screen*
 - *Stand with aruco marker*
- Remove foam layer
 - *Careful foam is precut.*



2

- Remove 2 Wingnuts
 - *See location in orange*
- Lift AMR out of the Case
 - *Warning AMR is 20kg.*



Mobile Robot setup

- 3 • Under the AMR located items
 - *Remote control Xbox style*
 - *Battery Charger*
 - 2x Batteries
 - *Battery on tradeshow lasts ~ 3 to 4 house depending on amount of driving to reach 1 led on battery*
 - *Battery should be changed @ 1 led for NIVDIA Jetson orin. Else hard shutdown can require re-flashing of the orin (end of show).*
 - Router
 - *Only needed when remotely connecting*



Mobile Robot setup



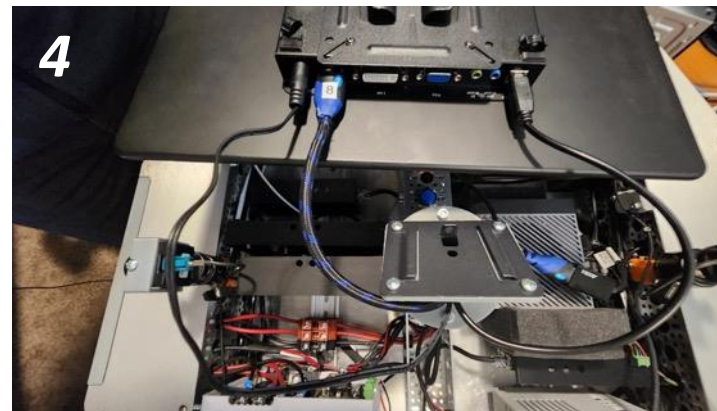
Hold LCD touch screen upside down above the buttons



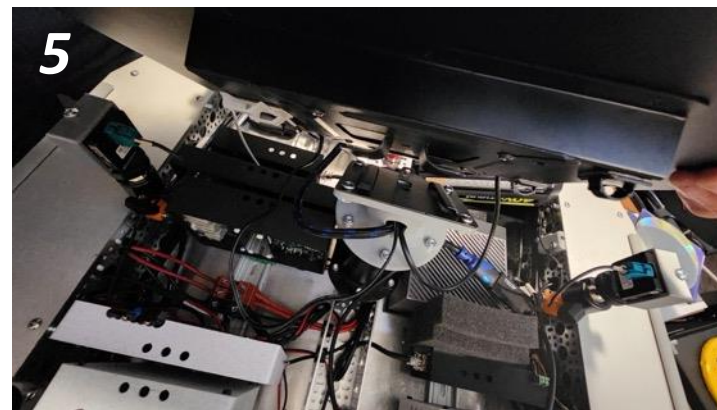
Connect USB to touch screen



Connect HDMI connector



Connect power connector

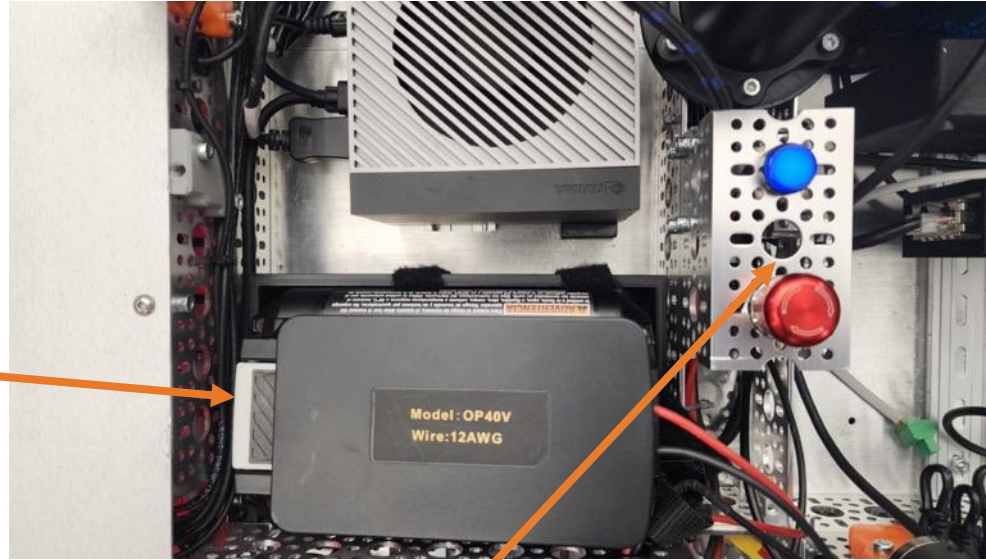


Slide touch screen onto mount

Power-Up and Power-Down

Mobile Robot Power up

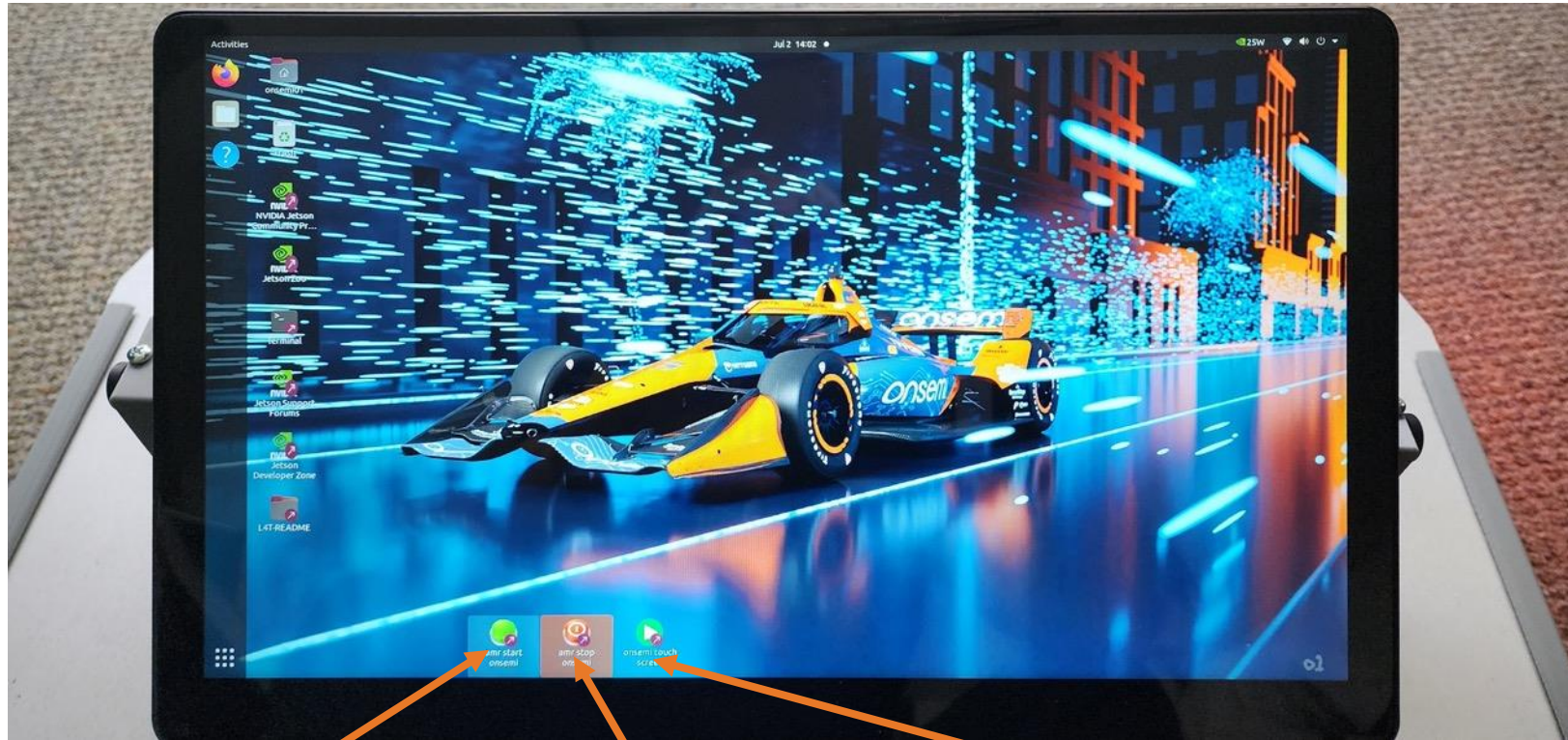
1. Optional Power-up router for foxglove
2. Place battery in battery bay
3. Slide battery connector onto battery



If the wheels do not turn

1. Pop Red Emergency button up
Button disconnects motor power only
Turn nob so button pops up to power motors
2. Blue button reset 10BaseT1S link
Link between NVIDIA Jetson Orin and motor controllers reset

Mobile Robot start ROS & product information App



“amr start onsemi”
Start Docker container
with ROS

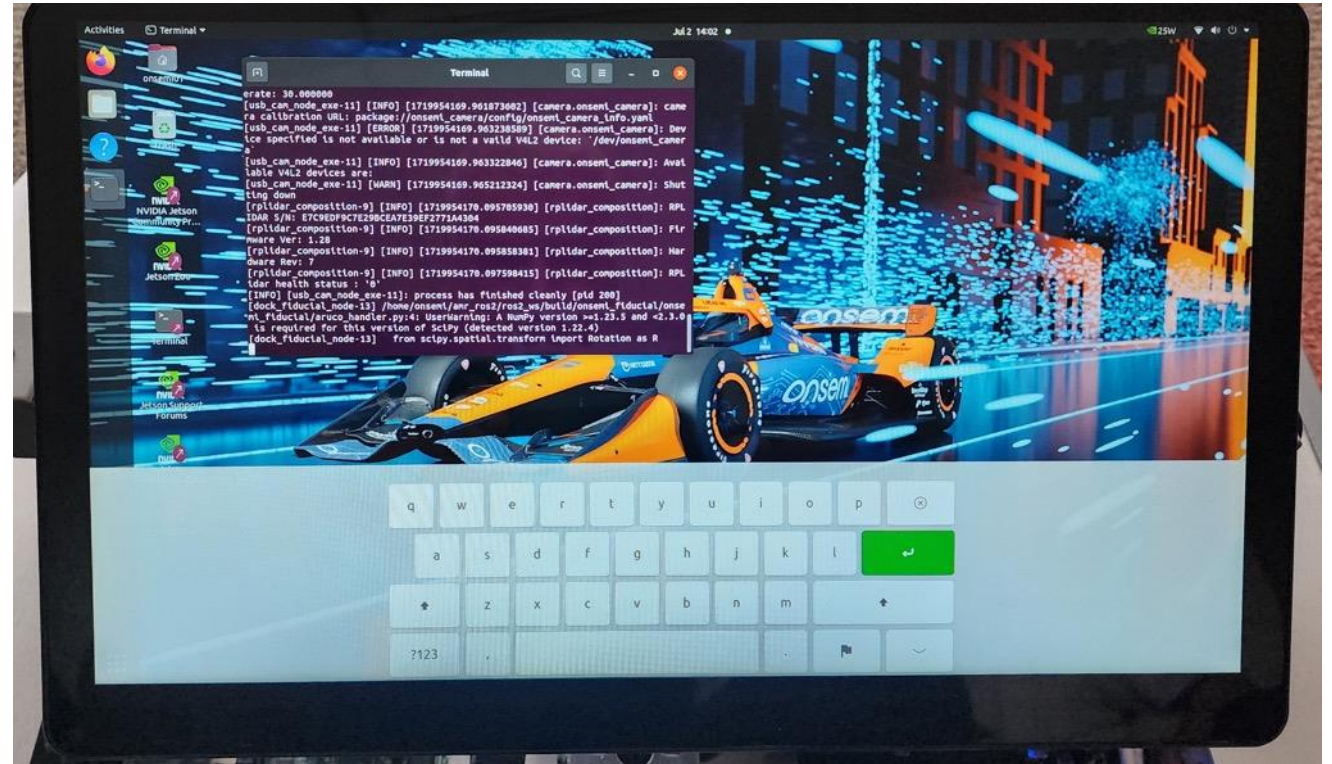
“amr stop onsemi”
Stop Docker container
with ROS

“onsemi touch screen”
Start app with AMR
product information

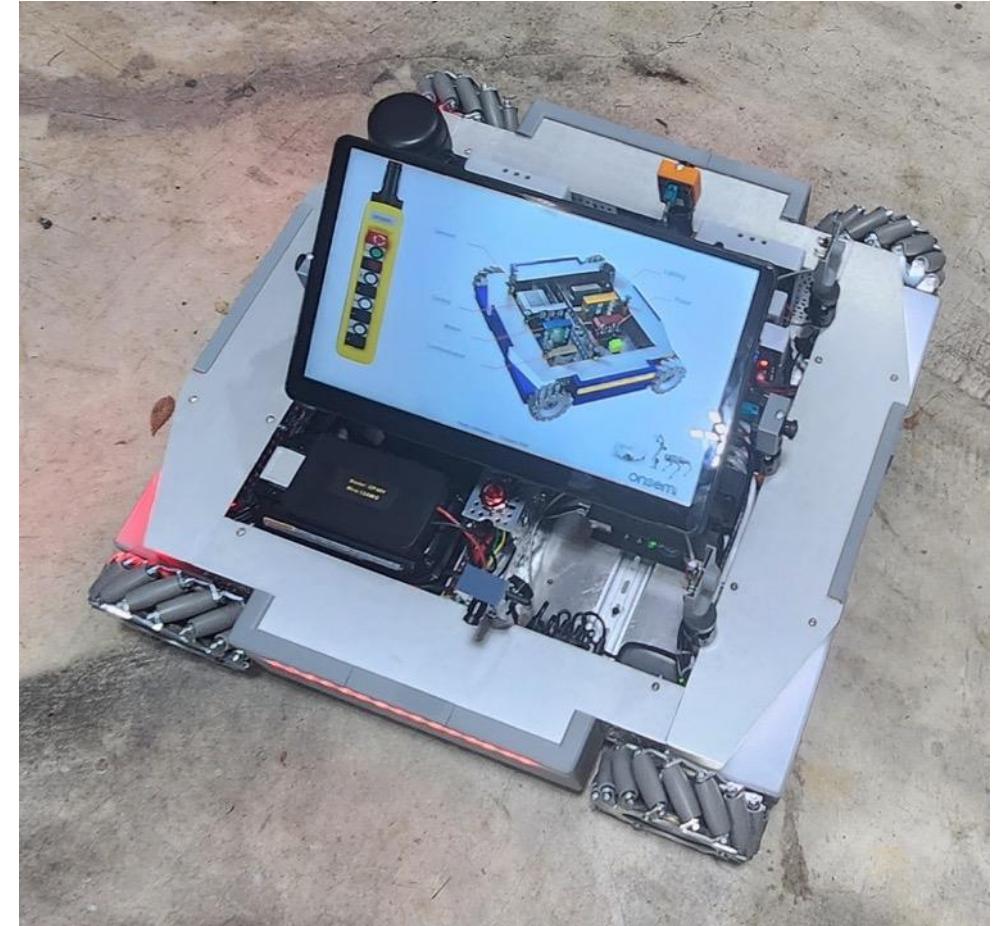
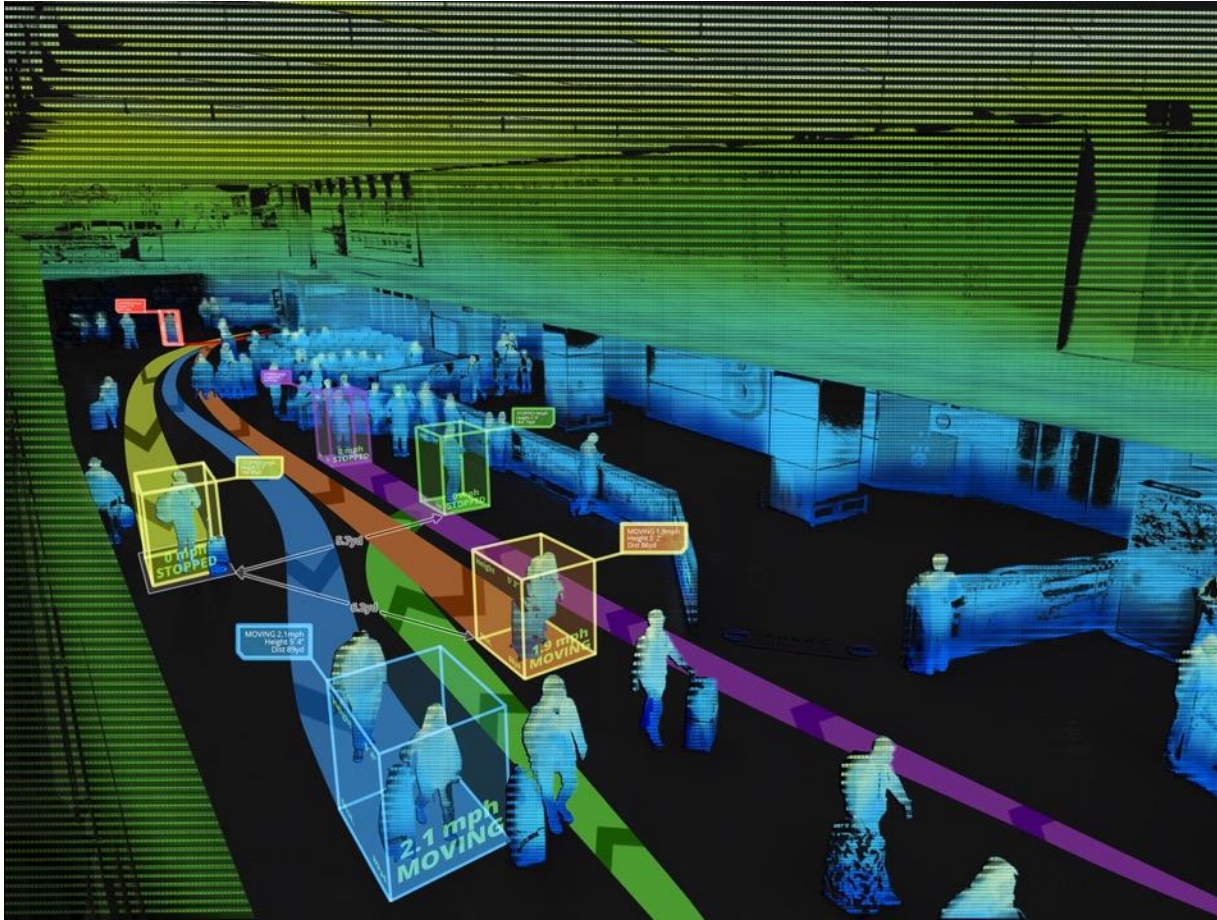
amr start onsemi

Terminal opens and starts the ROS2 demo application in a docker container

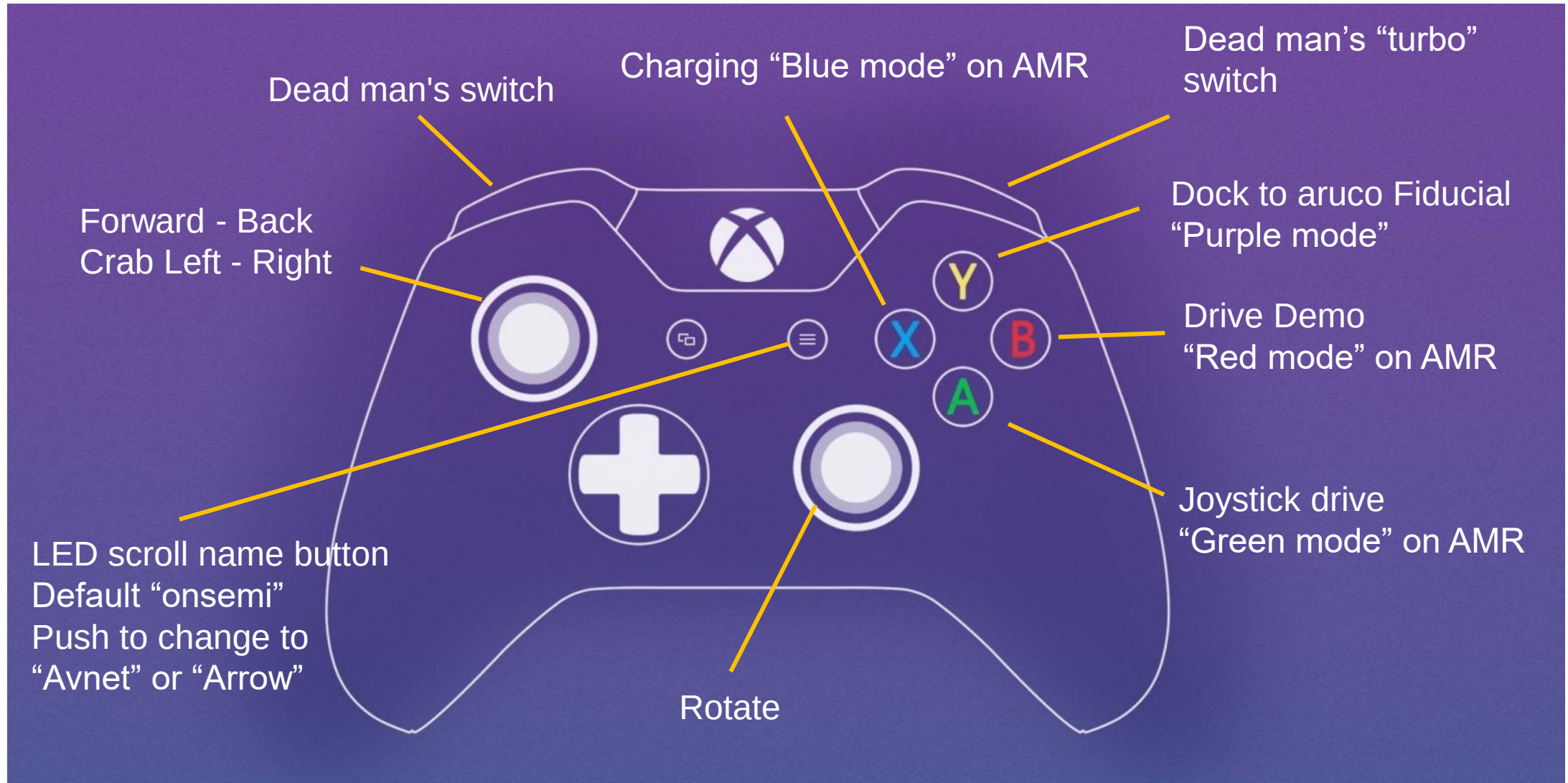
Click touch keyboard away with button on bottom right of the keyboard



onsemi touch screen



ROS2 Humble controller



Hold Dead man's switch to use joystick controls for driving

Parten name on matrix display

- Selecting the “LED scroll name button” on the remote will scroll the event partner name on the side of the robot.
- After some time, this will go back to the default ”onsemi”

BOM

AMR

BOM System Solutions Guide AMR

Suggested Block	Part Number	Description
Motion - Driving Stage		
Gate Driver	FAN7888	Monolithic three-phase half-bridge gate-drive IC, 200 V
	NCD83591	Multi-purpose 3-phase gate driver, 60V
	NCP51513	High and Low Side half bridge driver, 130 V
	NCP81080	High and Low Side half bridge driver, 180 V
	Application Recommended Gate Driver	
Inverter Si Discrete	NTMFS0D404XM	Power MOSFET, 40 V, 0.42mΩ, 509A, N-Channel, SO8-FL 5x6
	NTMJST1D4N06CL	Power MOSFET, 60V, 1.49mΩ, 198A, N-Channel, TCPAK57
	NTMJST2D6N08H	Power MOSFET, 80 V, 2.8 mΩ, 131A, N-Channel, TCPAK57
	NTMFS008N12MC	Power MOSFET, 120 V, 8 mΩ, 79A, N-Channel, SO-8FL
	Application Recommended MOSFET	
Inverter Si PIM	NXV08V110DB1	Three-phase power integrated module, 80V, 2.1mΩ, APM19
	NXV08V080DB1	Three-phase power integrated module, 80V, 3.1mΩ, APM19
	NXV04V120DB1	Three-phase power integrated module, 40V, 1.2mΩ, APM19
	Application Recommended PIM	
Motion - Control		
Inductive Sensor	NCS32100	Industrial Rotary Position Sensor - 6000 RPM full accuracy, 50 arcsec accuracy
CSA	NCS210R	Current Sense Amplifier, 26V, bidirectional, 200V/V
	NCS211R	Current Sense Amplifier, 26V, bidirectional, 500V/V
	NCS21671	Current Sense Amplifier, 40V, bidirectional, 25-200V/V
Op-amps	NCS2325	Operational Amplifier, CMOS, 0.25 μV/C, 35 μA, Zero-Drift
	NCS20166	Operational Amplifier, Rail-to-Rail Input/Output, Low Offset
Motor Driver	NCV33035	Brushless DC Motor Controller
	LV8968BBUWR2G	Three- phase BLDC Predriver
	LV8324	24V Single-phase BLDC Motor Driver
	LV8961HUW	Sensorless three-phase BLDC motor controller and predriver

BOM System Solutions Guide AMR

Suggested Block	Part Number	Description
LED Lighting		
Controller	NCV78702	Two Phase Boost LED Driver
	NCV78825	Dual Synchronous Buck, 2x3A LED Driver
	NCV7685	LED Driver, 12 channel, 60mA each
	NCV78343	Series String Pixel Controller
Mosfet	NVMFS6H852NL	Power MOSFET, 80 V, 13.1 mΩ, 42A, N-Channel, SO8-FL
	NVTFS5C673NL	Power MOSFET, 60 V, 9.8 mΩ, 50A, N-Channel, WDFNW8
	NTB6413AN	Power MOSFET, 100 V, 28 mΩ, 42A, N-Channel, D2PAK-3
	Application Recommended MOSFET	
Diode	NTS10100	Shottky Diode, 100V, 10A
	NRVTSAF260E	Shottky Diode, 60V, 2A
	FSV560	Shottky Diode, 60V, 5A
	Application Recommended Diode	
Machine Vision		
Sensor & Processor	AP1302	Image Signal Processor, 13MP
	AR0822	CMOS Image Sensor, Rolling shutter, 8MP
	AR0522	CMOS Image Sensor, Rolling shutter, 5.1MP, NIR enhancement
	AR0331	CMOS Image Sensor, Rolling shutter, 3MP
	AR0234CS	CMOS Image Sensor, Global shutter, 2.3MP, 120 fps
Clock Buffer	NL17SZ17	Clock Buffer, non-inverting
	MC74VHC1G50	Clock Buffer, non-inverting
EEPROM	CAT24C128	EEPROM, 128Kb, I2C
	CAT24C256	EEPROM, 256Kb, I2C
	CAT24M01	EEPROM, 1Mb, I2C

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Suggested Block	Part Number	Description
LiDAR		
Power Supply	NCV8870	Non-synchronous Boost controller, 3.2-45V
	NCV8871	Non-synchronous Boost controller, 3.2-44V
	NCV898031	Non-synchronous Boost controller, 3.2-45V
	Application Recommended Boost Controller	
Laser Driver	NVRGS055N06CL	MOSFET, 60V, 5A, 51mΩ, N-Channel, SOT-23
	FDMA037N08LC	MOSFET, 80V, 4A, 36.5mΩ, N-Channel, WDFN6
	FDS5351	MOSFET, 60V, 6.1A, 35mΩ, N-Channel, SOIC-8
	Application Recommended MOSFET	
	NRVB120VLSF	Shottky Diode, 20V, 1A, SOD-123FL
	NRVBSS25FA	Shottky Diode, 50V, 2A, SOD-123FL
	Application Recommended Diode	
	NCP81074	Gate Driver, Single, Low Side, 10A
	NCP81071	Gate Driver, Dual, Low Side, 5A
	FAN3122TM1X-G085	Gate Driver, Single, Low Side, 9A
	Application Recommended Gate Driver	
Receiver	ARRAYRDM-0112A20	SiPM Array, NIR enhanced
	C-Series	SiPM Sensor, C-Series
	J-Series	SiPM Sensor, J-Series
Clock Buffer	NL17SZ17	Clock Buffer, non-inverting
	MC74VHC1G50	Clock Buffer, non-inverting
EEPROM	CAT24C128	EEPROM, 128Kb, I2C
	CAT24C256	EEPROM, 256Kb, I2C
	CAT24M01	EEPROM, 1Mb, I2C
Signal Conditioning	NBA3N012C	LVDS Line Receiver
	NCV2903	Comparator
	BC817-40W	General Purpose NPN
	BC856BL	General Purpose PNP

BOM System Solutions Guide AMR

Suggested Block	Part Number	Description
LiDAR		
Power Supply	NCV8870	Non-synchronous Boost controller, 3.2-45V
	NCV8871	Non-synchronous Boost controller, 3.2-44V
	NCV898031	Non-synchronous Boost controller, 3.2-45V
	Application Recommended Boost Controller	
Laser Driver	NVRGS055N06CL	MOSFET, 60V, 5A, 51mΩ, N-Channel, SOT-23
	FDMA037N08LC	MOSFET, 80V, 4A, 36.5mΩ, N-Channel, WDFN6
	FDS5351	MOSFET, 60V, 6.1A, 35mΩ, N-Channel, SOIC-8
	Application Recommended MOSFET	
	NRVB120VLSF	Shottky Diode, 20V, 1A, SOD-123FL
	NRVBSS25FA	Shottky Diode, 50V, 2A, SOD-123FL
	Application Recommended Diode	
	NCP81074	Gate Driver, Single, Low Side, 10A
	NCP81071	Gate Driver, Dual, Low Side, 5A
	FAN3122TM1X-G085	Gate Driver, Single, Low Side, 9A
	Application Recommended Gate Driver	
Receiver	ARRAYRDM-0112A20	SiPM Array, NIR enhanced
	C-Series	SiPM Sensor, C-Series
	J-Series	SiPM Sensor, J-Series
Clock Buffer	NL17SZ17	Clock Buffer, non-inverting
	MC74VHC1G50	Clock Buffer, non-inverting
EEPROM	CAT24C128	EEPROM, 128Kb, I2C
	CAT24C256	EEPROM, 256Kb, I2C
	CAT24M01	EEPROM, 1Mb, I2C
Signal Conditioning	NBA3N012C	LVDS Line Receiver
	NCV2903	Comparator
	BC817-40W	General Purpose NPN
	BC856BL	General Purpose PNP



BOM System Solutions Guide AMR

Suggested Block	Part Number	Description
SiC MOSFET	NTBG015N065SC1	SiC MOSFET - EliteSiC, 12 mohm, 650 V, M2, D2PAK-7L
	NTH4L015N065SC1	SiC MOSFET - EliteSiC, 12 mohm, 650 V, M2, TO-247-4L
	NTHL075N065SC1	SiC MOSFET - EliteSiC, 57 mohm, 650 V, M2, TO-247-3L
	Application Recommended MOSFET	
MV MOSFET	NTMFS0D4N04XM	Power MOSFET, N-Channel, 40V, 0.7mΩ, 323A, SO8-FL 5x6
	NTMFWS1D5N08X	Power MOSFET, N-Channel, STD Gate. SO8FL-HEFET, 80V, 1.5mΩ, 247 A
	NTBGS004N10G	Power MOSFET, N-Channel, 203 A, 100V, D2PAK 7L
	NTMFS3D2N10MD	N-Channel Shielded Gate PowerTrench® MOSFET 100V, 142A, 3.2mΩ
	NTMFS7D5N15MC	N-Channel Shielded Gate PowerTrench® MOSFET 150V, 95.6A, 7.9mΩ
	Application Recommended HV MOSFET	
Gate Driver	NCP51530	High Performance, 700 V- 3.5/3.0 A High and Low Side MOSFET Driver
	NCP5183	High Voltage 4.3 A High and Low Side Driver
	NCP51810	High Performance, 150 V Half Bridge Gate Driver for GaN Power Switches
	NCP51561	4.5/9A Isolated Dual Channel Gate Driver with 8V UVLO and DISABLE
	Application Recommended Gate Driver	
Battery Charger - Buck		
Buck Controller	FAN65008B	Synchronous Buck Regulator, 65V, 10A
	FAN65004B	Synchronous Buck Regulator, 65V, 6A
	FAN65005A	Synchronous Buck Regulator, 65V, 8A
	Application Recommended Buck Controller	



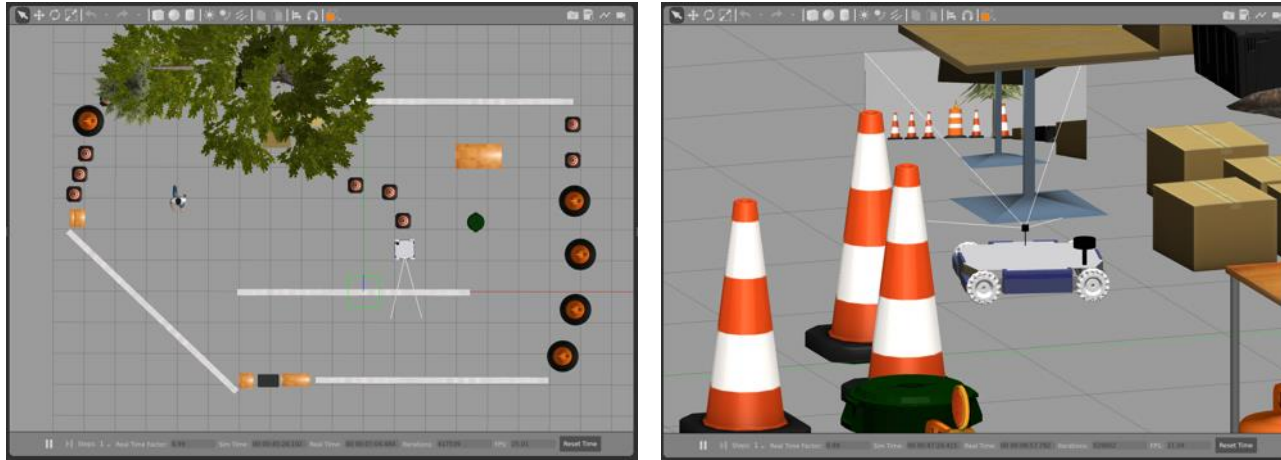
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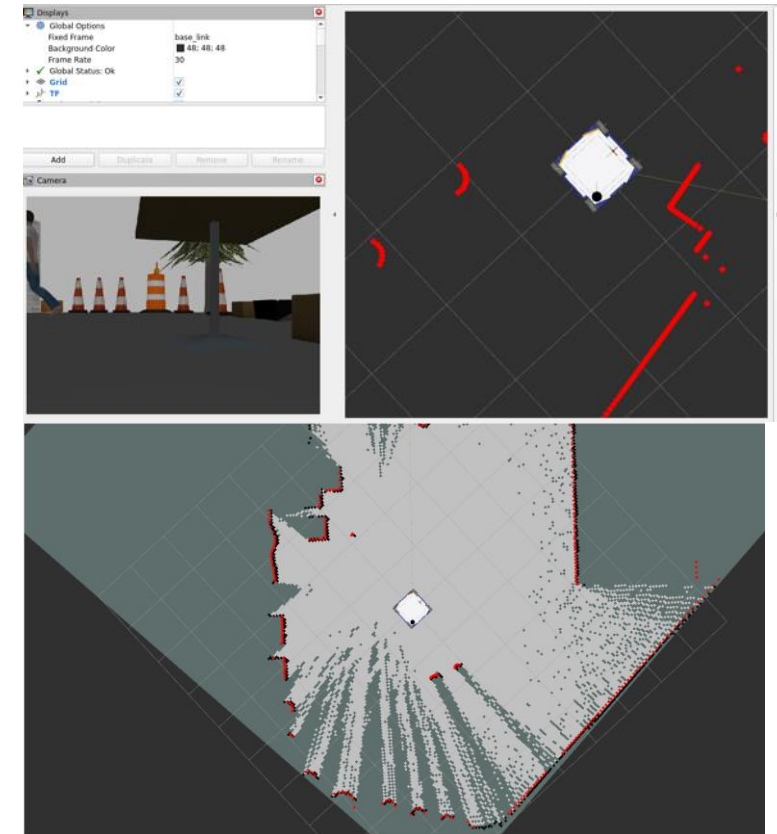
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ROS2 gazebo simulator and rviz mapping



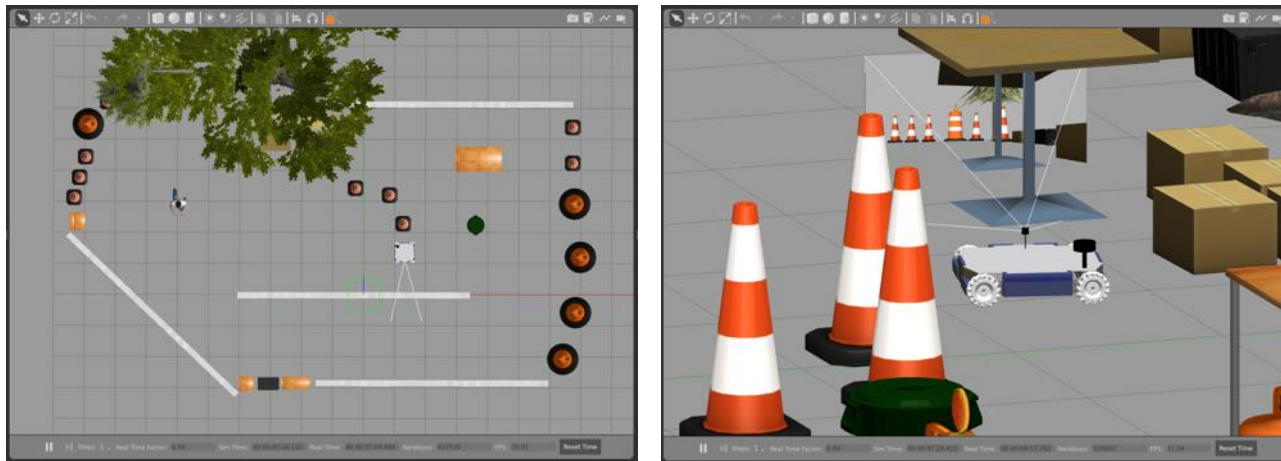
Electronics simulations

- *Project energy usage per motor and or sub-system to full unit battery requirements*
- *Add navigation to charge station and energy optimized navigation.*
- *System impact on electronics*



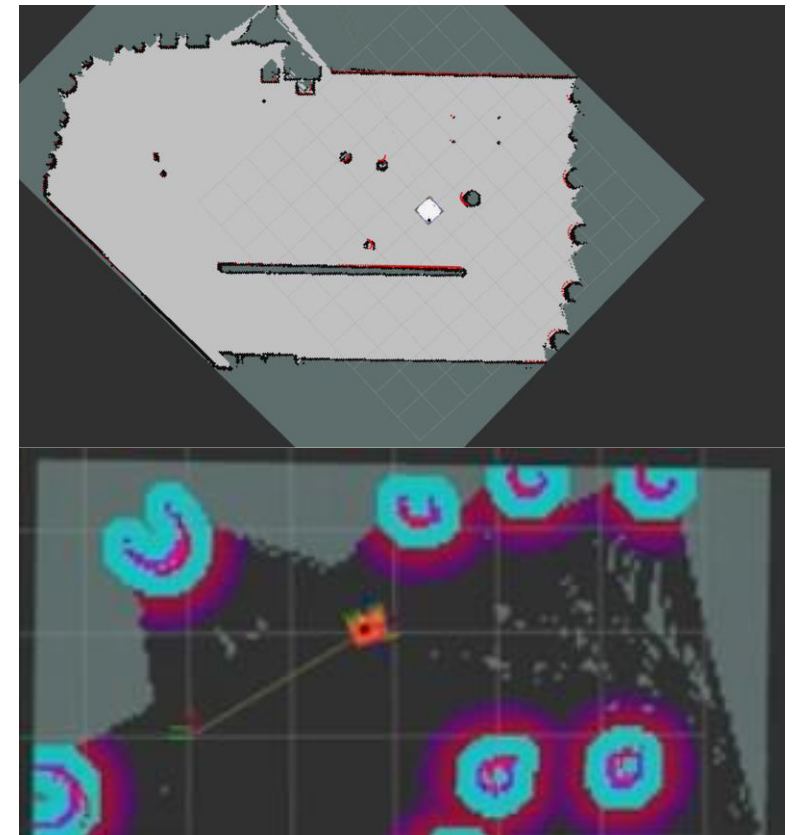
rviz shows amr and mapping

ROS2 gazebo simulator and rviz mapping



Start

- Gazebo simulation environment
- Mapping SLAM
- Navigation set pose



rviz shows robot, mapping
and cost map for navigation