Newrro

ROBOTICS

ARJUNA - Edu kit

ARJ

AMR

UNA

Kit details

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About ARJUNA

Introducing the ARJUNA Educational Robotics Kit: a unique and powerful tool designed to equip students with the essential knowledge and skills to excel beyond the competition and tackle real-world challenges. The ARJUNA features industrial-grade electronics, high-resolution sensors, and advanced smart actuators, ensuring a superior and practical learning experience. This kit is crafted to provide hands-on experience, empowering students to become the innovators and problem-solvers of tomorrow.

Education
Learning

Arjuna
Bridging the gap

Industry
Requirement

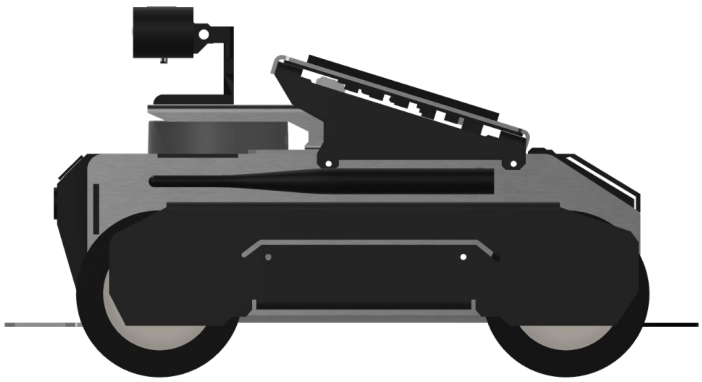
Appearance

A1

Appearance

Back
view

Top
view



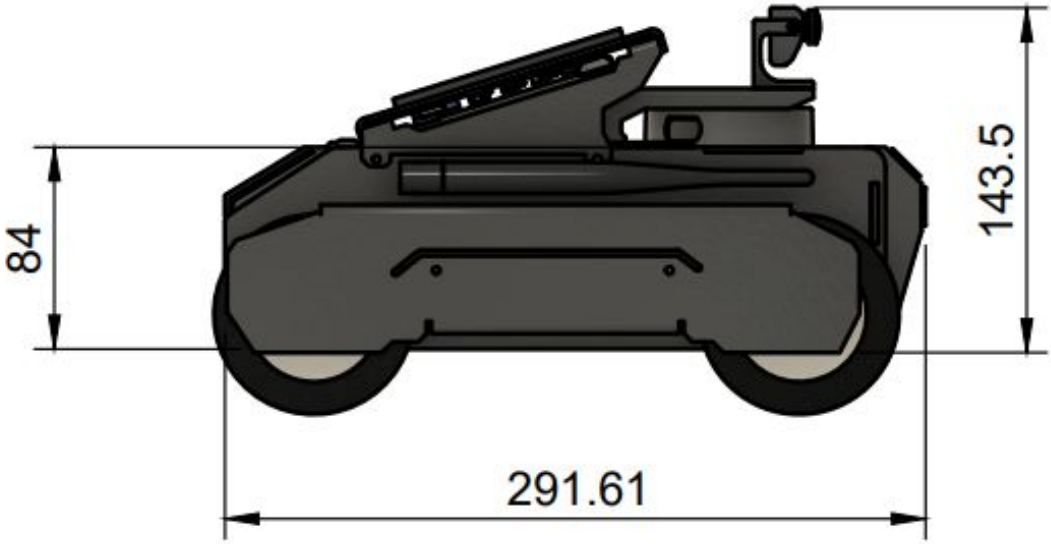
Side
view

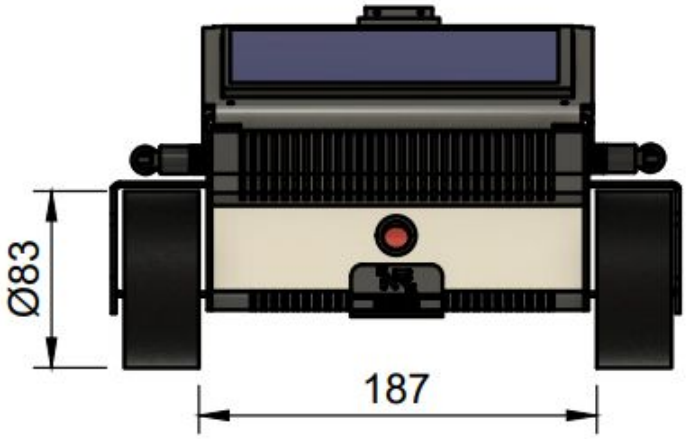
Front
view

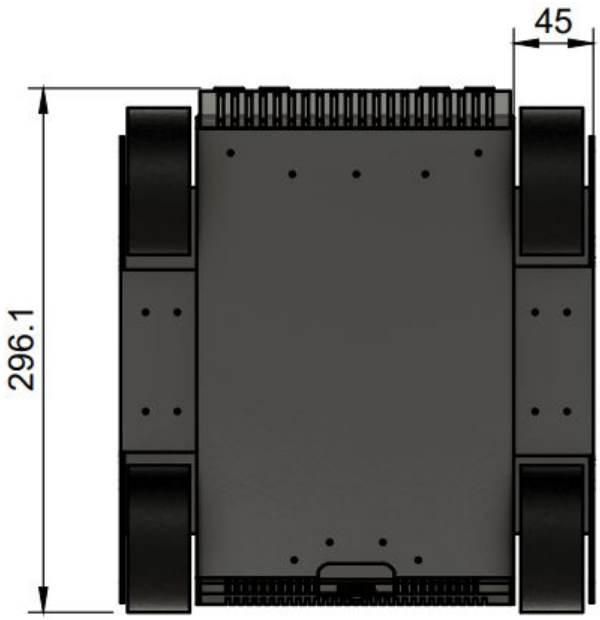
ISO
view

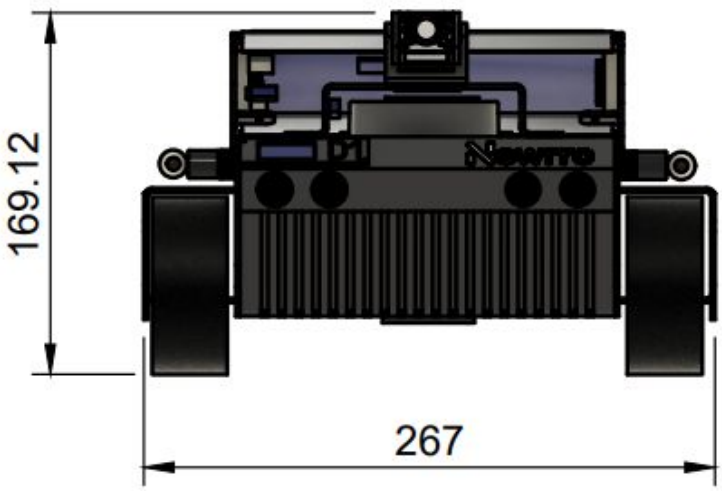
Appearance

Dimension





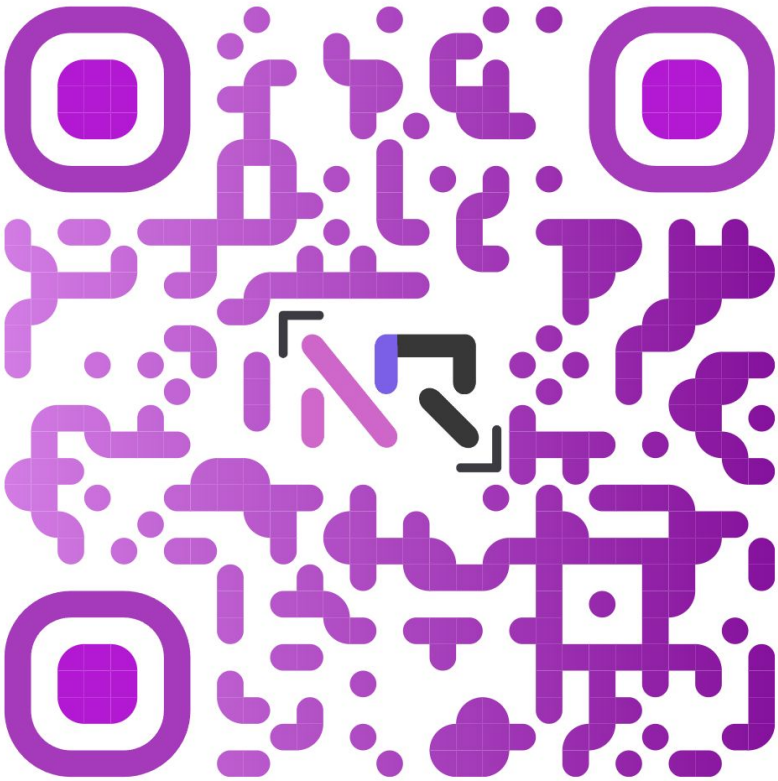




- All unit dimensions are in millimeters (**mm**).
- Dimensions may vary by 3-5% from the physical model.

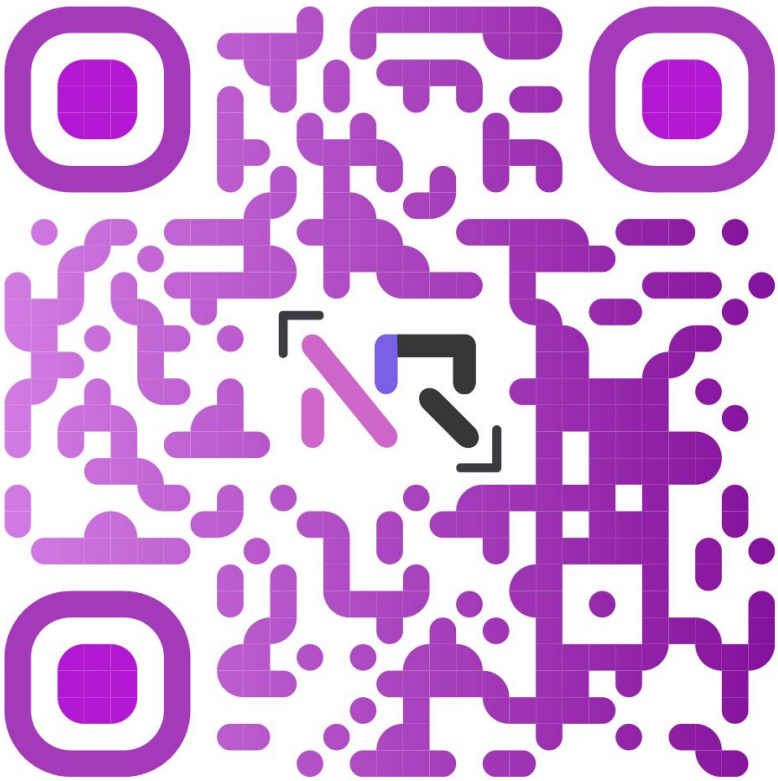
Appearance

3D and AR view



Arjuna

Arjuna with
colour options



Physical Specs

The ARJUNA's physical structure is built with high-quality materials, making it both durable and reliable. The sturdy frame is made from 6061-grade aluminum alloy, which is lightweight yet strong. It also features impact-resistant plastic components to handle the bumps and knocks of regular use, making it perfect for classrooms and workshops. With the ARJUNA, students can dive into hands-on learning, knowing they have a robust and dependable kit that will stand the test of time.

Structural material :

- 6061-grade Aluminum
- Hardened ABS

Methods

In constructing the physical structure, we utilize advanced techniques to ensure precision and quality. Laser cutting technology allows for immaculate cuts with incredible accuracy, ensuring each piece fits perfectly. To achieve flawless 90-degree bends, we employ a precision hydraulic press, guaranteeing consistency and strength in every bend. Additionally, 3D printing is integrated to enhance structural integrity without sacrificing aesthetic appeal. This combination of cutting-edge technologies results in a robust, visually appealing structure that meets the highest standards of craftsmanship.

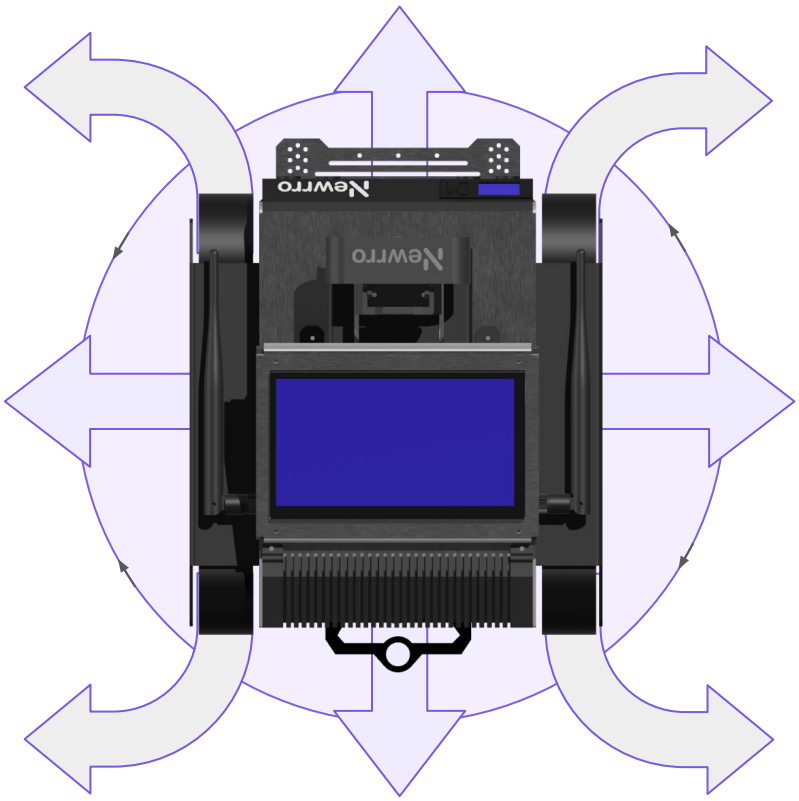
Laser cutting
Precis cuts

Hydraulic pressing
Precis 90 degree bends

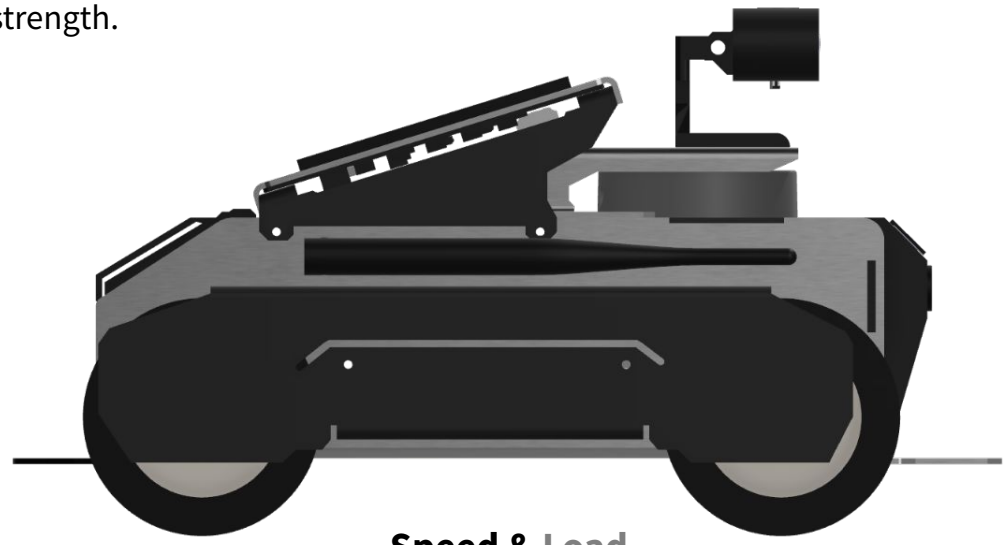
3D printing
Giving the rigidity with required shapes

Physical Specs

Manurability : capable of performing point 360 degrees turn, radial turn and move along X-axis and Y-axis.



Weight pulling capacity :
80kgs pulling strength.



Speed & Load

0.01m/s
Lowest speed

0.7 m/s
Highest speed

4 drive motors
With each of 20 kg/cm stall torque

Electronics Specs

LIDAR :

- **High-Performance Scanner**: 360-degree laser scanner with a range of up to 12 meters.
- **Detailed Mapping & Object Detection**: Ideal for precise environmental mapping and detecting objects.
- **Compact & Lightweight Design**: Facilitates integration into small to medium-sized devices and robotics.
- **High-Speed Rotations**: Capable of performing up to 10 rotations per second, providing real-time data for dynamic environments.
- **Robust & Reliable**: Built to perform reliably in both indoor and outdoor settings.
- **Versatile Integration**: Supports various interfaces and protocols for easy integration with different systems.
- **Diverse Applications**:
- **Autonomous Robotics**: Navigation and obstacle avoidance.
- **UAVs**: Terrain mapping and inspection.
- **AGVs**: Navigation in warehouses and factories.
- **Security & Surveillance**: Perimeter scanning.
- **Smart Home Devices**: Monitoring and automation.
- **Academic Research**: Studying LiDAR technology.
- **Industry Popularity**: Versatility and high performance make it a popular choice across multiple industries.

Operating Distance Range (Meter)	white: 0.05-12 meters(under 70% reflection), Black: 0.05-6 meters (under 10% reflection)
Sample Rate	5kHz
Scanning Frequency(Hz)	8~12Hz, 10Hz@typical
AngularResolution	0.72°@typical
Communication Interface	TTL and UART
Communication Speed	460800
Accuracy	±30mm
Resolution	15mm
Degree of Protection	IP54

Electronics Specs

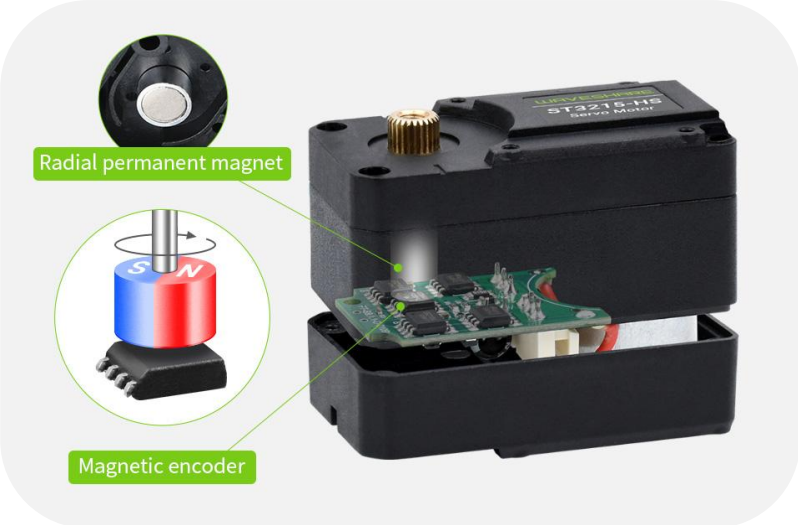
JETSON NANO 4GB DEV KIT:

Powerful AI Computing Platform: Jetson Nano enhances robotic applications with its ability to run multiple neural networks in parallel.
Advanced Robotics Tasks: Ideal for tasks like image recognition, object detection, and autonomous navigation.
Real-time Decision-making: Enables AI-driven robots to make decisions in real time.
Complex Task Execution: Helps in executing complex tasks efficiently.
Manufacturing Applications: Used in developing automated guided vehicles (AGVs) for material handling in manufacturing.
Service Robots: Enhances functionalities like facial recognition and natural language processing in service robots.
Sensor and Peripheral Support: Supports numerous sensors and peripherals for integrating vision, speech, and movement capabilities in robots.
Energy-efficient Design: Suitable for portable and battery-operated robotic applications.
Developer Ecosystem: Robust developer ecosystem and comprehensive software support accelerate development and deployment of AI-powered robotic solutions.
Industrial Deployment: Used in various industrial settings for AI-powered robotics.

CPU	Quad-core ARM A57 @ 1.43 GHz
GPU	128-core Maxwell
Memory (RAM)	4 GB 64-bit LPDDR4 25.6 GB/s
Storage	16GB eMMC + 64GB TF Card
Video Encoder	250 MP/s 1x 4K @ 30 [HEVC] 2x 1080p @ 60 [HEVC] 4x 1080p @ 30 [HEVC]
Video Decoder	500 MP/s 1x 4K @ 60 [HEVC] 2x 4K @ 30 [HEVC] 4x 1080p @ 60 [HEVC] 8x 1080p @ 30 [HEVC]
Connectivity	Gigabit Ethernet, M.2 Key E expansion connector
Display	HDMI
USB	1 × USB 3.2 Gen 1 Type A, 2 × USB 2.0 Type A, 1 × USB 2.0 Micro-B
Extension Interfaces	GPIO, I2C, I2S, SPI, UART

Electronics Specs

SMART ACTUATORS :



Feedback and Control: Servo motors provide essential feedback like position, speed, torque lock, and working modes, making them ideal for closed-loop automatic control projects.
Precise Speed Control: Perfect for wheeled robots that require precise speed control.
Robust and Versatile: With a torque of up to 20kg.cm at 12V, these motors are robust and versatile.
Flat Key Shaft Flange Design: Allows for driving various transmission parts.
360° Magnetic Encoder: Equipped with a 360° magnetic encoder for high precision and longer lifespan.
High-Precision Magnetic Encoding Angle Sensor: 12-bit sensor improves resolution, eliminates friction, and enhances durability.
Acceleration Start-Stop Function: Enables settable speed and acceleration values for smoother motion.
Reliability in Complex Applications: Servo motors are a reliable choice for complex robotic applications, ensuring accurate and efficient performance.

Torque	20kg.cm@12V
Rotation Angle	360° (0~4095)
No Load Speed	0.094sec / 60° (106RPM)
Position Sensor Resolution	360° / 4096
Operating Voltage	6 ~ 12.6 V
Gear	high precision metal gear
Encoder Type	360 degree magnetic
Baud Rate	38400 bps ~ 1Mbps (1Mbps by default)
Feedback	Position, Load, Speed, Input Voltage
No-Load current	240 mA
Locked Rotor Current	2.4A
KT	8.3kg.cm/A

Electronics Specs

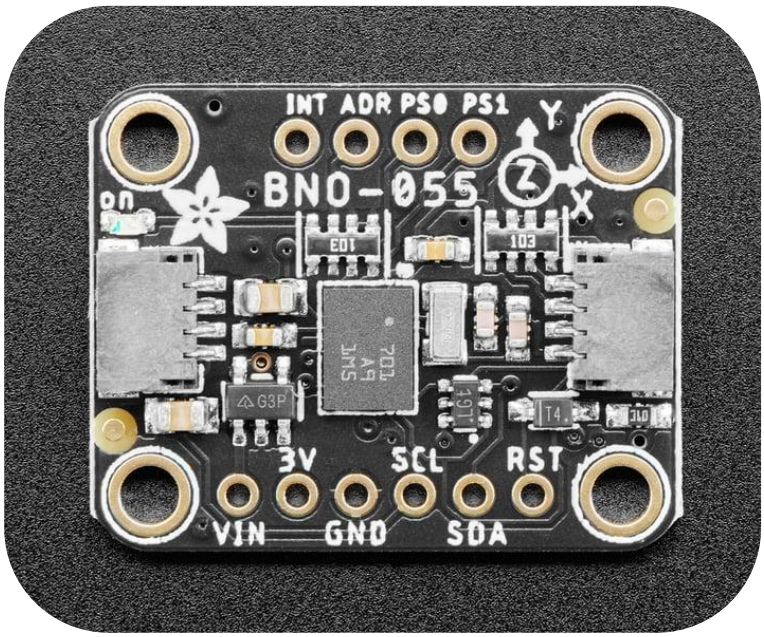
Servo Driver Expansion Board :

Simultaneous Control: The controller supports simultaneous control of up to 253 servos, given an adequate power supply.
Wide Voltage Input Range: Supports a voltage input range of 6-12V, ensuring compatibility with various servo voltages.
Built-in Connectivity: Equipped with built-in WiFi, Bluetooth, and ESP-NOW support for remote control and servo debugging.
Automatic Download Circuit: Simplifies program uploads.
Open-Source Web Application: Offers an open-source web application for enhanced versatility.
Support for Various Robot Structures: Supports various robot structures, enhancing its adaptability.
Compact Design: Its compact and space-saving design makes it ideal for projects with limited space.
Perfect for Complex Robotics: Ideal for complex robotics applications, providing robust and flexible control options.

Supply Voltage	6-12V
Power Supply connector	5.5 × 2.1mm DC
Download Interface	Type-C
Controller	ESP32
Control Interface	UART
Dimension	30 × 65mm

Electronics Specs

IMU BNO055 :



Precise Navigation and Orientation Tracking: The BNO055 integrates an accelerometer, gyroscope, and magnetometer, providing 9-axis absolute orientation data.
Built-in Sensor Fusion Algorithms: Delivers highly accurate position and movement information, essential for advanced navigation systems.
Offloads Complex Calculations: Simplifies development by offloading complex calculations from the host microcontroller.
Reliable and Stable Navigation: Ideal for robotics and autonomous systems, ensuring reliable and stable navigation.
Compact Design: Its compact design and I2C interfaces facilitate easy integration into various projects.
Compensation for Drift and Magnetic Disturbances: Ability to compensate for drift and external magnetic disturbances enhances navigation accuracy.
Low Power Consumption: Suitable for battery-operated devices due to its low power consumption.
Robust Solution: Overall, the BNO055 offers a robust solution for precise and efficient navigation in a wide range of applications.

Electronics Specs

IMU BNO055 :

Operating voltage	3.3V
Communication protocol	I2C and UART
Absolute Orientation	(Euler Vector, 100Hz) Three axis orientation data based on a 360° sphere
Absolute Orientation	(Quaternion, 100Hz) Four point quaternion output for more accurate data manipulation
Angular Velocity Vector	(100Hz) Three axis of 'rotation speed' in rad/s
Acceleration Vector	(100Hz) Three axis of acceleration (gravity + linear motion) in m/s^2
Magnetic Field Strength Vector	(20Hz) Three axis of magnetic field sensing in micro Tesla (uT)
Linear Acceleration Vector	(100Hz) Three axis of linear acceleration data (acceleration minus gravity) in m/s^2
Gravity Vector	(100Hz) Three axis of gravitational acceleration (minus any movement) in m/s^2
Temperature	(1Hz) Ambient temperature in degrees celsius

Electronics Specs

Ultrasonic sensors :

Versatile Use in Robotics: Ultrasonic sensors are essential in biped robots, obstacle avoider robots, and path-finding robots.
Obstacle Detection and Avoidance: They detect and avoid obstacles by measuring distances within a range of 2cm to 400cm.
Mapping Surroundings: These sensors can be mounted on rotating mechanisms to map surroundings accurately.
Depth Measurement: Ultrasonic sensors can measure the depth of certain places, like wells and pits, as their waves can penetrate water.
Comprehensive Information: For more detailed information on how ultrasonic sensors work, including their principles, applications, and advantages, you can read a comprehensive blog on the topic.

Power Supply	5V DC
Working current	15mA
Output signal	Electrical Frequency Signal
Ranging Distance	2cms-400cms
Resolution	0.3cm
Measuring Angel	30 degree
Dimension	3x2x1cm
Weight	15 grms

Electronics Specs

Camera:

Camera Specifications: The IMX219-77 is an 8-megapixel camera with a 77-degree field of view, compatible with the Jetson Nano.
Compatibility: It can also be used with various Raspberry Pi expansion boards, including Compute Module IO Board, Compute Module IO Board Plus, Compute Module POE Board from Waveshare, and the StereoPi board.
Versatile Applications: Ideal for IoT projects, its applications range from face recognition and road mark detection to license plate recognition.
High-Quality Imaging: The IMX219-77 excels in delivering clear and detailed images, essential for advanced image processing and computer vision applications.
Ease of Installation: Lightweight and easy to install, making it user-friendly for both professional and hobbyist use.
Compatibility and Integration: Its compatibility with multiple platforms and ease of integration make it a valuable addition to any development toolkit.

Pixels	8Mp
Sensor	IMX219
Resolution	3280x2464
Cmos size	¼ inch
Aperture (F)	2.0
Focal length	2.85mm
Field of view	79.3 degree
Lens dimensions	6.5x6.5mm
Screw holes	4 × screw holes, used for attachment, provides 3.3V power output
Dimension	25x24mm

Electronics Specs

AC8265 Wireless NIC:

Dual-Band Support: Operates on both 2.4GHz and 5GHz bands.
High Speed: Achieves speeds up to 300Mbps on the 2.4GHz band and 867Mbps on the 5GHz band.
Bluetooth 4.2: Integrated support for Bluetooth 4.2 standard.
Interface: Uses the NGFF (M.2 A/E Key) interface for connectivity.
OS Compatibility: Supports Linux, Windows 10, and Windows 11.
Wi-Fi 5 Standard: Complies with the IEEE 802.11ac (Wi-Fi 5) standard.
Low Latency: Designed for high-speed connections with low latency.
Reliable Connection: Provides stable and robust wireless connectivity.
Energy Efficient: Optimized for low power consumption.
Compact Design: Suitable for integration in compact devices due to its small form factor.

Electronics Specs

Display:

Features of 7 inch Capacitive Touch Screen LCD (H), 1024×600 : (primary)

Size: 7 inches
Resolution: 1024×600 pixels
Display Interface: HDMI / VGA
Display Panel: IPS (In-Plane Switching)
Viewing Angle: 170 degrees
Touch Type: Capacitive
Touch Points: 5-point multi-touch
Touch Port: USB
Audio Output: 3.5mm Jack and 24-PIN Header
Gaming Compatibility: Compatible with Xbox 360, PS4, and Switch

0.91 inch I2C Display : (secondary)

Size: 0.91 inches
Resolution: 128x32 pixels
Display Technology: OLED (Organic Light-Emitting Diode)
Color: Blue background with White text
Interface: I2C (IIC) serial interface for easy connection to Arduino
Power Supply: Operates on DC 2.8V
Brightness and Color Accuracy: High brightness with true and accurate colors
Self-Illuminating: Does not require a backlight, utilizing electroluminescence
Energy Efficiency: Very low power consumption, making it highly energy-efficient
Viewing Angle: Wide viewing angle for better visibility from different angles

Electronics Specs

Smart Robot Manager Board Features :

Battery Health Monitoring: The voltage and current sensors can continuously monitor the battery's health, providing data to prevent over-discharge and extending battery life.
Temperature Regulation: The temperature sensor can monitor critical component temperatures, and the controller can activate cooling systems or reduce power to prevent overheating.
Safety Mechanisms: The system can provide safety features such as cutting off power to prevent thermal runaway or short circuits, ensuring safe operation in various conditions.
Power Management: The MOSFET switch can control the power supply to the robot's components, ensuring efficient power usage and extending battery life.
Over Charge Protection: The controller is smart enough to cut off the power when the battery is fully charged
Automated Power Shutdown: The system can automatically shut down or enter a low-power state when critical thresholds (voltage, current, temperature) are exceeded, protecting the robot's components.
Controller: one more controller is already present is the robot which can be re program by the user and can be attached multiple sensors to it

Li-Ion Battery With The BMS :

Overcharge and Over-discharge Protection: The BMS prevents the battery from being overcharged or over-discharged, extending the battery's lifespan and ensuring safe operation.
Short-circuit Protection: The BMS includes safety features to protect against short circuits, preventing damage to the battery and connected devices.
Balancing of Battery Cells: The BMS balances the charge across individual cells within the battery pack, ensuring uniform performance and longevity.
Temperature Monitoring and Control: The BMS monitors the battery temperature, enabling the system to prevent overheating and ensuring optimal performance in various operating conditions.
Current Limitation: The BMS regulates the current draw from the battery, preventing overcurrent situations that could damage the battery or connected components.

Accessories

Additional Accessories for robot that comes with the kit:

sl.no	Items	Quantity
1	HDMI cable	1
2	Display power cable	1
3	Dc Power jack to power Jetson nano and Motors from the battery	2
4	Micro usb cable	1
5	Arduino cable	1
6	Cooling fan for jetson nano	1
7	Jumper cable	1
8	CSI connector for camera	1
9	Rubber Wheels	4
10	Mecanum Wheels	4
11	Rubber Wheels Coupler	4
12	Mecanum Wheels Coupler	4
13	Jetson power cable	1
14	Robot Charger	1
15	4 Pin connector For Ultrasonic	2
16	I2C display connector	1
17	Smart motor connectors	4
18	Extended Antennas	2
19	Required set of Fasteners	As required
20	Screw drivers	2
21	Camera mount	1
22	Display mount	1
23	Red cube	1
24	Green cube	1
25	wireless keyboard and mouse	1

Programs

List of program comes with the robot :

1: Autonomous navigation without obstacle avoidance :
This program enables the robot to navigate to any given coordinate on a specified map, following a pre-planned path that does not account for obstacles.

2: Autonomous navigation with obstacle avoidance - 1:
This program allows the robot to autonomously navigate to any given coordinate on a specified map, utilising the BUG-0 algorithm for dynamic obstacle avoidance.

3: Autonomous navigation with obstacle avoidance - 2 :
This program enables the robot to autonomously navigate to any specified coordinate on a map, using the BUG-1 algorithm for dynamic obstacle avoidance. This algorithm is a more efficient and cleaner method of avoiding obstacles when compared to BUG-0.

4: Object following using LIDAR :
This program enables the robot to follow any object within a range of 0.4 to 0.6 meters in front of it. If the object moves to the left, the robot will turn left to follow it, and if the object moves to the right, the robot will turn right to follow it.

5: Object following using CAMERA :
This program enables the robot to follow any specific colour with precision. For instance, if you place a red cube 0.4 to 0.6 meters in front of the robot, it will begin to follow the red cube. As the cube moves to the left, the robot will turn left to keep up, and if the cube moves to the right, the robot will turn right to continue following. This dynamic colour-tracking capability makes the robot versatile and responsive.

6: Algorithm for autonomous-docking to the charging station :
This program simulates autonomous docking to a charging station. Given the coordinates of the charging station on a specified map, the program will guide the robot to navigate autonomously and dock precisely at the charging station, ensuring an accurate simulation of the auto-docking process.

7: Delivery robot algorithm :
This program enables the robot to perform deliveries for items placed in its container. Initially, the program prompts the user to enter the number of delivery locations (up to a maximum of four). After specifying the number of locations, the user provides the coordinates for each delivery (e.g., X1 = 1, Y1 = 1; X2 = 2, Y2 = 2; X3 = 2.5, Y3 = 2.5 for three locations). Once the inputs are provided, the robot executes an advanced algorithm to deliver the items to the specified coordinates, efficiently avoiding obstacles along the way. This ensures smooth and reliable delivery operations.

Programs

List of program comes with the robot :

8: Voice controlled :
This program enables voice-controlled robot navigation. For example, when a user commands "move forward," the robot advances one meter and responds with "moved forward." The same intuitive voice commands can be used to move backward, turn right, and turn left, making robot control seamless and interactive.

9: Master and slave concept :
Consider two robots connected via a common Wi-Fi network. ROBOT-1 transmits the delivery point coordinates to ROBOT-2. Upon receiving these coordinates, ROBOT-2 autonomously navigates to the specified location, effectively avoiding obstacles along the way.

10: Manual control of the robot :
This program allows users to control the robot remotely using a laptop or any device with a VNC application installed. Users can command the robot to move forward, backward, turn right, turn left, and adjust both linear and angular velocity, providing comprehensive control over the robot's movements.

List of content

Complete List of items comes with the Kit :

Sl.No	Item name	Quantaty
1	Jetson nano	1
2	64GB Memory card	1
3	Jetson nano wifi module	1
4	Jetson nano Adapter	
5	Lidar	1
6	Camera	1
7	Smart servos	4
8	Smart Servo Coupler	4
9	Mecanum wheels	4
10	Rubber Wheels	4
11	Mecanum wheels coupler	4
12	Rubber Wheels coupler	4
13	Smart Servo Motor Expansion Board	1
14	IMU BNO055	1
15	Ultrasonic sensor	2
16	Smart Robot Manager Board	1
17	I2C display	1
18	7 inch LCD Display	1
19	12V Battery	1
20	Switch	1

List of content

21	Robot Battery Charger	
22	4 Pin Connector For Ultrasonic	2
23	4 Pin Connector For I2C Display	1
24	Jumper cables (M-M)	1
25	Jumper cables (M-F)	1
26	Jumper cables (F-F)	1
27	Nuts and Bolts	As required
28	HDMI Cable	1
29	Display Power Cable	1
30	Micro USB Cable	1
31	Arduino cable	1
32	Wireless Mouse and Keyboard	1
33	Chassis	1
34	Spacers	As required
35	Card Reader	1
36	USB C Charger	1
37	Aluminium main body cover	1
38	Aluninium wheel covers	2
39	Abs 3D Print Front Cover	1
40	Abs 3D Print back Cover	1
41	ABS 3D Print charger port holder	1
42	Motor Power Cable	1
43	Mic	1
44	Speaker	1

Newrro Support

Newrro is excited to introduce ARJUNA, a cutting-edge robot designed for autonomous navigation in indoor environments. Built with the advanced industrial tool ROS (Robot Operating System), ARJUNA offers researchers and students a comprehensive platform to explore and learn robotics in depth. This versatile robot allows students to program its microcontroller, integrate their own sensors, and add custom hardware, enhancing its functionality and usability.

- **Robust Customer Support**: Newrro guarantees strong customer support for all users online and offline.
- **Fast service:** Complete service in just 48 hours.
- **6-Month Comprehensive Warranty**: The entire ARJUNA robot comes with a 6-month comprehensive warranty, provided the seal remains intact.
- **Detailed User Guide**: A detailed guide on usability and functionality is included with every purchase.
- **Personalized Training**: Newrro offers personalized training for students and institutions, ensuring users can maximize the robot's potential.