{Learn, Create, Innovate};

Introduction to PuzzleBot

Overview and Specifications

MCR²

Manchester Robotics

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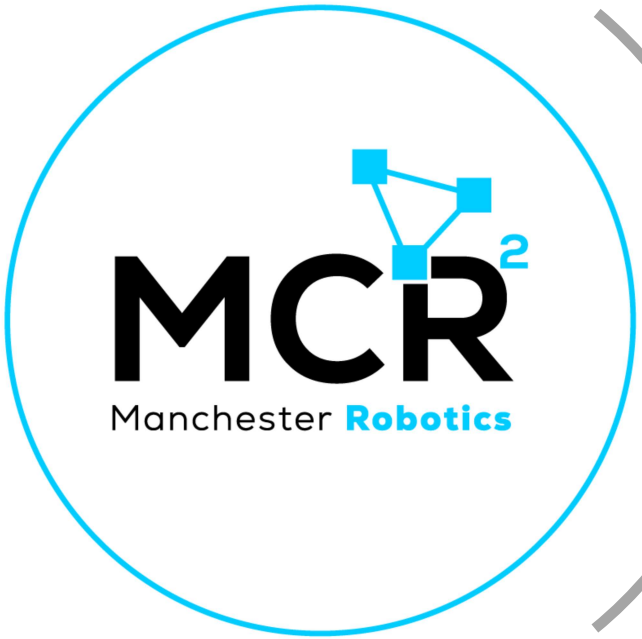


System Overview

NVIDIA Jetson Nano

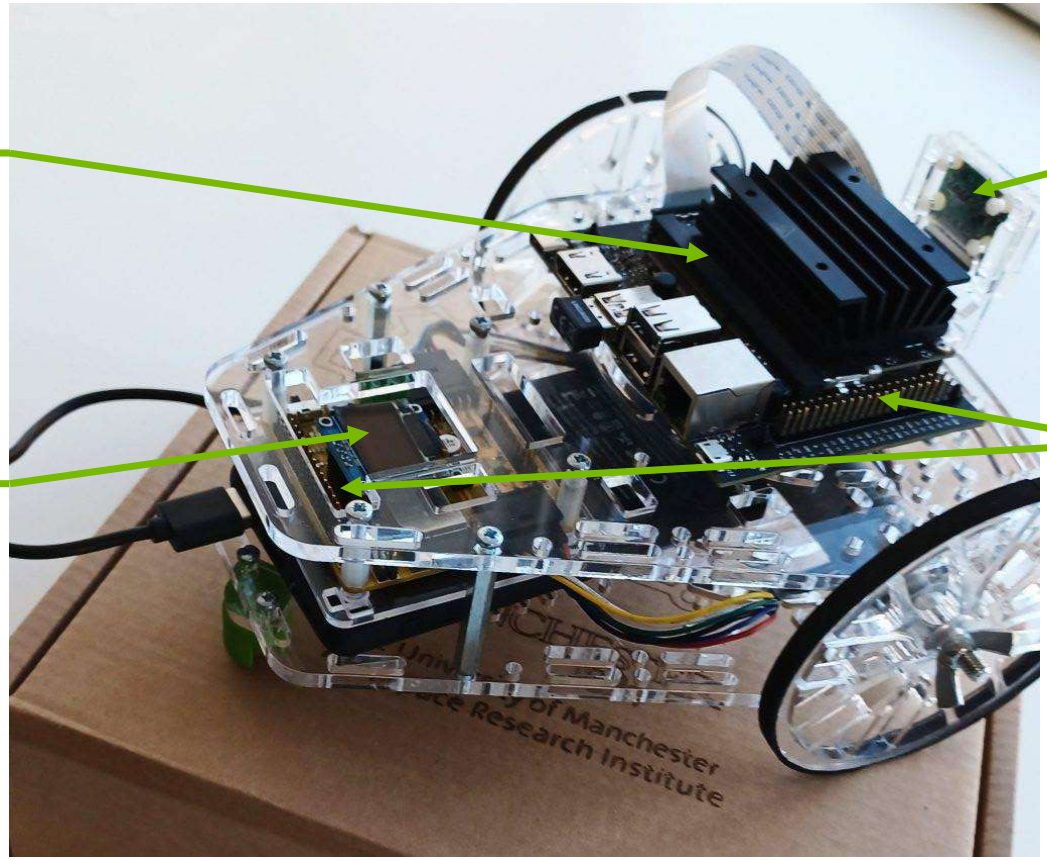
For AI and computer vision

- Higher processing power
- Time-sharing operating system
- Good for more complex, slower tasks
- Specifically designed by NVIDIA for AI applications

Hacker Board

For low-level control algorithms

- Low processing power
- Real-time operating system
- Good for simple, fast, time-sensitive tasks

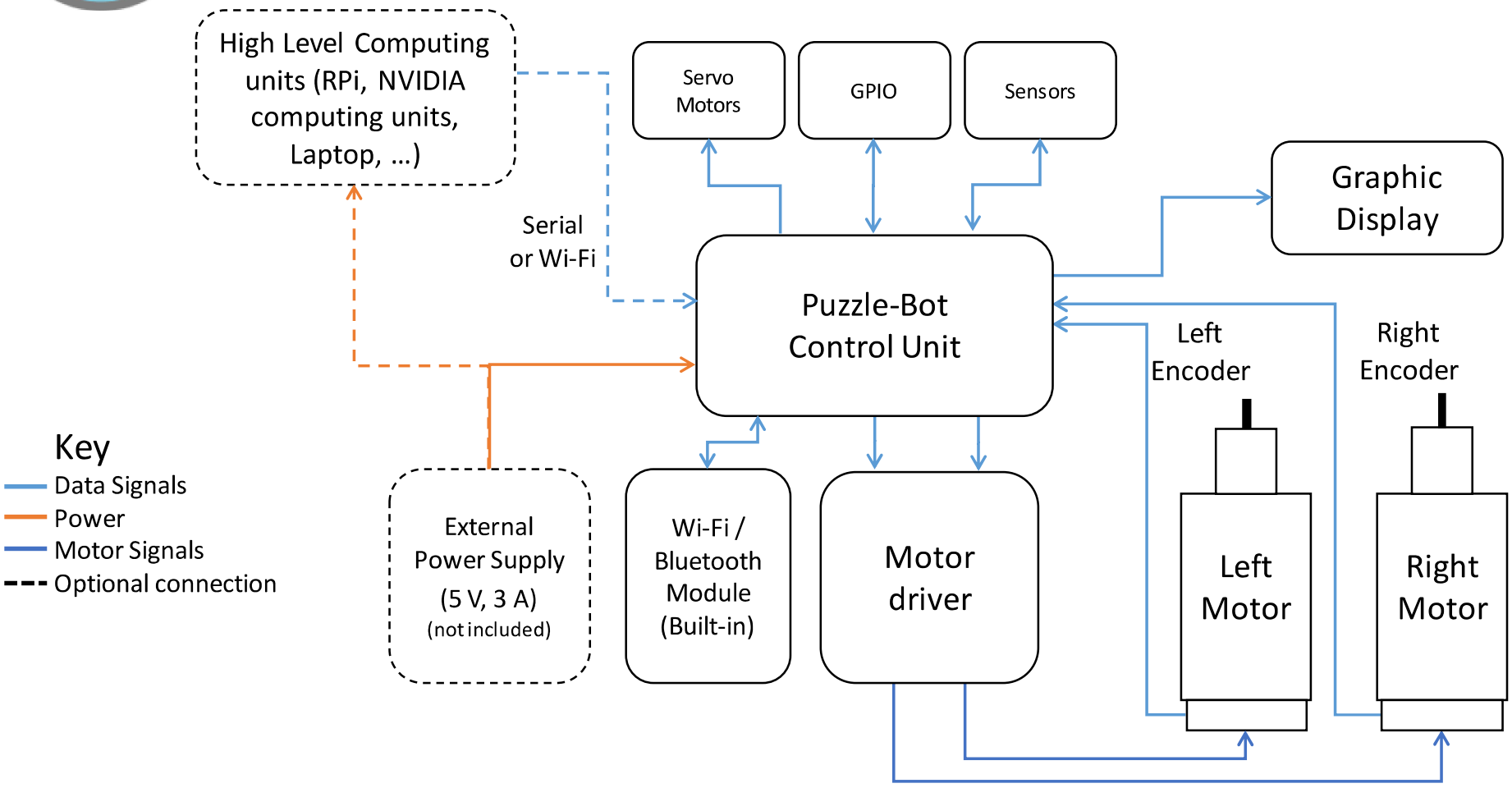


Raspberry Pi Camera

GPIO Arrays

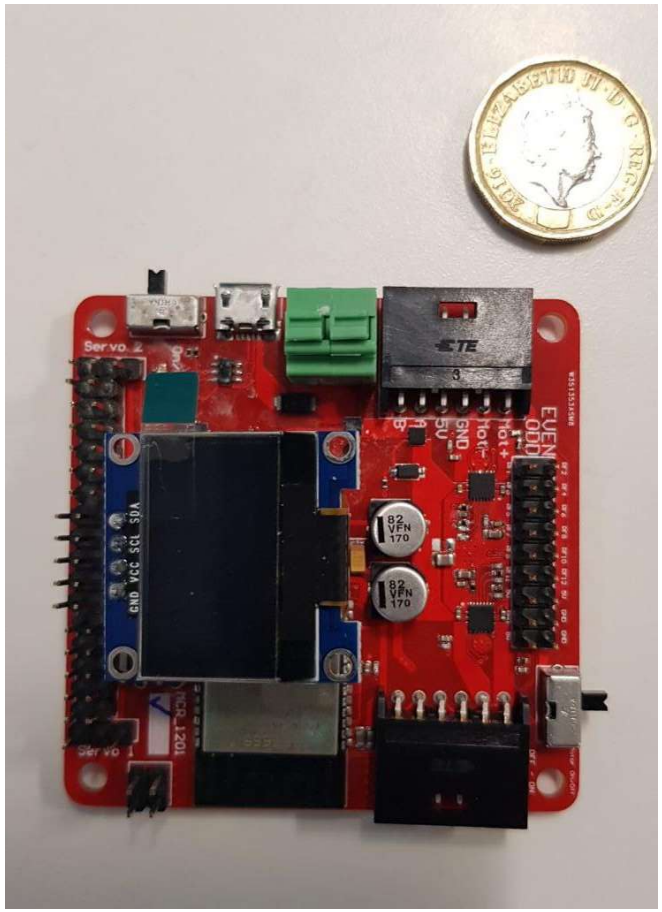
Expansion possible via the Jetson or the Hacker Board

System Architecture



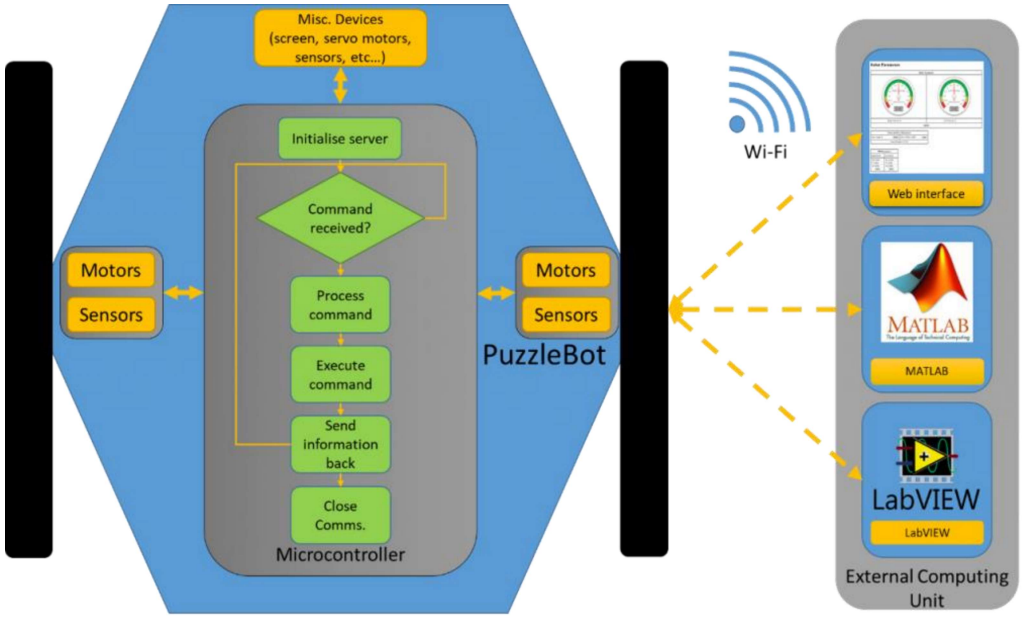
The Hacker Board

- ESP32-based Microcontroller
  - Xtensa dual-core 32-bit LX6 microprocessor
  - 520 KB of SRAM
  - WiFi & Bluetooth
- DC-DC Converter
- Motor Driver
- 0.96” I2C LCD Display



The Hacker Board

- Preprogramed firmware including basic control, sensing, and communication libraries
- Two programming configurations:
  - **Standalone Configuration**
  - **External-Control Configuration**



The Webpage

Restart Robot

Reset to Default Config

Robot Parameters

Change Configuration

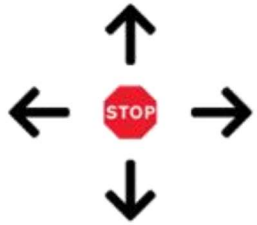
Active Modules	
Servo Motor	☐
Time-of-flight: Sonar	☐
Time-of-flight: Laser	☐
Reflectance Line Sensor	☐
LIDAR	☐
Screen	☑
ROS	☑
Save	

Network Settings	
SSID:	Puzzlebot
Password:	Puzzlebot72
Save	

Wheel Parameters	
	
Linear Velocity (rad/s): 0.0	Angular Velocity (m/s): 0.0
Submit	

Motor-Encoder Settings		
Control Mode	Robot Velocities (v and ω)	
Invert Directions	Left	Right
Motors	☑	☑
Encoders	☐	☐
Save		

Robot Controls	
On-screen Controls	Keyboard Controls



- Connect to the WiFi Network displayed on the Hacker Board
- Go to 192.168.1.1 in a browser

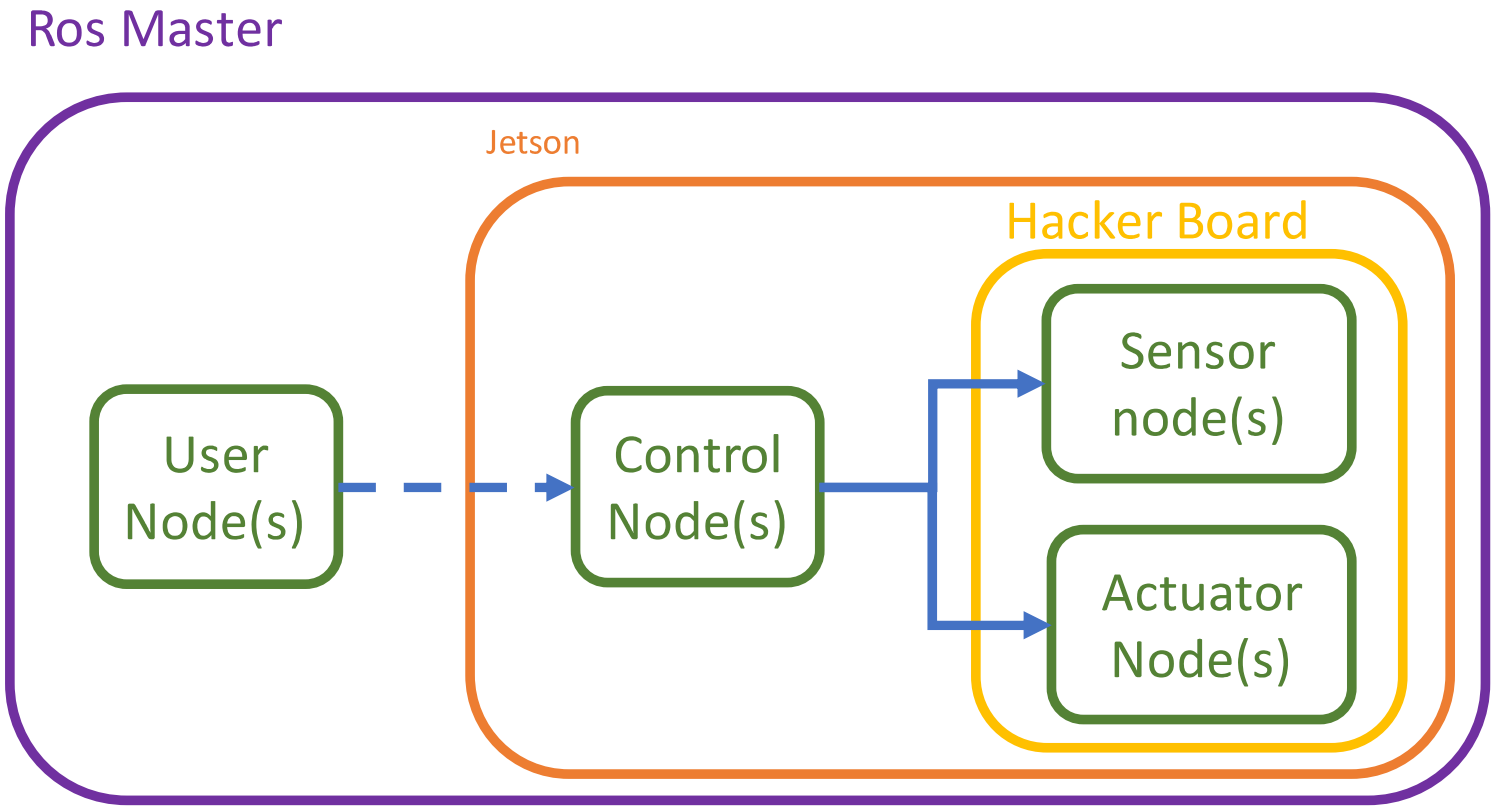
NVIDIA Jetson Nano, 2 GB

- 128-core NVIDA Maxwell GPU
- 1.43 GHz Quad-core ARM A57 CPU
- 2 GB of 64-bit LPDDR4 Memory
- SD card for storage
- Ethernet & Wi-Fi
- CSI-2 Connector for Camera
- Runs a modified version of Ubuntu 18

NVIDIA Jetson Nano, 2 GB

- Communicates with the Hacker Board serially via ROS
- Runs NVIDIA's own version of Linux, similar to Ubuntu
- The OS is flashed onto the SD card by a PC
- Three options for setup
  - Use the provided image in place of the NVIDIA image (recommended)
  - Run a setup bash file
  - Manual installation

The Jetson Nano with ROS



ROS Implementation