

VMX-Pi Key Use Cases and Hardware/Software Features and Benefits

Use Cases for FRC Teams:

- FRC Classroom Robot Controller
 - o Benefit: Significantly lower cost than the FRC Competition Robot, in a small package designed to allow “Personal Robots” for one or two students each
 - o Benefit: Access to identical tools and libraries used by teams using C++/Java in FRC Competition
- FRC Competition Vision Coprocessor and IMU
 - o Benefit: Access cutting-edge sensors (e.g., Intel RealSense Depth Camera, Tracking Camera or LIDAR) from FRC robot applications
 - o Benefit: Offload CPU-intensive Vision Processing including Neural Networking to a powerful quad-core Raspberry Pi with large amounts of RAM
- Drop-in replacement for FRC Competition Robot Controller for C++/Java teams
 - o Benefit: Keep last year’s competition robot running for demos

Hardware Features and Benefits: (“Raspberry Pi on Steroids for Robots”)

- o Powerful Analog/Digital IO
 - *Access to devices commonly used on FRC robots; sensing for autonomous navigation and field-centric control*
 - FRC-compatible CAN interface
 - Integrated 9-axis IMU featuring navX Technology
 - 30 Digital Channels with real-time processing including PWM, Quadrature Encoder decode, etc.
 - Digital Communication via SPI, I2C and TTL UART interfaces
 - 4 Analog Inputs w/Oversampling & Averaging
- o Tightly integrated with Raspberry Pi 4B
 - *Powerful processing and access to cutting-edge peripherals*
 - USB3 and Gigabit Ethernet
 - Benefit: Fast Connection to Intel Real Sense Depth Cameras and networked computers
 - Built-in Wifi (2.4 and 5Ghz)
 - Benefit: Configurable either as Access Point (for access from Driver Station) or as a Wifi Client (for internet and remote desktop access)
 - Quad Core, 64-bit 1.5Ghz A72 processor with up to 8GB RAM
 - Benefit: Processing power for cutting-edge vision algorithms
 - Dual HDMI display interfaces for connection to monitors
 - Benefit: Enables your robot to be used as a desktop computer
- o Sophisticated Power Management
 - *Simple and Reliable Power that ensures your robot keeps running even in adverse circumstances*

- Powered directly by unregulated 12VDC battery (on robot) or AC/DC adapter (on desktop)
- Power supply to Raspberry Pi4B and external sensors
- Overvoltage Protection, Current-limiting and flexible Signal Voltages

Software Features and Benefits:

- High-level robot programming in C++/Java with the exact same programming tools used with competition FRC robots
 - 2020 WPI Library, VSCode (on Windows, MacOS and Linux)
 - Support for Vendor Libraries from Cross the Road Electronics, REV Robotics and Kauai Labs
- Low-level programming in C++/Java/Python/C# using VMX-pi platform libraries
 - Great for exploring sensors and electrical prototyping in a stand-alone environment
- Powered by Linux, enabling integration of thousands of open source Linux libraries
 - Robot Operating System, OpenCV,
- Via Raspberry Pi OS, functions a Desktop Computer - enhancing learning opportunities in the classroom
 - Using the Raspberry Pi OS, provides additional learning tools including Wolfram Mathematica, various programming IDEs, etc.