

KernalMind- Apex VR Teleoperation System

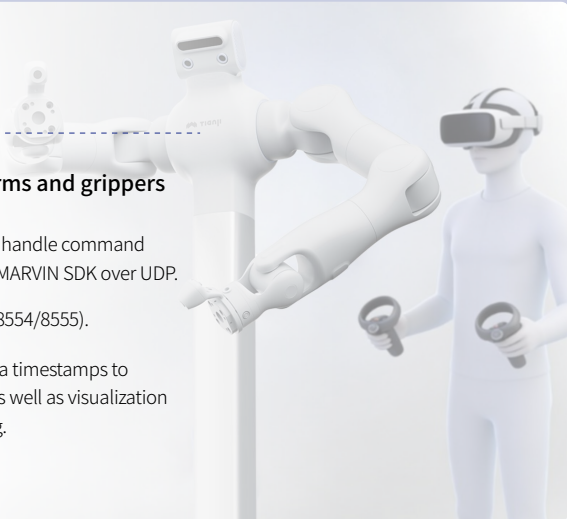
Integrated platform for remote operation and data acquisition of robotic arms and grippers

It captures operator motion and visual input through a VR headset and data gloves, utilizes ROS 2 to handle command publishing and state feedback (via Topics and Services), and drives low-level execution through the MARVIN SDK over UDP.

On the visual side, GStreamer is used for video capture, encoding (MP4), and RTSP streaming (ports 8554/8555).

The system synchronously records robotic arm data (in MCAP format) and video data, aligns them via timestamps to generate structured multimodal datasets, and supports conversion to the LeRobot training format as well as visualization with Rerun—enabling a complete pipeline from teleoperation and data processing to model training.

Support first-person visual passthrough and enable remote teleoperation.



Teleoperation System	Category	Specification
	Platform Positioning	Marvin6-Apex Teleoperation System
	Control Modes	Position Control + Impedance Control
	Control Frequency	500 Hz
	Data Sampling Rate	500 Hz
	Communication Interface	Ethernet/CAN-FD
	ROS Support	ROS 2 Supported
	Data Formats	HDF5, RLDS
	End-to-End Latency	≤ 100 ms
	Degrees of Freedom	16 DOF
	Power Consumption	300 W (Average), 600 W (Peak)
	Operating Voltage Range	48 V (+15%)
	Video Resolution	2560 x 720
	Frame Rate	30 FPS
	Transparent Transmission	Supported
	Compatible Dexterous Hand Platforms	Wuji, Sharpa, Qiangnao, etc
	Optional End Effectors	Vision-Tactile Gripper



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Marvin Pro
Fixed Force-Controlled
Humanoid Dual-Arm Platform

Marvin Pro

Marvin Pro is a fixed dual-arm robot integrating strong manipulation capability, high-precision data acquisition, high computing power, and a minimalist structure. Featuring a fixed-height rigid base and a simplified design with a non-movable head, it significantly reduces cost and deployment complexity. Equipped with a standard 5-camera panoramic vision system and dual 7DoF arms with high-precision force control, it is perfectly suited for industrial fixed-station assembly, fixed-position scientific experiments, high-precision vision, and force-controlled data acquisition applications.



Fixed Base · High-Precision Stable Operation

14 DoF (excluding dexterous hands) with a fixed rigid stand. By removing the mobile chassis and folding body while retaining dual 7 DoF force-controlled arms, the structure stays lean with maximized stability and optimized cost. Designed for high-precision fixed-point operation, it delivers repeatability of ± 0.03 mm—meeting the stringent requirements of industrial assembly, scientific experiments, and force-controlled data acquisition.

Full-body dual-arm force control · Safe human-robot interaction

Paradigm shift from "position control" to "force and impedance control"
Dual-arm models come standard with force control; single-arm models support a maximum rated payload of 6 kg and repeatability of ± 0.03 mm, achieving full-body compliant impedance control.

Collision detection automatically reduces joint stiffness to ensure safe human-robot collaboration, with smooth, human-like motions free of rigid starts, stops, or vibrations.



Robotic Arm System

14 DoF

7DoF × 2 Full Force-Controlled Dual Arms

Dual-arm Force Control

Impedance Control
Force-Position Hybrid Control

Rated Payload

M6 Lite: 5kg | M6: 6kg

Working Radius

M3: 615mm | M6: 696mm

Repeat Positioning Accuracy

± 0.03 mm

End Interface

RS485/CAN/EtherCAT

Perception System

Head RGBD

1 × D435 Depth Camera

Head RGB

2 × SH5WG Cameras

Wrist RGB

2 × SH5WG Cameras

6-Axis Force Sensor

End Effector Optional

VR Teleoperation System

VR Headset

First-Person View Video Transmission

Data Controller

Motion Capture & Data Acquisition

ROS2 Communication

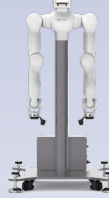
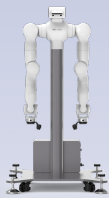
Topics/Services

Data Format

HDF5/RLDS/MCAP

Marvin Pro

Fixed Force-Controlled Humanoid Dual-Arm Platform



Robot Arm Specifications	Specifications	Marvin Pro+M6 Lite	Marvin Pro+M6
	Arm Degrees of Freedom	7DoF × 2, standard joint force control	
	Single-arm rated payload	5kg	6kg
	Working radius	615mm	696mm
	Repeatability	± 0.03 mm	
	Force repeatability	0.15N	
	Maximum joint speed	J1-J7: 180°/s	
	Control Modes	Position control, impedance control, force-position hybrid control	
	Communication Protocol	1Khz EtherCAT	
	Braking Method	J1-J4 with brakes	All-joint brakes
	End-Effector Interface	RS485、CAN、EtherCAT	
	Six-axis force sensor at the end effector	Optional Accessories	
	End-Effector Dexterous Hand	Self-developed Gripper, Wuji Dexterous Hand, compatible with mainstream dexterous hands available on the market	

Basic Machine Specifications	Specifications	Specifications
	Overall degrees of freedom	14DoF (excluding dexterous hand, 7 DoF × 2 dual arms)
	Base Type	Fixed-height rigid bracket
	Head	Fixed, no degrees of freedom
	Vertical workspace	0.6-1.8m
	Total Weight	≈ 80 kg
	Force Control System	Dual-arm standard vVwith force control

	Communication Interface	WiFi, EtherNet
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Vision Camera System	Model and Quantity	Features
Head	D435 RGBD×1SH5WG RGB×2	Environmental perception, global positioning, point cloud acquisition, target recognition
Wrist	SH5WG RGB ×2	End-effector precise positioning, workpiece inspection, and operation vision guidance
Total	5 cameras	Standard on all models, no options needed

Computing Platform Specifications	Specifications	Option 1	Option 2
	Main Control Platform	NVIDIA Jetson Orin AGX 64G (275TOPS)	Nvidia Thor
	CPU	12 cores, max frequency 2.2 GHz	14 cores, max frequency 2.6 GHz
	GPU	Max frequency 1.3 GHz	Max frequency 1.53 GHz

Electrical Specifications	Specifications	Specifications
	Power Supply Method	Direct AC power supply (AC 220 V) / Compatible with overseas voltages
	Operating Time	24-hour continuous operation
	Charging / Battery	None (fixed power supply, no battery module)