

Product Features

HANBACK ELECTRONICS

	A Physical AI-based smart home control system training platform, modularized into four zones—Entrance, Room (indoor), Kitchen, and Pixel Board—on a rectangular panel built with large aluminum-profile frames
	Sensors and actuators in each zone are driven by a high-performance MCU, supporting standard interfaces such as I ² C/PWM/GPIO and real-time control loops
	An intelligent unified controller equipped with a CUDA-accelerated edge supercomputer supports high-performance inference and multimodal perception/control services
	The intelligent unified controller provides a large touchscreen-based HMI/GUI runtime, enabling easy composition of system monitoring dashboards and control scenarios
	With a camera and digital microphone (array), supports AI human-machine interfaces (HMI) such as vision/audio-based user recognition and command processing
	The high-performance MCU and intelligent unified controller are interconnected over a TCP/IP network via a router; with Internet access, secure remote connectivity and control scenarios can be configured
	Provides the Pop plus library, which controls physical components through a unified API regardless of local or remote deployment (device abstraction, event-subscription I/O)
	Provides an open-source MQTT broker supporting SSL/TLS-based encrypted communication and authentication, with standard QoS and topic-level access control (ACL) configuration
	Provides an integrated Python/MicroPython development environment, including real-time logs/serial console, firmware transfer, and package-management workflows
	Provides sample implementations for IoT security training, including 2FA-based user authentication/authorization and AES-based encryption
	Provides Blynk examples for building remote-control GUIs on Android/iOS without coding
	Provides integrated Physical AI control examples based on PySide6, DeepStream Perception, and Riva Speech Embedded

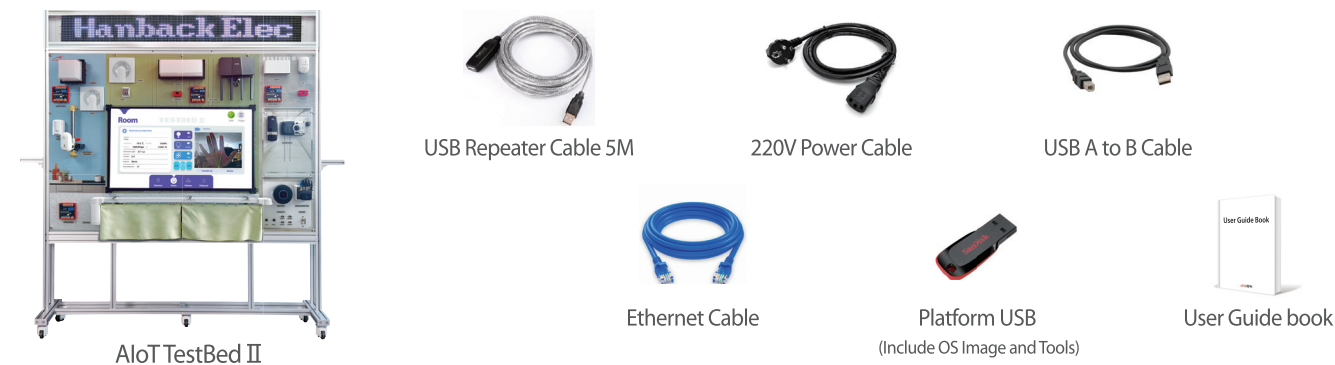
Educational Content

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- TestBed Overview
- Foundations of Smart Home Deployment
 - Smart Home Overview and Deployment
 - Control of lighting, ventilation fans, doors, curtains, and LED display boards
 - Sensor data acquisition
 - Foundations of Firmware Design
 - Threads, asynchronous control, and protocols
- User Interface (HMI)
 - MQTT-based message schema and topic design
 - GUI programming
 - Building a real-time monitoring system
 - Sensor data visualization and remote control
 - Anomaly detection and alerting
- Smartphone Integration and Monitoring
 - Mobile app-based remote control
- Cloud IoT Integration
 - Integration with open-source IoT clouds
 - Cloud dashboard development
 - Data visualization
- Security and Privacy
 - Certificate-based secure network communication
 - 2FA-based user authentication and access control
 - Vision-based user authentication
 - Data encryption and decryption
- Computer Vision and AI-Driven Control
 - OpenCV
 - Machine learning
 - Classification algorithms and data processing
 - OpenCV-based classification logic implementation
 - MediaPipe-based classification logic implementation
 - Voice-driven automated control
- Automation Logic Design and Implementation (Capstone Project)
 - Conditional behavior programming
 - Scenario-based control

Product Configuration

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www.hanback.com

AIOT TESTBED II

Physical AI-based Smart Home Control System



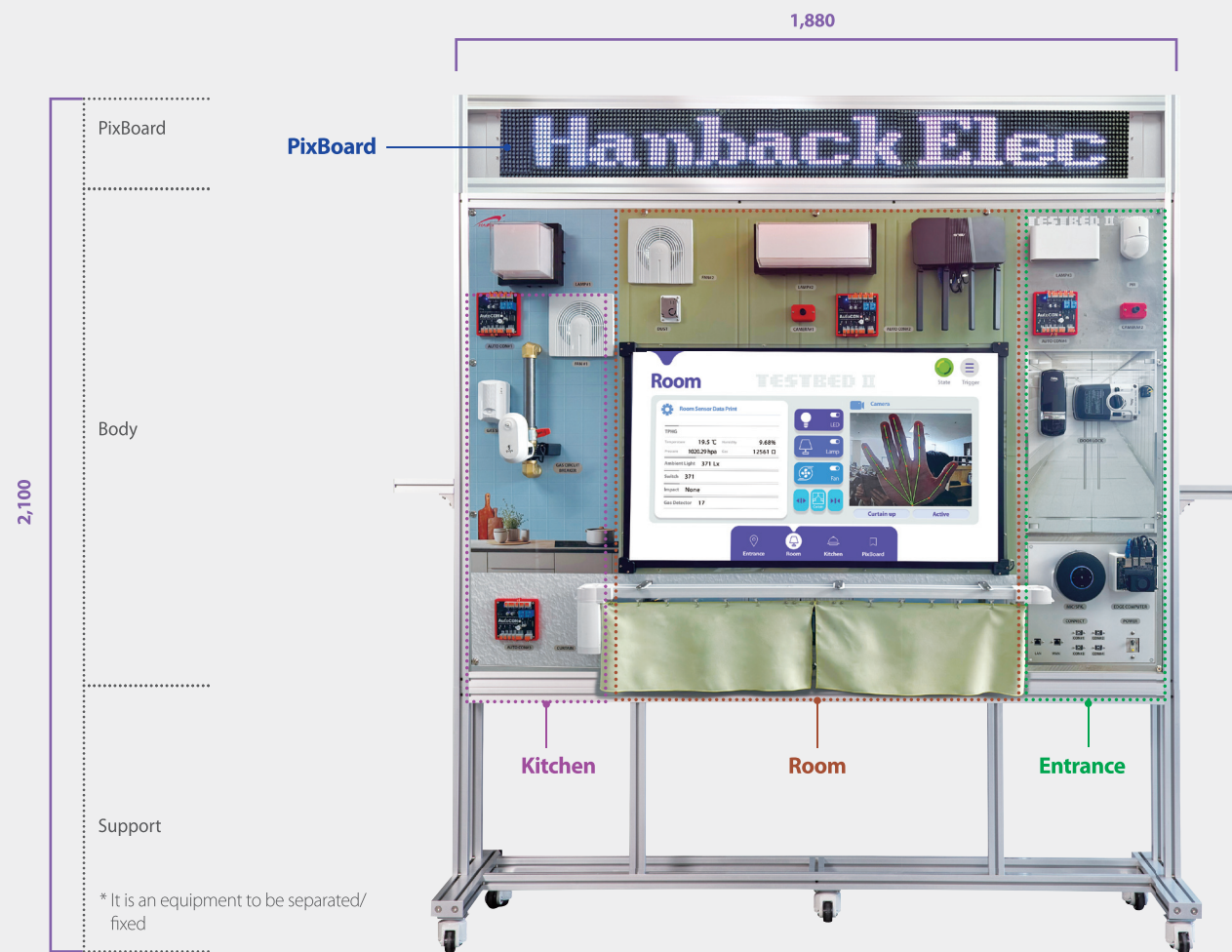
HANBACK
ELECTRONICS
Since 1984

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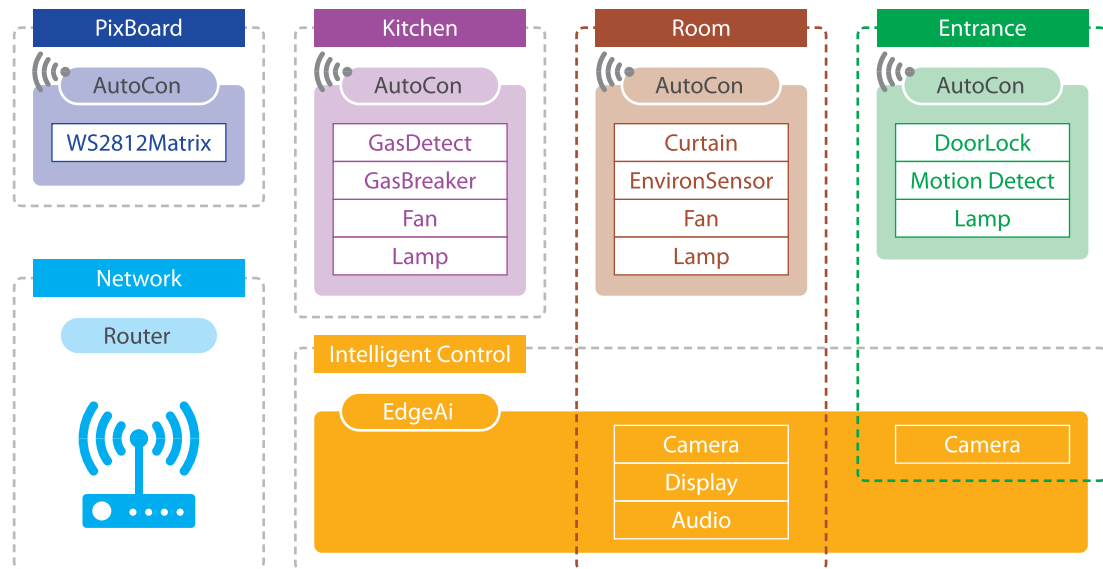


AIOT TESTBED II



Block Diagram

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Software Specifications

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List		Specifications
AutoCon	Embedded Runtime Environment for MCU	MicroPython V1.26, upyboard
	Pop plus Library for MCU	Multiple control components (WS2812Matrix, Relay, ServoMotor, SR04 etc) Zsh, Tmux, Peco, powerlevel9k thema, Powerline fonts
Intelligent Integrated Controller	Embedded Runtime Environment for Application Processor	Openbox with X-Server, Tint2, conky, Oh-My-Zsh, tmux
	IoT Service	MQTT Broker, Things board
	User Authentication and Security	cryptography, pyotp, qrcode
	AI Service	PyTorch / TensorFlow / ONNX Runtime(TensorRT EP)
		DeepStream Perception(PeopleNet/YOLO), VLM Inference, Zero-Shot Detection
		Grounding DINO (GDINO), VLM Video Summarization & Analytics AI
Intelligent Integrated Control Program	Pop plus Library for TestBed	Riva Speech AI Embedded (ASR/TTS)
		WS2812Matrix, GasDetect, GasBreaker, Fan, Lamp, Curtain, Tphg, Light
	Implementing integrated physical AI control with DeepStream Perception and Riva Speech Embedded in the PySide6 GUI environment	DoorLock, MotionDetect, Camera, Audio
		Implemented 2FA user authentication and authorization management, and AES-based data encryption
	It is implemented to control physical components equally regardless of local/remote distinction, enabling simultaneous execution of integrated control programs on the Intelligent Integrated Controller and PC	

Hardware Specifications

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List		Specifications	
Entrance Zone	AutoCon	Dual Core ARM Cortex-M33	
		Wi-Fi, Bluetooth	
		Relay, Motor Driver, GPIO	
		led, switch, Tphg, Ambient, 3-Axis	
	Camera	High signal-to-noise ratio (SNR)	
		Built-in 2D Dynamic Defect Pixel Correction (DPC)	
		Phase Detection Autofocus (PDAF) for rapid autofocus	
		QBC Re-mosaic function	
	Lamp	Entrance lamp	AC 220V LAMP with Feedback
	MotionDetect	Passive Infrared method	
DoorLock	Limit Switch for Feedback		
Room Zone	AutoCon	Dual Core ARM Cortex-M33	
		Wi-Fi, Bluetooth	
		Relay 2/ Motor Driver/ GPIO	
		led, switch, Tphg, Ambient, 3-Axis	
	Touch Display	43 inch LCD	
		IR touch screen	
	Camera	High signal-to-noise ratio (SNR)	
		Built-in 2D Dynamic Defect Pixel Correction (DPC)	
		Phase Detection Autofocus (PDAF) for rapid autofocus	
		QBC Re-mosaic function	
Audio	HDR mode (up to 3 mega-pixel output)		
	Microphone		
Speaker			
Lamp	Room Lamp	AC 220V LAMP with Feedback	
Fan	AC 220V Fan + LED(Active Fan) with feedback		
Curtain	Electric Curtain		
	Limit Switch for feedback		
Environmental Sensor	Ambient light		
	Tphg(Temperature, Press, Humidity, Gas), Dust Sensor		

List		Specifications	
Kitchen Zone	AutoCon	Dual Core ARM Cortex-M33	
		Wi-Fi, Bluetooth	
		Relay 2/ Motor Driver/ GPIO	
		led, switch, Tphg, Ambient, 3-Axis	
	Lamp	Kitchen Lamp	AC 220V LAMP with Feedback
	Fan	Air Circulator	AC 220V Fan + LED(Active Fan) with feedback
	GasDetect	LPG Gas Detection	Yellow LED flashes and alarm sound
	GasBreaker	GAS Valve Control	GAS Valve moving by geared Motor
			Limit switch for feedback
	PixBoard	AutoCon	Dual Core ARM Cortex-M33
Wi-Fi, Bluetooth			
WS2812Matrix		PIO0, PIO1, PIO2, LED Power	
Network Router	WAN	10/100/1000Mbps x1	
	LAN	10/100/1000Mbps x4	
Intelligent Integrated Controller	Arm-Cortex V8 64-bit, 8 GB LPDDR5		
	Ampere GPU 1024 CUDA cores + 32 Tensor cores, 70 TOPs		
	256 GB M.2 NVMe SSD		
	1000 BASE-T Ethernet, 2.4G/5GHz dual-band Wi-Fi, Bluetooth 5.0 standard		
Body	Size	1,880 x 2,100 x 300 mm	
	Power	AC 220V Input	