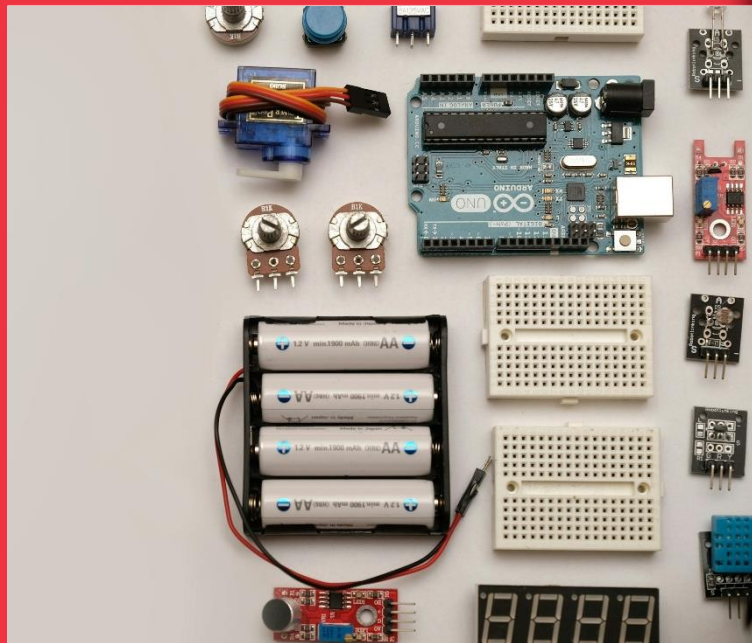




Artificial Intelligence of Things (AIoT) Rapid Development Board

SP Singapore Polytechnic

Technology Licensing Opportunity

Technology Overview

AI and IoT developers face significant prototyping bottlenecks as existing General Input/Output shields for microcontrollers create critical limitations that impede rapid development. The core problems include GPIO overload when stacking multiple shields, higher power consumption, conflicting GPIO pins, and inability to support both direct analog and digital inputs simultaneously. Most critically, traditional shields have permanently attached electronic components on PCBs, making it extremely difficult for developers to replace or upgrade sensors, actuators, and communication modules as project requirements evolve. This forces developers to spend excessive time troubleshooting wiring issues, wrong connections, and recovering from accidental damage to base microcontrollers, significantly slowing development cycles and increasing project costs for academic institutions, tech startups, and R&D teams.

Our AIoT Rapid Development Board eliminates these development barriers through an innovative compact two-layered PCB layout design with modular I/O placements and stackable architecture. The technology enables seamless component replacement and upgrading whilst preventing GPIO conflicts and supporting both analog and digital inputs simultaneously. By eliminating hard-wiring requirements and providing robust protection against accidental microcontroller damage, developers can focus entirely on application development rather than hardware troubleshooting. This transforms AI and IoT prototyping from a time-intensive, error-prone process into a streamlined, flexible development platform that accelerates innovation cycles and reduces development costs for educational institutions, startups, and R&D projects.

Potential Applications

The technology is related and can be applied to customization of electronic hardware and equipment for safe and rapid prototyping for education industries, industry automation, robotic control, condition monitoring and machine-to-machine communication.

- Automation Control Systems
- Educational Training Kits
- Smart Urban Farming (Indoor and Outdoor)
- Condition Monitoring
- Smart Home Monitoring
- Logistic industries (with Smart temperature, humidity and CO2 monitoring)

Commercialization / R&D Opportunities

- ✓ Ready for commercialization
- ✓ Looking collaborators for further development / to develop new applications
- ✓ Available for licensing
- ✓ Accepting business plans from interested parties

Intellectual Property -

- Know-How

Technology Features & Specifications

- Affordable, overcoming space constraint over multi-stacking and space. It supports multi-wired-and-wireless communication protocol *5 such as SPI, I2C, UART, Bluetooth, Wi-Fi, etc.
- The AIoT board (hardware) module can be interfaced to Raspberry Pi microcontroller module, and it can be controlled and programmed via programming tools such as Python, JavaScript, Node-RED and C
- The technology enables users especially developers, trainers, and trainees to have rapid access, damage protection to inputs / outputs pins and main controller board from wrong wiring as well as safe and easy operation.



AIoT Board used in an urban farming scenario

Unique Value Proposition

- Today, most of the I/O kit shields available in the market are very limited to the functionality and a typical shield can't be fitted for both educational use and actual industry as well as business solutions. If they are stacked vertically, it will be enormously bulky and impractical for IoT applications. And by using a first shield module may block access to the second module. Sometimes, it may lead to I/O pins overlapped and produce unexpected outcomes and errors.
- The application of I-O expansion modules spans various industries, including manufacturing, healthcare, energy, and transportation. In manufacturing, these modules facilitate seamless connectivity between machinery and monitoring systems, leading to increased productivity and reduced downtime. In healthcare, they enable precise data collection from medical devices, improving patient care. The energy sector benefits from enhanced monitoring capabilities, allowing for better resource management. As organizations across sectors continue to embrace automation, the I-O expansion module market is poised for significant growth, fueled by its diverse applications and the increasing demand for interconnected systems.
- I-O Expansion Module Market size was valued at USD 1.5 Billion in 2024 and is forecasted to grow at a CAGR of 7.5% from 2026 to 2033, reaching USD 2.8 Billion by 2033.
- A significant factor contributing to this growth is the rising adoption of control systems. Control systems are essential in managing and regulating machinery, processes, and systems, making them pivotal in industries such as manufacturing, energy, and transportation. The integration of I-O expansion modules within these control systems enhances data acquisition and process monitoring, thus driving efficiency. As industries strive for real-time insights, the synergy between control systems and I-O expansion modules becomes increasingly vital.

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