

The Tiny Module Making Waves in Environmental Protection

Industry: Environmental Protection

Product: NanoCOM-KBU

Introduction

Commodities like oil and gold might sell for billions of dollars every year, but when it comes to the question of importance to life on Earth, nothing is as valuable as water. Despite its value, however, the water in our oceans, lakes, and rivers is routinely neglected and misused.

Industrial, household, and agricultural waste has polluted our reserves of both fresh and saltwater, and, due to the burning of fossil fuels, huge amounts of carbon dioxide have been released into the atmosphere and then absorbed by our oceans. This has led to the gradual acidification of the water, which is having disastrous consequences on both plant and animal life.

To ensure that our lakes, rivers, and seas remain healthy and clean, environmental protection agencies need to monitor them and regularly collect and test samples of water. Traditionally, this work has been done by scientists either working on board specialist boats or sailing out to designated locations to collect containers of water. This process is both time-consuming and expensive, and it could be revolutionized by unmanned vessels.

Customer challenges

Unmanned vehicles could help environmental protection agencies save resources and also free up scientists' time, allowing them to conduct further research. Vessels carrying out this work, however, would have to reliably make their way to preassigned locations and then automatically collect water samples.

To maximize on fuel efficiency, the boats would have to be as small as possible. The customer, a Chinese manufacturer of USVs (unmanned surface vehicles), therefore wanted to use ultra-compact computer controllers in their vessels.



Navigation

Boats have to find their way to specific locations, traveling autonomously, rapidly, and safely. This means they have to be aware of obstacles such as other vessels, large debris, or trash that might get caught in their propulsion systems.

To overcome this challenge, the USVs have to be able to change track to avoid such impediments and then make the necessary corrections to get back on course.

Unstable conditions

The open ocean can be a rough environment, and during their missions, USVs may have to cope with extreme temperatures, high winds, and choppy seas. As a result, their circuit boards need to be both strong and resilient.

Adaptability

The customer produces a range of unmanned vessels for different purposes, including firefighting and the measurement of water currents and ocean depths.

To maximize its return on investment, the company requested a flexible computer system that could easily be adapted for use in its entire line of USVs.

The NanoCOM-KBU features a 7th Gen Intel® Core™ U Processor and onboard 4GB DDR4 memory, which makes it the world's most advanced COM Express Type 10 module.

AAEON's solution

Given the customer's need for a small, rugged, flexible solution, AAEON suggested using a COM Express Type 10 module with a custom-built carrier board. Despite measuring only 84mm x 55mm, AAEON's [NanoCOM-KBU](#) features a 7th Gen Intel® Core™ U Processor and onboard 4GB DDR4 memory, specifications that make it the world's most advanced module of its type.

With decades of experience designing and building IPCs, AAEON has also been able to produce carrier boards for the customer's entire fleet of USVs, no matter what functions they have to perform.

Autonomous navigation

Using the boat's GPS location device, users can program the vessel's course before putting it into the water. Waypoints, where the craft will stop and use an onboard pump to collect water, can also be preassigned.

For obstacle detection, the boat is fitted with a pair of ultrasound sensors that have a ten-meter range. When they detect something in the water, the USV automatically corrects its path to avoid the object. The system is effective and reliable, and it leaves human operators free to focus on other tasks.

Communication

By fitting the NanoCOM-KBU's carrier board with 4G, WiFi, and Bluetooth, AAEON has enabled the boat to remain in contact with the base station and broadcast a live video stream from its onboard camera. The powerful COM Express module supports 4K resolution, so users can count on receiving high-quality images.

Rugged specifications

With its onboard memory, the NanoCOM-KBU is a more reliable option for in-vehicle applications. Connectors for external storage devices can easily be shaken loose by the constant impact of waves striking the hulls of vessels, but the NanoCOM-KBU is able to bypass this issue.

The module also features a -40°C to 85°C operating temperature range and 5V/12V DC input support, making it a highly resilient computer module.



Impact

Using the NanoCOM-KBU and a project-specific carrier board, the customer has built a series of water sampling USVs and deployed them around the world. The small, lightweight vessels can easily be packed in the back of a car and launched by a single environmental protection officer.

The boats can travel 100km in a single trip, and the water they collect is used to produce valuable analytics about water quality and the sources of pollution.

Since the unmanned vessels remove the need for a full-size boat and crew, the customer estimates that each USV will save environmental protection agencies as much as US\$100,000 per year.

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About the NanoCOM-KBU

The NANOCOM-KBU is the world's first COM Express Type 10 board with a 7th Gen Intel[®] Core™ U Processor. With its powerful CPU, the trailblazing NANOCOM-KBU has onboard 4GB DDR4 memory and a graphics engine that supports 4K applications.

The NANOCOM-KBU boasts an upgraded embedded controller structure with a real-time interrupt for faster response rates, and it features power control and battery management systems. The board's I2C bus also supports a range of IC formats, making it easier for end users to integrate the module with their own custom-made carrier boards.

The module features a wide operating temperature range of -40oC to 85oC, 5V/12V CD input support, a 1GbE LAN port, eight USB2.0 and two USB3.0 ports, two SATA 2 interfaces, and four PCI-E expansion slots.



ABOUT AAEON

Established in 1992, AAEON has become one of the leading designers and manufacturers of advanced industrial and embedded computing platforms. Committed to innovative engineering, AAEON provides Industry 4.0 integrated solutions, hardware and intelligent automated services for premier OEM/ODMs and system integrators worldwide, as well as IoT solution platforms that seamlessly consolidate virtual and physical networks. Reliable and high quality computing platforms include industrial motherboards and systems, industrial displays, rugged tablets, PC/104, PICMG and COM modules, embedded SBCs, embedded controllers, network appliances and related accessories. AAEON also offers customized end-to-end services from initial product conceptualization and product development through to volume manufacturing and after-sales service programs. It is also committed to continuously redefining and harmonizing the management and development processes of the industry.

With its constant pursuit of innovation and excellence, AAEON became a member of the ASUS group in 2011, enabling the company to further strengthen its leadership, access advanced technology from ASUS, and leverage resources from within the group. AAEON is poised to offer more diversified embedded products and solutions at higher quality standards to meet world-class design and manufacturing demands in the years to come.

AAEON is an Associate member of the Intel[®] Internet of Things Solutions Alliance.

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