Autonomous Drone Inspection

Autonomous Drone Inspection Powered by Axiomtek

"Axiomtek has raised the bar for the embedded computer solutions industry with superior customer service and systems built for industrial environments"

Jonathan Bendes
VP of Product Development
SkySpecs

Background

Wind energy is the fastest growing energy technology worldwide. Laws enacted in most western states require energy companies to provide a portion of their energy from renewable sources.* Wind turbines can provide clean and reliable electricity that can be highly competitive with other energy sources. According to the Wind Energy Foundation, it can power 18 million homes. Wind energy trends are changing, especially in the Western United States. As it gains popularity, more emphasis is being placed on operational reliability, maintenance, safety and overall efficiency. More regulations are in place to ensure that operational safety and reliability factors are in check.

SkySpecs provides automated wind turbine blade inspection services that enable wind farm owners, ISPs and OEMs to track and monitor the health of their wind turbines with automatic robotic inspection by advanced, autonomous drones. The services offer cost and time savings and deliver precise, high quality, easy-to-access data with minimal disruption. With a focus on safety, speed and quality, SkySpecs offers a repeatable, reliable and robust blade inspection service.

An automated aerial inspection offered by SkySpecs is conducted as follows:

- Inspections are launched with the single push of a button.
- While 3D scanning turbines in real-time, the drone generates a flight path to optimally collect inspection images from all three blades in a single flight.
- 3D mapping data is correlated to images for precise damage measurements.

Since SkySpecs enables end-to-end automation, a single inspection can be conducted in less than 15 minutes, with 48-hour data turnaround time. Speed and scalability drive down customer costs and produce high resolution data that enables quick repair scheduling and continuity between inspections. The SkySpecs Data Portal allows its users easy access to important data as well as the ability to closely and intelligently monitor the current health of their assets against their benchmarks.

Requirements

SkySpecs' requirements were demanding but straightforward. The company required the highest quality product based on the most advanced technology available so it could offer its customers the highest of service reliability. The requirements are as follows:

- The company needed an industrial, reliable computer to handle environments from the Baltic Sea to the Mojave Desert.
- The system had to be extremely lightweight so it could be flown on a small drone and robust enough to minimize interference.
- The system needed high computing power that was capable of handling complex algorithms required by the company's drone-based automated inspection algorithms.

Challenges

SkySpecs faced the typical challenges when working with embedded computers; embedded systems are mostly designed for simple applications. They are not tailored to act as the central brain for a very complex application like that of an autonomous, robotic drone. The computers required to operate these drones must have the ability to acquire audio/visual data, interface with many different data input devices, and analyze the acquired data quickly and efficiently in order to command the drone to conduct an inspection. The process is very similar to a human's brain function during a decision-making process.

Potential for error is high when dealing with outdoor, often unpredictable conditions and the complex operations of wind turbines and energy conversion. Having a system that is foolproof – offers redundant backup functions; and is robust, highly reliable, and fast to handle different unforeseen scenarios – is crucial to the success of an inspection.

Another critical factor SkySpecs faced was the overall weight consideration of the drone. With all the required onboard peripherals, i.e., cameras, sensors, etc., every gram/ounce of weight added has a value against the drone's battery life and, ultimately, its fly time. Therefore, in addition to the high computing power requirement, the motherboard selected must be extremely light and highly compact in size.

Solutions

Axiomtek mitigates the difficulties encountered with hardware design and allows the SkySpecs technology team to focus on software development required to make the inspection service possible. Axiomtek's smallest form factor, Pico-ITX, has been one of the leading industrial motherboards in the market.

Axiomtek offered SkySpecs its scalable PICO880. The PICO880 offers 5th Generation Intel® Core™ i3/i5/i7 as well as 4th Generation Intel® Core™ i3/i5/i7 CPUs. SkySpecs selected the PICO880 with 4th Generation Intel® Core™ i7 processor with 1.6mm (6/100th of an inch) in thickness, 136 grams (less than 5 ounces) in weight and 100x72 mm (3.9 x 2.83 inch) in size. It can handle a wide operating temperature range of -20°C to +70°C (-4°F to +158°F) for operational stability in harsh environments. Among its many features, the board offers up to 8GB of DDR3L memory, one full-size PCI Express Mini Card with mSATA, one PCIe x1, two UART and one DDI with four USB 3.0 ports. A customized tower assembly holding the peripherals and the motherboard was built to fit each drone.

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> *Jonathan Bendes*
> *VP of Product Development*
> *SkySpecs*

Why Axiomtek

The SkySpecs team believes that Axiomtek has "the best industrial computer products and offers superior customer service built for industrial environments." The technology Axiomtek delivered worked well according to the company's requirements, and met their expectations.

Jonathan Bendes, SkySpecs' VP of Product Development also commented, "Axiomtek's technology "works" right out of the box and any issues we have are immediately addressed by their engineering team. We have used all sorts of computational hardware in the past. We've designed our own flight computers, built our own circuit boards, compiled and customized kernels, as well as used services and hardware from other companies. Nothing has worked as flawlessly and as reliably as Axiomtek products."

Future plans

SkySpecs plans to continue their partnership with Axiomtek to deliver the best automated wind turbine inspection data services to their customers. The company will continue to grow its customer base and meet the ever-changing market demands and regulatory climates. With the focus on being at the forefront of technology, SkySpecs' mission is to transform the way customers inspect their assets, guaranteeing the highest value with the least amount of disruption.

Axiomtek values its customer's trust and partnership – and will continue to support SkySpecs on their quest to be the leader in the asset inspection service market and all their future needs for high quality industrial computer products.

*U.S. Department of Interior, Bureau of Land Management

About Axiomtek

Founded in 1990, Axiomtek is a design and manufacturing company of PC-based industrial solutions and value-added services for a variety of industries. Axiomtek's high quality products include industrial PCs, single board computers, fanless and rugged embedded systems, intelligent transportation systems, EtherCAT Master Controllers, IoT gateway devices, touch-panel computers, medical grade PCs, digital signage OPS players, network appliances, and casino gaming platforms.

The Axiomtek USA headquarters is located in City of Industry, CA. The subsidiary incorporates product integration and logistics, as well as a wide range of service offerings including design assistance, technical support and return merchandise authorization. Axiomtek Systems in Methuen, MA is the subsidiary's Eastern and Central Headquarters. Axiomtek Systems added its high level of expertise on COTS integration and a variety of value-added services to the Axiomtek USA comprehensive suite of capabilities.

To learn more about Axiomtek or how we can help with your project, visit us at **us.axiomtek.com,** email us at **solutions@axiomtek.com** or call at **1-888-GO-AXIOM (1-888-462-9466)**.

About SkySpecs

SkySpecs enables wind farm owners, ISPs, and OEMs to easily monitor and track the health of their wind turbines. SkySpecs' focus is on offering the most efficient inspection and reporting process to its wind energy customers with the most advanced drone technology. SkySpecs is a proud member of AWEA, WindEurope and the Commercial Drone Alliance.

To learn more about SkySpecs, visit us at **skyspecs.com**, email us at **info@skyspecs.com** or call at **734-413-7346**.