NVIDIA Maximus Success Story

NVIDIA Maximus Technology and Liquid Robotics Work Together to Revolutionize Ocean Research

Liquid Robotics, maker of the pioneering Wave Glider™ ocean robot, is doing truly cutting-edge design that is changing the landscape of oceanic sensing. Now, equally cutting-edge design technology from NVIDIA is changing the landscape of how Liquid Robotics is able to work and continue innovating. New NVIDIA® Maximus™ technology brings together the industry-leading, professional 3D graphics capability of NVIDIA Quadro® professional graphics processing units (GPUs) with the parallel-computing power of the new NVIDIA Tesla™ C2075 companion processor to enable simultaneous 3D design, simulation, and visualization at the desktop.

Liquid Robotics Wave Glider (Image courtesy of Liquid Robotics)

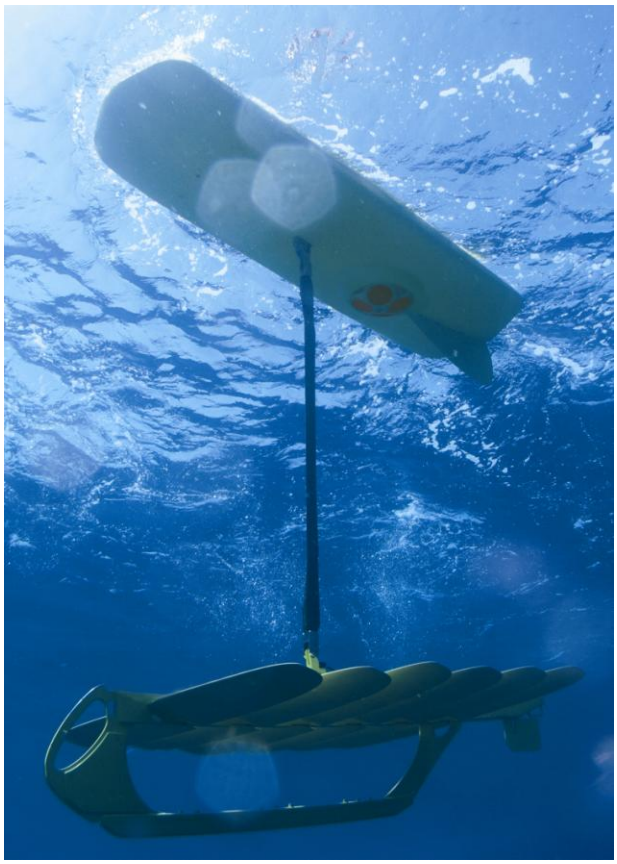
"The real advantage of the Maximus technology is flexibility and increased productivity," said Tim Ong, VP Mechanical Engineering for Liquid Robotics. "It's a tremendous tool to allow my engineers to be flexible, to multitask, and to be more productive because they're not waiting on computational power, period."

CHALLENGE

Liquid Robotics is revolutionizing the exploration and observation of the world's oceans with its innovative Wave Glider ocean robots – but the company's design workflow needed some revolutionizing of its own.

Did you know the ocean comprises 72% of our earth? Surprisingly, more exploration has been done in outer space than we have explored our oceans. It is critical to know more about our oceans for many reasons as the commercial and governmental applications dependent on ocean data is broad. Examples such as: gathering and tracking data on climate or on fish populations; earthquake monitoring, tsunami warning, monitoring water quality following an oil spill or natural disaster; forecasting weather, and; assessing placement of wind- or wave-powered energy projects are just a few of the major applications.

Traditionally, oceanic observation has required some combination of ships, satellites, and buoys, with their challenges of being expensive, hard to manage, unreliable, or difficult to power at sea. Liquid Robotics' surfboard-sized Wave Glider, a solar- and wave-powered autonomous ocean robot, offers a far more cost-effective way to gather ocean data. In creating the Wave Glider, Liquid Robotics has taken enormous design pressure off organizations that require ocean-based sensing data. Instead, the design pressure now rests with Liquid Robotics, both for integrating customer-specific sensor payloads and for continuing to enhance the performance and capabilities of the Wave Glider itself.



Liquid Robotics Wave Glider (Image courtesy of Liquid Robotics)

"The key is that the Wave Glider is persistent, meaning it can operate continuously, without intervention, for months and a year at a time," said Tim Ong, VP Mechanical Engineering for Liquid Robotics. "We can integrate scientific, governmental, or commercial sensors onto the Wave Glider platform and put it on the ocean to act as either a virtual buoy or a vehicle, to take and transmit sensor information."

Liquid Robotics engineers use a number of software programs – including Dassault Systèmes SolidWorks, ANSYS, MathWorks MATLAB, and various proprietary codes – to design, test, simulate, and render complex mechanical designs such as structural assembly or computational fluid dynamics. In the past, doing simulation or rendering required the complete computational power of their systems.

"If you wanted to do anything else while running a simulation or modeling, you were out of luck," said Ong. "You either got a cup of coffee or worked on something in the shop once the computer was using all its processing power running one of these programs."

Often, engineers would wait until the end of the day to set up simulation models. "We'd turn them on and leave the office and check them the next day, or we'd send them to a third party to run," said Ong. "Often we'd return in the morning to find out the simulation crashed, so we'd have to reset it and try again the next evening. You can lose days or weeks, very quickly, if you're doing complex modeling and you can't run it and monitor it as it's running."

SOLUTION

NVIDIA Maximus technology has transformed the mechanical design process for Liquid Robotics. This unique technology powers a new class of workstations by merging Quadro and Tesla GPUs together, for simultaneous 3D design, simulation, and visualization.

For the engineers at Liquid Robotics, NVIDIA Maximus technology means not having to wait around for running simulations anymore.

"We're also very excited about the future of simulation, with newer software that will take advantage of the computational power of the Maximus technology," said Ong. "Our design philosophy was always to build, prototype, test, iterate, and repeat over and over until we increased the performance and reliability of the Wave Glider vehicle to our satisfaction. NVIDIA Maximus technology will enable a huge increase in our computational modeling capability, which will further accelerate our speed and efficiency."

With the previous system, each engineer was only able to work on one software program on one computer at a time, so workflows involved passing things from engineer to engineer. Now, every Liquid Robotics engineer can work on multiple programs on a single NVIDIA Maximus-powered workstation.

For instance, their 12-core workstation with 6 CPU cores plus an NVIDIA Tesla companion processor can run ANSYS, leaving the workstation's other 6 CPU cores, along with its Quadro GPU, to run SolidWorks and other design programs.

"We have a limited number of engineers, so allowing each one to do multiple things at once is transformative for our workflow," said Ong. "Now, an engineer can design some mechanical components in SolidWorks, while he's also using the structures package of ANSYS to do simulation. We never would have thought of doing this before."

IMPACT

As a result of leveraging NVIDIA Maximus technology, Liquid Robotics spends less time to integrate customer-specific sensor payloads or to boost the Wave Glider platform's performance, whether that entails more power, faster speeds, or enhanced communications capabilities.

Liquid Robotics Wave Glider (Image courtesy of Liquid Robotics)

"We spent multiple millions of dollars and years of research on the current Wave Glider," said Ong. "Now, within just a few weeks, we can change the design to incrementally increase performance. When you reduce the time it takes to do the design work, you know the cost is going down as well."

NVIDIA Maximus technology integrates two GPUs in a single, affordable workstation, so Liquid Robotics can run their visually demanding 3D design applications while simulations are run simultaneously without having to purchase a prohibitively expensive computer system, or breakdown these stages into two different steps in a workflow which would require multiple computers.

"With the Maximus technology, I no longer have to give each of my engineers a workflow to run through," said Ong. "It's up to them to set up the workflow that enables them to best achieve their design goals. The NVIDIA system lets them do it however they want to. What they work on first or when doesn't matter anymore, because the Maximus system can handle it all at the same time. This flexibility, and not having to wait around for things to happen, lets our team be so much more productive."

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