

SYNOPSYS®

Predictable Success

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— Paul Beard,
Senior Design Engineer



Synplicity®

Simply Better Results

Success with the Synopsys® Synplicity® Business Group and SSG Precision Optronics

Synplify® DSP Success Story

Summary

SSG Precision Optronics, a supplier of state-of-the-art optical systems, has recently begun using FPGAs for DSP applications in its products. When bottlenecks arose in the small group that hand-codes these devices, SSG adopted Synplify® DSP from Synopsys’ Synplicity Business Group. The Synplify DSP tool is enabling SSG engineers to generate their own FPGA firmware, improving their control over projects and eliminating the bottlenecks.

SSG is recouping its investment quickly through savings on time-to-market, area, and cost. They can implement changes in minutes that required days before Synplify DSP, debug designs in hours that used to take a week or more, and generate device-independent code that consumes 20% less area than the device-dependent, hand-written code of the past.

FPGAs for DSP—A Boon for the Business, But One that Brings New Challenges

SSG specializes in the design, fabrication and testing of precision optical subsystems for space and military applications. A key component of many systems is a Fast-steering Mirror (FSM), an electronically controlled mirror that scans a target area to deliver an image to a capture device. SSG’s ability to design and build FSMs, often to military specifications or in space-hardened form, is a major reason for the company’s business success.

In the past FSMs were driven by analog hardware that was subject to drift, often a death knell to highly precise optics. Recent advances allowed SSG to overcome this problem by substituting digital electronics, in particular FPGAs that perform DSP operations. But in deploying them a new obstacle quickly arose—SSG had a very small, continually overloaded group capable of developing RTL firmware to drive these devices.

“We had to find a way for engineers like myself who don’t know Verilog or VHDL to generate the necessary firmware,” said Paul Beard, Senior Design Engineer. Since Beard had a great deal of experience using Matlab and Simulink, he began by researching The Mathworks’ website, which suggested the Synplify DSP software for customers who face SSG’s dilemma. He then called Synplicity and requested a trial license.

“We found the Synplify DSP tool very easy to learn and use, and quickly realized how ideal it is for our purposes,” Beard reported. “We can design at the straightforward block diagram level in the Simulink environment, run simulations to verify that it’s doing what we want, and generate human-readable code that’s easy to understand and change—even by someone other than the original author. We found that the code generated by the

Synplify DSP Success Story

Synplify DSP software usually works better than hand-written code, and that if there are any bugs they're orders of magnitude easier to find and fix."

A Series of Successes with Synplify DSP

SSG converted to a full license and quickly began recouping its investment. On one project for a major defense contractor, the FSMs made use of a position sensor bought "off the shelf" from another supplier. These position sensors exhibited a level of non-linearity that was much higher than the FSM specification would allow. Beard used the Synplify DSP software to develop an algorithm that corrected for the non-linearity inherent in the position sensor, thus enabling the FSM to meet its own linearity requirements. This code is now shipping in every unit that SSG delivers.

On another project, the firmware staff was struggling to develop code to compensate for temperature-related drift in FSMs until Beard became involved. He applied his understanding of the physics of the situation, along with his ability to generate firmware himself using the Synplify DSP tool, to quickly create a solution.

"These projects highlight one of the huge values of the Synplify DSP software, the fact that for the first time the engineers who understand the problem are in full control of solving it," explained Beard. "We don't have to rely on obtuse code we can't read or on an overworked RTL programming staff."

On a third project, SSG will use a superior Synplify DSP-generated design for the production phase of a very large defense contract, replacing the hand-written code that was employed in the initial prototypes under evaluation.

Device Independence and Area Minimization Add Up to Big Savings

"Another tremendous value of the Synplify DSP solution is its device independence," Beard continued. "We can use it to find out how much area a design will consume in each of several candidate FPGAs and then choose the smallest one that works. The cost of military and space-ready FPGAs can vary by \$10,000 or more, so it's a huge benefit to use the least expensive one that the design fits into—rather than be locked in to a specific device chosen up front before the facts are in."

"The Synplify DSP software helps us fit designs into less expensive FPGAs in another way, by generating designs that are smaller than hand-written code—an average of 20% I'd say," he added. "The 'folding' technique it employs gets a lot of the credit for that."

Bright Future with FPGAs-for-DSP and Synplify DSP

A small company for most of its 30-year life, SSG is now experiencing rapid growth. Beard expects FPGAs for DSP applications, with the Synplify DSP solution as their key enabler, to continue playing major roles in the bright future the company foresees.

"The Synplify DSP software has proven to be a very wise investment from many points of view," Beard concluded. "It's even helped us produce a more harmonious and functional engineering environment now that we're all able to take advantage of our particular skills without feeling like we're getting in each other's way. The crunch is over for our RTL programmers. Who knows? Maybe they'll even have time to learn Simulink and the Synplify DSP tool themselves."

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