

Applying Graphics to FPGA-Based Solutions

Introduction

Take a look around and check out the innovations in display technology. Your car’s navigation system has an interface that looks better than your favorite video game. The treadmill at your gym has an instrument panel that rivals the cockpit of a fighter jet. Your MP3 player displays the title and photo-quality album cover when you select your favorite song. Does your new product offer the same “wow” factor?

Do You Need a Display?

Like it or not, the Apple iPhone has changed the game. Every device imaginable is getting a revamp with colorful displays and easy-to-use interfaces. Companies are racing frantically to be first to market with innovative GUIs. And they should be—this is no market for second-place efforts.

With Altia’s chain of user interface design and deployment tools, you can get your product from concept to code quickly and easily. Whether you’re adding a display to your Altera solution for the first time or just giving your product a little face-lift, Altia can help get a custom human-machine interface (HMI) design from the designer’s imagination to the lowest cost hardware in the shortest amount of time.

Altia’s Tool Chain

Altia’s tools can be used individually or together in a model-based process to develop your user interface. Start with Adobe Photoshop, end on an Altera® FPGA. Altia’s tools help you prototype, simulate, and deploy your HMI with PhotoProto, Altia Design, and DeepScreen (Figure 1).

Figure 1. PhotoProto, Altia Design, and DeepScreen



1. Prototype

(with PhotoShop® and PhotoProto™)



2. Design

(with Altia® Design)



3. Generate Code

(with DeepScreen® Graphics Code Generator)

PhotoProto is a Photoshop add-on that automatically transforms your Photoshop graphics into a working, interactive, user-driven prototype. PhotoProto automatically transforms your artist's cutting-edge graphics into interactive storyboards that can be shared with managers, customers, or focus groups. Simply arrange and name your Photoshop graphics layers for buttons, screens, and other user interface objects. Click on the PhotoProto menu and out pops a working prototype that you can instantly try out or send to colleagues, users, and executives. Once the concept is perfected, move up to Altia Design—while keeping all the assets intact.

Altia Design is a full-featured authoring and integration environment that turns ideas, graphics, and concept prototypes into detailed simulation models. You can build user-interface models from scratch or import graphic assets previously created by artists. Altia Design then helps you integrate your interface with third-party tools or your own application code. In the end, you get a high-fidelity, functionally complete, accurate simulation model. Use it to test your code, algorithms, concepts, and systems, all before you ever generate code or even lay hands on the target.

When you're ready to get down to the hardware, you need DeepScreen. DeepScreen is a graphics code generator that transforms your model or prototype into deployable code. The generated code is small, efficient, and tuned for your target operating system. DeepScreen also generates code for commercial and custom RTOSs—or even no RTOS at all. With DeepScreen, your programmers are saved from the grunt work of graphics programming and can focus on the more challenging control and application code. DeepScreen can help you shave months, or even years, off your schedule. Most importantly, DeepScreen helps you deliver before your competition.

Altia Solutions for Altera

Although DeepScreen can be used on just about any hardware, from an 8-bit micro to full desktops, it has been customized to take full advantage of industry-leading hardware like Altera FPGAs. Altia tools can be used to generate user-interface code for any Cyclone® or Stratix® device with a Nios® II embedded processor using:

- A software-based rendering solution that leverages the Nios II embedded processor for all graphical operations, allowing developers to get the highest graphics performance without the added cost of hardware acceleration.
- A hardware-based rendering solution with the TES® D/AVE graphics engine. This target takes full advantage of the TES D/AVE Graphics IP and maximizes performance with parallel hardware/software processing

Both solutions allow for 2D color graphics with a full set of rendering features, including vector objects, bitmaps, text, alpha blending, and transformations like scaling and rotation.

How do you know which solution your HMI requires? Try it! With DeepScreen, you can generate code for different targets with the push of a button. Find out what works and what doesn't with the least-expensive hardware option. Is that eye-catching animation going to run smoothly on an FPGA? There's only one sure-fire way to find out.

Required Hardware and Software

- Quartus® II, version 7.2 (or later)
- Nios II Embedded Design Suite, version 7.2 (or later)
- Nios II Embedded Evaluation Kit
- *For D/AVE applications:* D/AVE Evaluation Kit, version 1.5 (or later)

Key peripherals for developing an Altia HMI on an Altera FPGA include the following:

- Nios II processor core (Nios II/f core with instruction and data cache)
- FIFO bridge
- DDR SDRAM memory
- SSRAM memory
- External flash memory
- Touch panel interface (SPI)
- LCD display interface (I²C)

- For frame buffer applications: SGDMA for sending streaming display data
- For D/AVE Applications: TES D/AVE 2D Graphics Engine

Conclusion

Whether you need accelerated performance or an ultra-low cost option, Altia and Altera have collaborated to provide the optimal solution to get a custom HMI design from the artist's imagination to the lowest cost hardware in the shortest amount of time.

Further Information

- Altia products for Altera FPGAs:
www.altia.com/altera.php
- Altia PhotoProto:
www.altia.com/products_photoproto.php
- Altia Design:
www.altia.com/products_design.php
- Altia Deep Screen:
www.altia.com/products_ds.php
- *Implementing a Flexible CPLD-Only Digital Dashboard for Automobiles:*
www.altera.com/literature/wp/wp-01072-implementing-flexible-cpld-only-digital-dashboard-automobiles.pdf
- *A Flexible Architecture for Fisheye Correction in Automotive Rear-View Cameras:*
www.altera.com/literature/wp/wp-01073-flexible-architecture-fisheye-correction-automotive-rear-view-cameras.pdf
- *Creating Low-Cost Intelligent Display Modules With an FPGA and Embedded Processor:*
www.altera.com/literature/wp/wp-01074-creating-low-cost-intelligent-display-modules-with-fpga.pdf
- *Using LEDs as Light-Level Sensors and Emitters:*
www.altera.com/literature/wp/wp-01076-leds-as-light-level-sensors-and-emitters.pdf



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