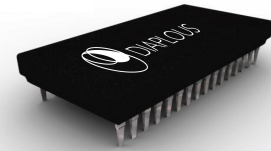


DIAPLOUS

COMPONENTS FOR VISUAL PERCEPTION



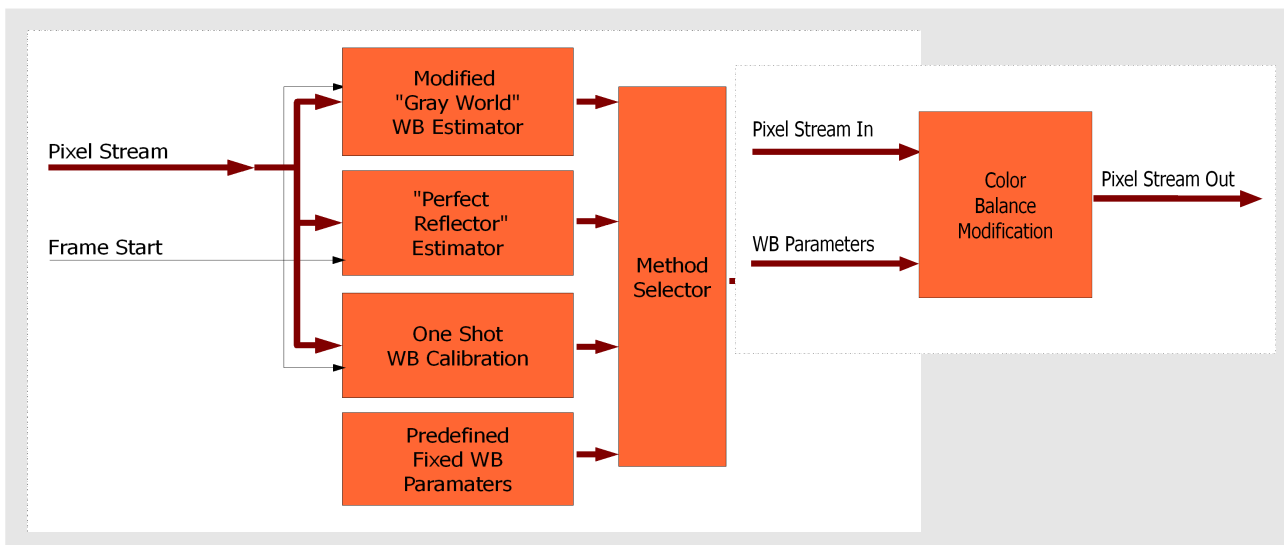
Automatic White Balance Estimator

Product Outline

An IP block that provides configurable automatic estimation of white balance parameters

The DIAPLOUS Automatic White Balance Estimator is a flexible unit that reads an entire frame out of a flow of pixel data in RGB format and generates color balance parameters. Three algorithms of estimation are used: *Perfect Reflector*, *Modified Gray World* and *One-Shot WB Calibration*, each fit to a different purpose.

A separate block for applying the balance parameters is used so that the IP can fit various architectures.



Pixel Stream: The unit expects a stream of pixels formatted as 24bit RGB. The stream may be continuous or can be synchronized to "row valid" and "column valid" inputs. A "Frame Start" pulse is required by the algorithm.

Method Selector: The various methods of determining color temperature are multiplexed at this stage. The unit can be configured to either always select one or to automatically choose method based on a threshold value.

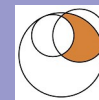
Predefined Fixed WB Parameters: In a large number of cases, the color temperature is a-priori known. In those cases it is always better to apply fixed white-balance parameters to the image. These parameters can be programmed by the user – upon reset they get default values corresponding to typical cases.

Algorithms, There are three methods for estimation of the color temperature:

Modified "Gray World": This method fits well to scenes where the three components (red, green, blue) are more or less balanced. It is based on the assumption that a well balanced image will have an average "gray" color if colors of all pixels are summed. This is the more generic approach if we know nothing else.

"Perfect Reflector": In scenes where a bright point – in best cases a reflection of the light source- exists. The algorithm assumes that this point should be white and appropriately estimates the color temperature of the light source. It is very sensitive to saturated pixels, so the user must have a good knowledge of conditions.

One-shot WB Calibration: If there is a known white region in the scene captured by the camera (or if we can put one there) then we can have a very good calculation of the color temperature. This is the preferred method for fixed cameras, especially if artificial light is used.



Features:

- Integrated auto white balance solution with no need for software control
- Configurable parameters for all estimation algorithms
- Default reset values for fixed color balance settings
- Two-block IP for easy integration in various pixel flow architectures.

Target Applications:

- Image sensor interfacing
- Display drivers

Size: 3600 Slices, 1000 FFs (Xilinx Spartan XC3S1000-5) for images with 2K columns per row.

Speed: Pixel Clock 150MHz.

Interfaces:

- Unbalanced Pixel-flow Input
- Status/Control Registers
- Balanced Pixel-flow Output
- Balance Parameters Output

Software:

C Header File with Register Definitions

Status:

Working FPGA Implementation.

Demonstration:

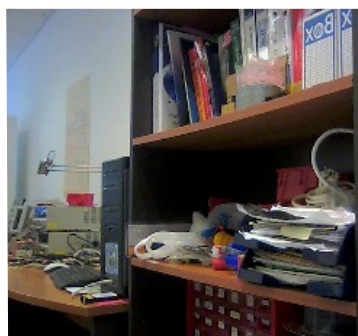
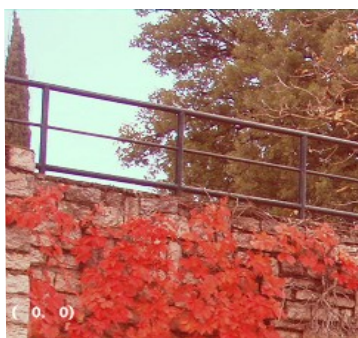
Development board including:

- FPGA with RISC Core, Ethernet 10/100 MAC, Sensor Interface, I2C, Memory Interface
- Memories (SDRAM & Flash)
- Ethernet Phy & Connector
- 3Mpixel Color Image Sensor

Original Image



White Balance Enabled



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