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BLOCKOUT GENERATION FOR 5 LAYERS SANDWICH PRINTMODE

HP INC

Blockout generation for 5 Layers Sandwich Printmode

ABSTRACT

Sandwich application is commonly used in the windows graphics market, but it can be very attractive for other applications done with transparent media (flexible or rigid). It consists on printing an image A, then on top of it a white layer and finally on top of the white layer and image B (which could be the same as A if desired). Thus, images A is visible from one side of the media and B is visible from the other side of the media. One of the main challenges to obtain a good sandwich output is the opacity provided by the white layer between the color layers because if this layer is not enough opaque one image might be seen mixed with the other image and you don't want this effect. It is not a matter of quantity of white. Obviously if you put 4 drops of white the opacity will be higher than when you put only 2, but there is a point of saturation of our ink and the opacity doesn't change although you put more ink. This limitation (or saturation point) is not specific to latex but also present in competitors as UV inks. To solve this problem a layer of black color can be added as following: print image A, white layer, black layer, white layer and image B in this order. This black layer prevents transparency between sides and provides full opacity.

Some UV competitors already have a 5-layer sandwich solution among their features. In order to close this competitive gap, a 5 layers mode was strongly required for the latex R-series but the current pipeline was not able to handle such a high number of planes. In order to overcome this technical limitation, the proposed invention reuses the information of some of the planes to map it, after some smart masking implementation, to the proper colorant trenches of the printhead to finally generate a 5-layer sandwich mode printmode.

DESCRIPTION OF THE INVENTION

PROBLEMS SOLVED

The FPGA have a plane definition limitation and is not able to add more planes to generate a Sandwich with 5 Layers. The 5 Layers consist in print Color (CMYKcmPS) + White + Black + White + Color (JLITjlUi).

The 3 Layer printmode can be implemented through the current pipeline without any limitations. It has been demonstrated that even using the highest white opacity provided with gen4 latex ink products, 16 drop per pixel (dpp), is not enough to get the required opacity to don't see the other Side.

Figure1: 3 layers sandwich

Figure2: 5 layers sandwich

PRIOR SOLUTIONS

Sandwich mode, ideally, should support 2 options:

1- Using the same images in both side
2- Using different images in both sides.

The current 3 layers solution only covers with good performance the first one. Customer would be limited to use the same image in both sides to have a good performance in terms of opacity.

DESCRIPTION

To make the 5 layers without adding more planes (FPGA limitation) we propose to distribute the information of plane W (the one containing the information of the white layer) and use it to print the 3 layers required in the blockout: white layer 1, black layer and white layer2. This is possible using a printmode strategy where the information of plane W is used in one part of the white printhead (W), the same information in one part of the black printhead (K) and again in another part of the white printhead (W). Each layer of the blockout uses a different mask to adapt the white plane W to their purpose. White layer 1 is printed using 8dpp of white, the blockout black layer is printed at 1dpp of black and the white layer 2 is printed at 10dpp of white.

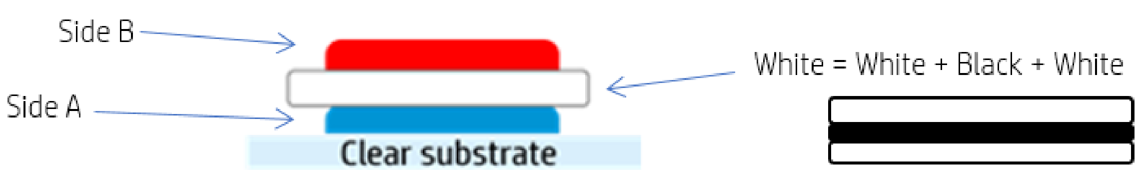

Figure3: sandwich mode scheme

In order to generate the 3 layers blockout (W1+K+W2) with different ink amounts starting from the same plane information it has been required to create different masks for each. Each mask has been limited to a different ink drops maximum mapping the same half tone levels to a different number of drops, as indicated in the following table:

Halftone levels	0	1	2	3
Drop sequence -W1	0	1	2	4
Drop sequence - K	0	0	0.5	1
Drop sequence - W2	0	1	3	5

Two different criteria have been followed to select the previous mentioned drop sequences:

1. The top priority was the blockout (full opacity). The solution has been optimized adjusting the halftone level 3 with this corresponding ink amounts ensuring full opacity and maximum white lightness
2. The second priority was to get the same whiteness matching between sides. We saw that white printed on media required less ink to match the lightness of the white printed on black layer. That is, the is an ink on media effect which we solved printing different number of white drops in each of the white layers (8dpp for W1 vs 10dpp for W2). W2 requires more white ink due to printing on top of black. With these values changes between white layers tones are reduced to less than 0,7dL between white sides.
3. The third priority was to deliver the best linearity possible obtaining the values selected for halftones levels 0 to 2.

ADVANTAGES

With this implementation we can print a 5 Layers sandwich printmode as our competitors. And we solve the issue in opacity of the 3 Layers mode.

LIMITATION

This solution has been optimized to get the maximum white opacity, so this solution is perfect when the value of the full white layer is 100%. However, black and white linearizations are not very similar, the white ink is strongly not linear, so if the white layer is different from 100% the white layer will be more much reduced than the black layer, so the white layer loses whiteness and becomes a bit greyish.

Disclosed by Sara Echevarria, Alexandre Rodríguez and Mauricio Seras, HP Inc.