BACK

GENESIS

Application Note

Simplified gm833x3F Cascading for SXGA to XGA

MSD-0011-B

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1. Overview

1.1. Introduction

The Genesis gm833x3F is a three channel single chip image scaler performing high quality image resizing. The device can operate at speeds of up to 68 Mpixels/sec and can process input images of up to 1024 pixels wide by 4095 lines.

For certain applications involving high resolutions graphics, the maximum image width restriction and/or maximum operating speed may be a limiting factor. Multiple gm833x3F devices may be used to increase the maximum input image size; however, the standard cascading scheme, although seamless, requires some additional dedicated hardware such as adders, shift registers, etc.

This application note describes a specific, simplified cascading method for scaling 1280x1024 SXGA to 1024x768 XGA using two gm833x3F devices.

1.2. What is Cascading?

The term cascading is used to described the following procedure:

a) The input image is divided into segments. Each segment is less than 1024 pixels wide and can be processed at a rate of less than 68 Mpixels/sec.
b) The segments are treated as completely separate images and processed individually.
c) The final output image is created by assembling the resized segments.

2. System Design

2.1. Dividing the Input Image

For this application, the SXGA 1280x1024 input image is divided vertically into left and right 646x1024 segments, each of which can be processed by a single gm833x3F (see Figure 1 below). A total of 11 pixels (636-646) are shared at the segment boundary and processed by both devices. Scaler #1 receives the leftmost 646 pixels (1-646), while Scaler #2 receives the rightmost 646 pixels including a single ‘dummy’ pixel supplied by the system at the end of each line (636-1281).

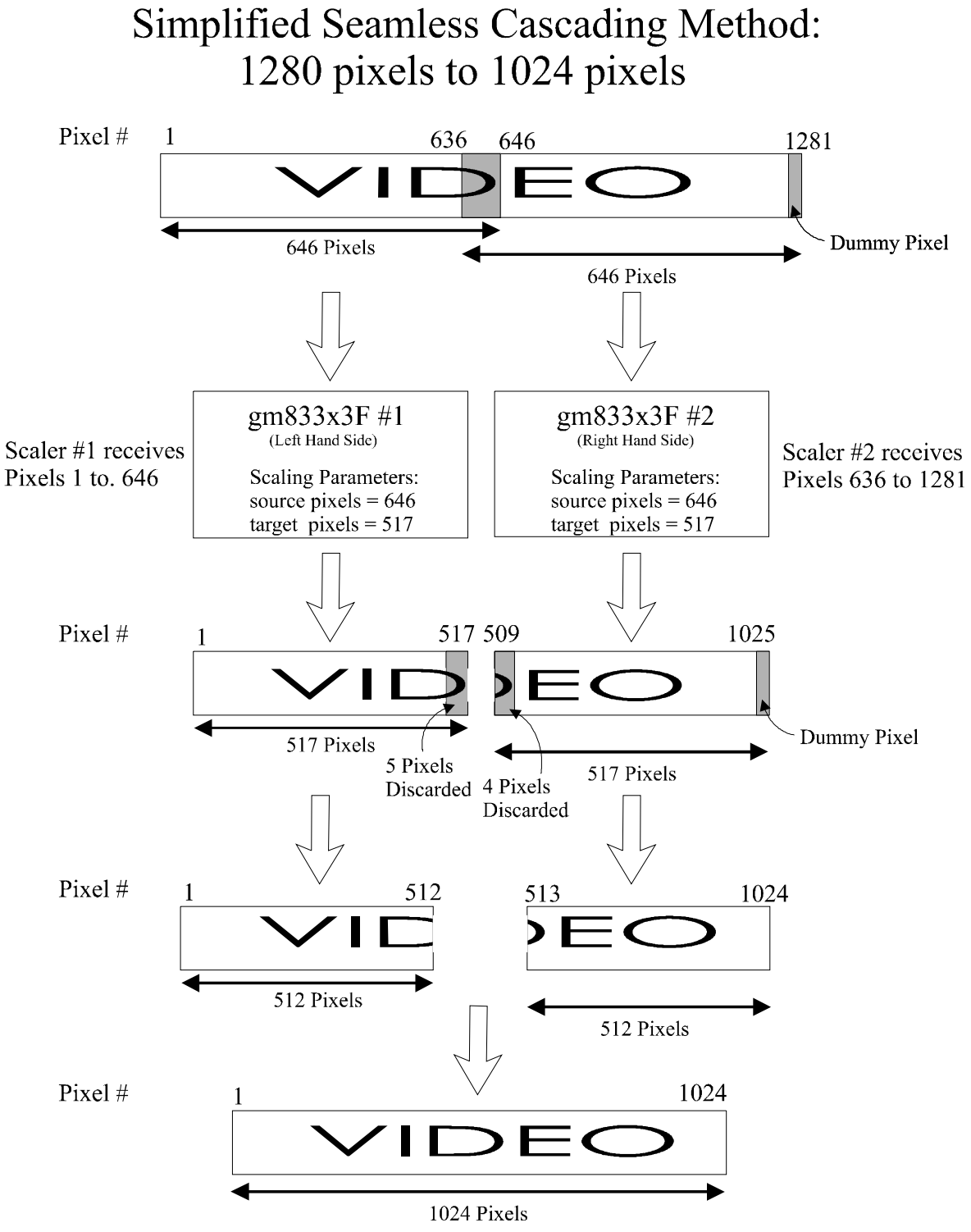

Figure 1: Dividing the Input Image

2.1.1. Input Boundary Conditions

In conventional cascading methods, a single boundary pixel is shared between the two segments. To ensure a seamless output display, the resulting two boundary pixels in adjoining segments must be averaged into a single output pixel by adding the pixels and dividing the result by two.

In the simplified cascading approach, no boundary pixel averaging is required. The input image is divided so that adjoining segments share a total of 11 pixels along their common boundary (refer to Figure 1), i.e. the final eleven pixels (636-646) of segment #1 (left) are the same as the first eleven pixels (636-646) in segment #2 (right).

2.2. Processing the Segments

After the input image has been divided into two segments, each segment is treated as a separate image and processed independently using the two gm833x3F devices.

2.3. Reconstructing the Output Image

The two independently processed segments are each resized to 517x768 by the gm833x3F devices. The final output image must then be reconstructed from these two output image segments. This is accomplished by placing the two output image segments in the same configuration as the input segments, and discarding the superfluous boundary pixels.

In this application, a total of nine pixels must be discarded along the boundary. To avoid any display image seams, the last five pixels of scaler #1 and the first four pixels of scaler #2 must be discarded. The rightmost (last) pixel of scaler #2 is also discarded.

Using this method, the remaining two 512x768 segments may be attached without requiring any mathematical operations to be performed on the boundary pixels.