Technical Note

MT9P031
Maintaining a Constant Frame Rate

Introduction

This technical note discusses maintaining a constant frame rate with Micron's MT9P031 CMOS image sensor.

It is often desirable to maintain a constant frame rate while still having the ability to adjust certain parameters. This is not always possible, however, since register updates are synchronized to the read pointer and the shutter pointer for a frame is usually active during the readout of the previous frame. Therefore, any register changes that could affect the row time or the set of rows sampled will cause the shutter pointer to start over at the beginning of the next frame.

The following register fields will cause a "bubble" in the output rate (that is, the vertical blank will increase for one frame) if they are written in continuous mode, even if the new values would not change the resulting frame rate:

- Row_start
- Row_size
- Column_size
- Horizontal_blank
- Vertical_blank
- Shutter_delay
- Mirror_row
- Row_bin
- Row_skip
- Column_skip

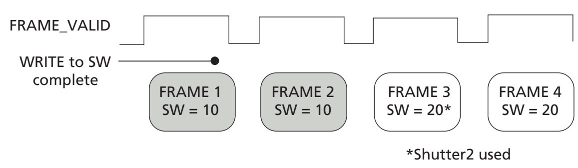
The size of this bubble is Shutter_Width × ^{t}ROW, calculating the row time according to the new settings.

Under certain circumstances, the Shutter_Width_Lower and Shutter_Width_Upper fields may be written without causing a bubble in the output rate. Since the shutter sequence for the next frame is often active during the output of the current frame, this would not be possible without special provisions in the hardware. WRITEs to these registers take effect two frames after the frame they are written to, allowing the shutter width to increase without interrupting the output or producing a corrupted frame (as long as the change in shutter width does not affect the frame time).

Figure 1 shows the timing of WRITEs to the shutter width registers in electronic rolling shutter (ERS) continuous mode (in snapshot modes, shutter width changes generally take effect immediately). In the example, the shutter width is changed from 10 to 20 during Frame 1. The effective shutter width of Frame 3 is smaller than that of Frame 4, since Frame 3 was exposed using Shutter2 and Frame 4 was exposed using Shutter1. As defined in Equation 1, $^{t}sh2$ equals the difference between Frame 3 SW and Frame 4 SW.

$$^{t}sh2 = \begin{cases} ((Shutter\_Sequence\_Length + 1) \times 2) \times {}^{t}ACLK & \text{if R0x1E[14] = 0 (where } {}^{t}ACLK \text{ is } 2 * {}^{t}PIXCLK\text{)} \\ 3 \times {}^{t}aclk & \text{otherwise} \end{cases} \quad \text{(EQ 1)}$$

Figure 1: Writing Shutter Width Registers



Conclusion

For more information on frame rates, or for information on this and other features, refer to the MT9P031 CMOS digital image sensor data sheet on Micron's Web site at www.micron.com/imaging.

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Revision History

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- Initial release.